

Teagasc Statement of Strategy 2017-2020



Supporting Science-Based Innovation in Agriculture and Food
by driving sustainable profit from productivity



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Foreword



We are pleased to present the sixth Statement of Strategy of Teagasc, which sets out our goals, priorities and high level strategic actions for the period 2017-2020. The Statement has been prepared in consultation with staff and a range of external stakeholders and represents our response to the opportunities and challenges facing the organisation and the agri-food sector during the next three years.

Agriculture faces significant challenges in the coming decades. On the one hand, it must produce more food for a growing, increasingly affluent global population that requires a more diverse, protein-rich diet. On the other, it must also compete for lucrative new markets, while vying for access to increasingly scarce natural resources, preserving biodiversity, water and soil quality, restoring fragile ecosystems and mitigating the effects of climate change.

Over the period of this Statement, the industry will have to address a new challenge arising from the decision of the UK to exit the European Union (Brexit). While the short-term implications of this decision are already apparent in terms of the impact of changes in the value of Sterling against the Euro, the medium-to-long-term impact will only become clear as the exact terms of Brexit are agreed over the coming years.

It is in this context that the long-term future of Irish agriculture and food must be considered.

The new industry-led strategy launched in 2015, entitled **Food Wise 2025**, which is endorsed in **A Programme for a Partnership Government (2016)**, sets out ambitious growth targets while acknowledging the need to deal with many challenges.

The continuous development and application of new technologies will be critical in helping realise the **Food Wise** ambitions. Not only are new technologies needed to increase the productivity and competitiveness of Irish agri-food enterprises, they must also enable all actors of agri-food and bioeconomy value chains to play their part in protecting the environment and mitigating and adapting to climate change. Teagasc is committed over the course of this strategy period to the development and dissemination of the knowledge and technologies needed in delivering on the **Food Wise 2025** ambitions.

In this regard, the **Teagasc Technology Foresight 2035**, launched in 2016, will be crucial in guiding the development of the new tools and techniques that will help to better address the 'Grand Challenges', in particular the challenges of climate change and wider sustainability concerns, while promoting the efficiency and competitiveness of our agri-food sector to enable it compete in growing global markets.

Dr Noel Cawley
Chairman

Professor Gerry Boyle
Director

Section 1

Mandate, Mission, Vision and Values

Teagasc Mandate

Teagasc was established under the Agriculture (Research, Training and Advice) Act 1988, which states that its principal functions shall be:

- To provide, or procure the provision of educational, training and advisory services in agriculture, including such educational, training or advisory services in agriculture as may be specified by the Minister for the purpose of giving effect to any directive, regulation or other act adopted by an institution of the European Communities.
- To obtain and make available to the agricultural industry the scientific and practical information in relation to agriculture required by it.
- To undertake, promote, encourage, assist, co-ordinate, facilitate and review agricultural research and development (including research and development in relation to food processing and the food processing industry).

This mandate gives Teagasc responsibility for meeting the knowledge and technology needs of the entire food chain and the authority to integrate research, advice and education services to deliver the innovation support necessary to add significant value to Ireland's agri-food sector.

Mission

To support science-based innovation in the agri-food sector and wider bioeconomy so as to underpin profitability, competitiveness and sustainability

Vision

Teagasc will be nationally and internationally recognized as the knowledge provider of choice for Ireland's agri-food sector

Organisational values

We aim to be professional, responsive, efficient, accountable and independent through endeavouring to attain scientific excellence in all our activities and by working in partnership with other organisations to meet the needs of our stakeholders.

Research and Knowledge Transfer Activities

Teagasc is the leading public organisation in the fields of agriculture and food research in Ireland, undertaking innovative research, knowledge dissemination and education covering the following broad thematic areas:

- Animal and Grassland
- Crops, Environment and Land Use
- Food
- Rural Economy and Development.

Our annual research portfolio comprises some 300 research projects undertaken by 500 scientific and technical staff. We collaborate extensively with our colleagues in Irish institutes of higher education. Our Walsh Fellowships post-graduate programme supports more than 250 Ph.D. and M.Sc. students annually and enhances this collaboration. We compete successfully in EU research programmes and we have developed bilateral agreements with research organisations in Europe, the USA, Canada, South America, New Zealand, Africa, and also with a number of the Consortium for International Agricultural Research Centres (CIGAR).

The challenge for Teagasc is to provide scientific leadership to the agri-food industry and rural communities by generating new knowledge and innovation to underpin competitiveness and sustainability. Teagasc research priorities continue to be informed by the aim of delivering a more sustainable primary agriculture sector – economic, social and environmental sustainability. In addition, Teagasc has a very important role to play in researching and analysing the implications of changes in the external policy environment for agriculture and food to inform decision making in both the agri-food sector and at national level.

We ensure that the main focus of research is on the rapid delivery of results with potential for economic and social impact. While retaining our strong capacity in applied research, we have also strengthened our capacity in key areas of strategic research. This will ensure that agri-food research is fully competitive in the national Science, Technology and Innovation (STI) programme and in the European Research Area.

The main thrust of the Food Programme is directed towards developing the base of expertise and information in generic technologies needed to assist the Irish food industry to achieve consistent quality and guaranteed safety, allied to product and process innovations. The programme covers the full spectrum of the innovatory process, ranging from market studies through to strategic research to technology development services and training programmes. The research is mission oriented and is complemented by a structured programme of innovation management and technology transfer (Teagasc “Gateways”). Moorepark Technology Ltd. (MTL) is a key link in the technology transfer chain. It is a unique entity, being a joint not-for-profit venture with Irish dairy companies and having a commercial ethos and business strategy.

Over the course of this Strategy, Teagasc aims to construct a Food Innovation Hub at its Moorepark campus to promote greater collaboration between industry and public research and to deliver a step change in innovation activity in the food industry.

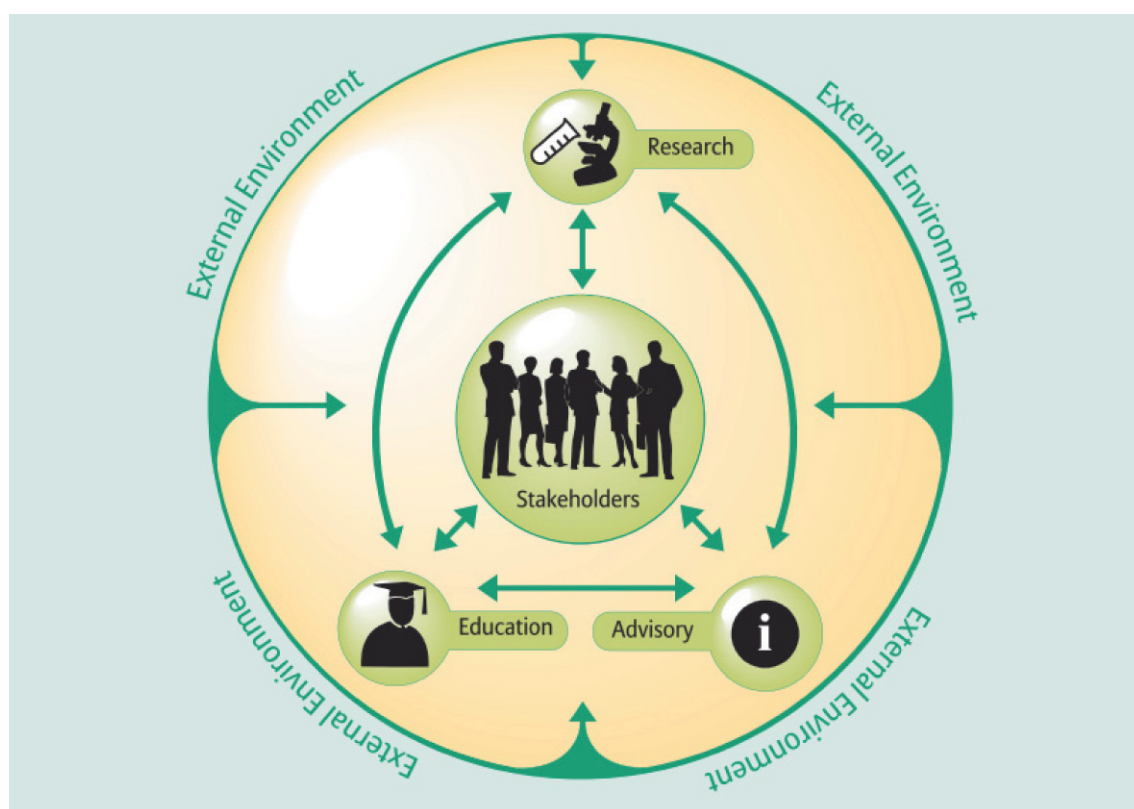
Research outcomes need to be easily accessed and incorporated by farmers into their farm enterprises. A properly resourced independent, impartial advisory service, with ready access to research, is key to improving efficiency on-farm.

The Teagasc Advisory Service supports innovation by farmers in the management of their businesses and provides access to the technologies they can apply to improve their competitiveness. The Advisory Service is delivered by advisors in 12 regional advisory areas.

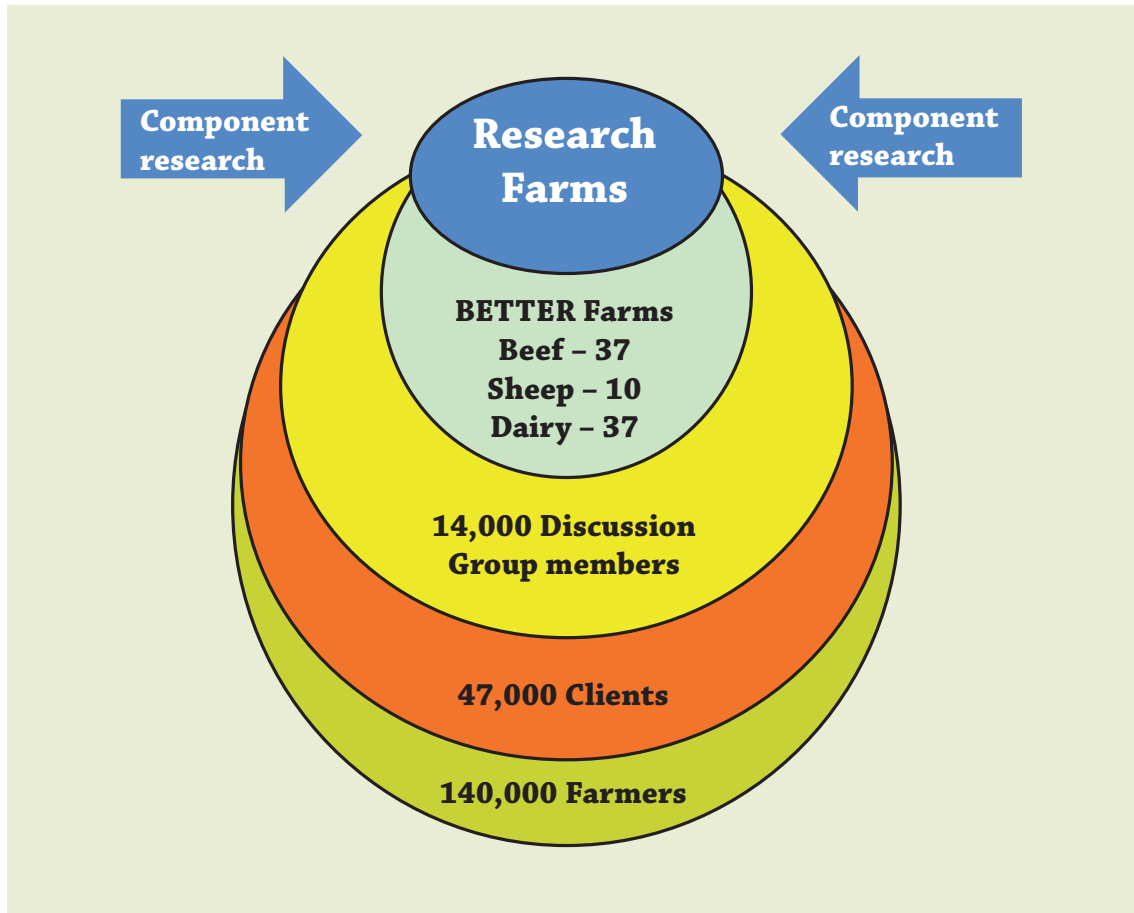
These advisors are in contact with some 80,000 farmers and rural dwellers each year, of whom approximately 45,000 avail of our intensive farm consultancy service.

Teagasc is a key node in Ireland's agri-food **Knowledge Innovation System (AKIS)** (see Figure 1). It is unique internationally in having the three pillars of the innovation system (research, education and advisory functions) within the one organisation. A dynamic innovation system requires a high level of integration between these pillars within Teagasc and with their external counterparts.

Figure 1: Teagasc Agricultural Knowledge Innovation System (AKIS)



The best technologies and the latest research is transferred to farmers using a variety of methods, including discussion groups, individual consultations, farm management newsletters, education and training, and a large number of public events (Figure 2). The Advisory Service is supported by subject-matter specialists who are located within the Research Directorate to ensure effective transfer of new information and to focus on meeting the development needs of a diverse farming and rural population.

Figure 2: Cascade Model – Operational Version of the Teagasc AKIS

Under the Teagasc Act, a key priority is to develop the capacity, skills and knowledge base of farmers and agri-food industry personnel to ensure a quantifiable impact on profitability, competitiveness, exports and employment.

Teagasc is the primary education provider for the overall land-based sector and is a significant training provider to the food sector. We also provide specialised and customised training to the agri-service sector as required through our newly established ConnectEd service. We are a registered Quality Qualifications Ireland (QQI) training provider and work in partnership with many other education stakeholders, including the universities, institutes of technology and others to deliver quality-driven, applied education and training programmes. Our education programmes are provided through a network of colleges and regional education centres, with full-time, part-time and distance learning courses offered as appropriate. Lifelong learning is now an essential requirement of the farming sector and our advisory and education services are committed to expanding our role in this area in line with increased demand.

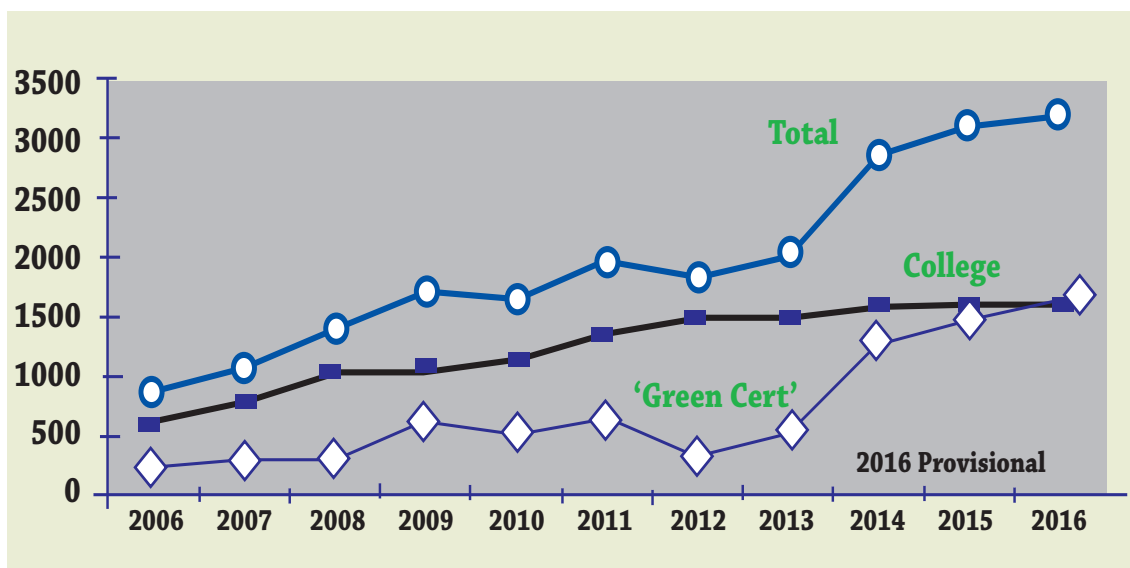
Figure 3: Teagasc Enrolment Trends 2006-2016

Figure 3 shows trends in college and adult part-time enrolments in Teagasc courses in recent years. Enrolments in colleges grew steadily from 618 in 2006 to about 1600 by 2015 – a growth of nearly 160%. An even more dramatic trend is apparent for adult enrolments in the Teagasc 'Green Cert' programme. Up to 2013, enrolments in the 'Green Cert' programme in part-time courses in Teagasc Regional Education Centres and in our distance education centres were about 500 per annum. Following the incentives introduced for young farmers as part of a suite of measures in the Rural Development Programme of the CAP, enrolments have increased dramatically in the last three years. At present, there are about 4,000 adults on a waiting list for entry to the programme. Accommodating these students will be a major challenge over the period of the Strategy.

There is an on-going need for agricultural college courses to be updated and upgraded to reflect the changing requirements of the future farmer. In tandem with this, continuous professional development (CPD) of college lecturers must be provided to ensure that they are up-to-date in the latest teaching and policy developments in their specialist fields. The extension of the discussion group model across different sectors as an effective means of knowledge transfer has been a positive initiative over the last five years, with the numbers of participating farmers increasing annually. In addition, there is a requirement for more structured CPD programmes for qualified farmers across a broad range of areas – including financial management, resource efficiency, and training in information technology.

Teagasc also has a significant involvement in Fourth-Level Education through its Walsh Fellowships Programme for Ph.D. and M.Sc. students. At present there are about 250 Walsh Fellows who are jointly supervised by Teagasc researchers and their counterparts in national and international higher education and research institutes.

Section 2

Operating Environment

Introduction

Food Wise 2025 and **A Programme for a Partnership Government** (2016) set the context for Teagasc programmes and activities over the duration of this Statement of Strategy. Our work will also continue to be guided by the **Sustainable Healthy Agri-Food Research Plan (SHARP)** (DAFM 2015), **The Action Plan for Jobs 2016** (DJEI 2016), **Innovation 2020** (DJEI 2015), among others.

The Public Service Reform Plan 2014-2016 (DPER 2014) is a further important policy context. Teagasc is fully committed to the on-going programme of reform in the Public Service, which seeks to build capacity to respond to existing and future challenges and improve the performance of the Public Service and its staff. The Plan outlines a vision for the Public Service and practical changes that will deliver better outcomes for all stakeholders while strengthening leadership, renewal and organisational reform.

Food Wise 2025

The **Report of the 2025 Agri-Food Strategy Committee** sets out a strategic plan for the development of the agri-food sector over the next decade. The Report identifies significant opportunities for growth across all sub-sectors arising from an increasing global population and greater access to international markets. It also recognises that the increased pressure on global agricultural resources and the environment will offer growth opportunities for an Irish agri-food sector that can clearly demonstrate its comparative advantage in terms of the sustainability of its production systems.

However, a major challenge presents itself in that there has been very little progress in improving the overall viability and profitability of farm enterprises in the primary agriculture sector, which underpins the entire agri-food industry. Low farm income, particularly in the non-dairy sectors, is a huge challenge facing the agri-food sector in its ability to deliver on the targets set out in **Food Wise 2025**.

Food Wise 2025

Food Wise 2025 has set the following growth targets:

- Increasing the value of agri-food exports by 85% to €19 billion
- Increasing value added in the agri-food, fisheries and wood products sector by 70% to more than €13 billion
- Increasing the value of primary production by 65% to almost €10 billion
- Creating an additional 23,000 direct jobs in the agri-food sector all along the supply chain from primary production to high valued added product development.

Challenges and Opportunities

The agri-food and wider bioeconomy sector is a very significant part of the Irish economy. Its long-term competitiveness and sustainability are priority concerns for national policy. Agriculture, in particular, faces significant challenges in the coming decades. It must produce more food for a growing, increasingly affluent global population while vying for access to increasingly scarce natural resources, preserving biodiversity and water quality, restoring fragile ecosystems and mitigating the effects of climate change. It must also adapt to new plant and animal disease threats.

Future food production systems must be sustainable in terms of delivering a supply of safe, healthy food with low environmental impacts in terms of emissions and biodiversity and utilisation of natural resources. This will require a hugely enhanced level of innovation and involve major improvements in efficiency and waste reduction as well as access to new types of technology. New programmes of R&D will be needed to support the development of lower-input, more sustainable systems.

The move to lower-carbon/lower-input systems will present challenges for the resilience and competitiveness of our agriculture and food sectors. In particular, the livestock sectors face difficulties in securing reductions in greenhouse gas emissions arising from the EU **‘Effort Sharing Decision’**, which proposes binding annual greenhouse gas emission targets for Member States for the period 2020–2030. Support will be required to underpin technological developments and the introduction of innovative agricultural and food-processing practices.

Brexit – A New Challenge

The 2016 Brexit vote in the UK could have serious implications for the Irish agri-food industry. While the future remains uncertain, and will for months if not years, the implications for the Irish agri-food sector do not bode well. Ireland is the 33rd largest exporter in the world and the UK is our single biggest trading partner. Total Irish merchandise exports in 2014 were valued at €92 billion, of which almost €13.6 billion were exports to the UK.

Irish agri-food exports to the UK make up approximately one third of the country’s total merchandise exports to the UK. In 2014, total Irish merchandise imports were valued at €61 billion, of which almost €20.6 billion were from the UK. Of that, the agri-food imports were worth €4.5 billion.

Outside of the impact on Sterling, which fell to a 30-year low on the back of the Brexit result, it is not clear how much trade can continue between Ireland and a UK outside the EU. Teagasc has estimated that a Brexit could mean a reduction in the value of Irish agri-food exports of anything from €150m (1.5%) to €800m (7.2%) per annum.

Teagasc will utilise its well-established economic modelling capabilities in collaboration with the Department of Agriculture, Food and the Marine and other stakeholders to monitor and evaluate the Brexit process. More fundamentally, Brexit presents an unprecedented competitiveness shock to the sector. This shock can only be absorbed in the medium-to-long run through a greatly enhanced investment in innovation right across the industry, including in Teagasc.

Sectoral Challenges

Teagasc produces a series of **Roadmaps** every two years which sets out clear challenges for the major agriculture and food sectors.

All farm sectors are challenged to make greater use of financial management tools, to utilise grass much more intensively and to upgrade their breeding stock. In the process of expansion on dairy farms, close attention must also be paid to animal welfare. Health and safety vigilance also continues to be an imperative throughout the farming sector.

A continued process of improvement in environmental management is also required in all sectors. Improved nutrient efficiency and more precision in the management of nutrients, using the recently developed Teagasc nutrient planning tool (NMP-Online), can reduce GHG emissions and improve water quality. Further research can be expected to produce an improved understanding of the interactions between lime, P and N, better land use management, improved slurry storage systems and a better appreciation of the process of enteric fermentation.

A challenge also exists to reduce biodiversity loss. The provision of comprehensive baseline data and regular updates through the Teagasc **National Farm Survey** will assist in enhancing the biodiversity of our agriculture and forestry landscapes through the provision of critical information for remedial technical and policy actions.

The emergence of antimicrobial and anthelmintic resistance poses a large threat to the production and welfare of livestock. A similar resistance phenomenon is evident in crop pests. Research and KT interventions to delay the development of resistance are being developed to both reduce the need for the use of chemical products and to reduce the conditions that potentially give rise to resistance. The availability of a comprehensive usage database of these products would be of great assistance in dealing with this challenge.

Dairy

- Our grass-based ruminant livestock system is our greatest comparative advantage as a trading nation. A key challenge is to increase the level of grass utilisation from 7.4t DM/ha to 10 t DM/Ha over the next decade or so.
- Dairy farms are becoming more and more specialised and with this development there is a requirement for a larger and more diverse contracting sector.
- The numbers of highly trained dairy farmers, managers and operatives need to be increased significantly.
- GHG mitigation, through the use of SMART solutions, such as increased use of stabilised urea, needs to be adopted by farmers, as well as optimal nutrient management practices to improve water quality.
- The challenge and opportunity exist to incorporate health traits into dairy breeding indices.
- Precision farming technologies hold out the prospect of better economic and environmental returns in the sector.

Beef

- Ireland exports over 90% of its beef output and nearly half of our exports in volume terms go to the UK. Brexit will affect all export sectors, but beef will be especially hard hit. Like the dairy sector, the priority is to increase the level of grass utilisation in the beef animal's diet, from 63% at present to at least 67% over the next 10 years.
- Progress is also required in relation to basic productivity metrics such as reduced slaughter weights, calving interval, calving date, calving duration and age at first calving.
- There is scope to reduce the aggregate level of carbon emissions from the beef herd through the likely increased proportion of beef being bred from the dairy herd and through higher productivity.

Pigs

- The pig sector needs to target an increase in sow productivity from 25.1 live pigs per sow per year to 27 over the next decade.
- Feed accounts for over 70% of production costs and the sector is capable of generating a feed conversion efficiency rate from 'weaning to sale' of at least 2.35 by 2025.
- Pig slurry is a valuable fertiliser for other farm enterprises, but its widespread acceptance as such is a challenge that needs to be addressed. The rollout of more effective nutrient management tools such as the Teagasc 'NMP-Online' should assist delivery of this objective.
- Antimicrobial resistance (AMR) is an emerging challenge for global agriculture, especially in the pig and poultry sectors. In the absence of effective substitute products, pig producers will be challenged to ensure more effective and reduced usage of antimicrobial products to minimize the threat of resistance.

Sheep

- A quality product that meets consumer requirements creates a need for a payment system that incentivises this outcome.
- Our understanding of how meat quality is affected by factors such as gender, age, season and lamb diet needs to be developed through sensory and nutrition studies.
- Profitability of the sector will be enhanced through improved productivity metrics such as litter size (from 1.32 now to 1.65 in 10 years); lambs weaned per ewe joined (1.29 now to 1.45 in 10 years); lamb mortality (from 7% now to <8%¹ in 10 years); and stocking rate (from 7.3 ewes/ha now to 9 ewes/ha in 10 years).
- The launch of genomic selection for sheep will greatly progress the rate of genetic gain.

¹ Mortality increases as litter size increases.

- The dependence on anthelmintics to reduce parasitic infestation needs to be reduced to combat emergent resistance to current products.
- The maintenance of mountain and hill sheep flocks is increasingly seen as important to maintaining the recreational use of these lands.

Tillage

- The tillage sector is likely to be one of the most economically challenged sectors over the duration of this strategy.
- Crop rotation needs to be implemented on farms (from less than 20% of arable crops at present to at least 25% in 10 years) to improve yields, protein production and meet environmental requirements.
- Input costs can be reduced and environmental sustainability enhanced by the deployment of improved 'Integrated Pest Management' (IPM) techniques, in addition to much greater efficiencies in nutrient and machinery use, as well as weed, disease and lodging control.
- The use of precision agriculture techniques, and especially 'yield mapping', also holds out the prospect of reduced input consumption, with associated economic and environmental benefits.
- Increased use of stabilised urea in preference to CAN will reduce both GHG and ammonia emissions.
- The use of biotechnological techniques involving the development of marker and genomic-assisted breeding approaches can greatly assist the production of new potato and crop varieties (including grasses) suited to Irish production conditions and agronomic requirements.
- Energy crops grow well in the Irish climate and could become a viable alternative on many cereal farms if appropriate supports were to be provided.

Forestry

- Forestry can be an economically attractive alternative to other land uses provided an appropriate management regime is employed, such as formative shaping, early thinning and high pruning of trees to produce valuable sawn logs and other forest products (e.g., hurley ash).
- The economic potential of the sector can be further advanced through the greater exploitation of our forests as a recreational resource.
- Forestry has the potential to sequester the significant additional amounts of GHGs that will be required to meet Ireland's future emission targets, provided Ireland's rate of new planting can be increased significantly.
- Determined collaborative efforts at national and international level will be needed to combat the potentially devastating impact of the chalara disease in our ash forests.

Horticulture

- All horticultural crops can benefit in economic and environmental terms from the exploitation of integrated pest and disease management techniques.
- The mushroom sub-sector has already faced a severe reduction in export margins due the Brexit-induced depreciation of Sterling, and further competitive challenges lie ahead as the Brexit process unfolds. However, there is huge potential to significantly improve harvester productivity.
- Opportunities also exist for the mushroom sub-sector to maximise the utilisation of waste and to improve the efficiency of energy consumption.
- The cut foliage and nursery stock/ornamental sub-sectors can benefit from innovations in new varieties, business models and marketing approaches.
- Tailored education and training programmes and improved facilities will be required to meet emerging competitiveness challenges in all sub-sectors and to face the challenges of ever-increasing regulations.

Food processing

- Increases in the demand for protein-based food in countries with growing populations and an expanding middle class present opportunities for Ireland's meat and dairy exporters.
- To exploit these emerging markets, Ireland will need to be at the forefront in utilising new and innovative technologies in areas such as the preservation and extension of shelf life (meats, seafood and dairy), powder reconstitution, packaging and e-commerce.
- Teagasc and UCC scientists intend to progress their research to scientifically establish the benefits of pasture-based livestock systems, which will, *inter alia*, serve to support Bord Bia's **Origin Green** initiative.
- Ireland's dairy sector faces a twin challenge to improve the competitiveness of its traditional commodity product portfolio while converting more milk into value-added ingredients and nutritional beverages, including lifestyle/sports applications and products with proven health benefits and improved sensory attributes.
- Opportunities exist for innovation in the production of greater diversity, quality and consistency in non-cheddar cheese and fermented dairy products.
- A challenge exists to exploit known health-conferring minerals and antioxidants in meats, including the recovery of bioactive components.
- A focus also is needed to use the most sophisticated bioscience techniques available to develop risk-based approaches to monitor and control key microbial pathogens and contaminants in the 'farm-to-fork' value chain.
- The Department of Agriculture, Food and the Marine (DAFM), along with Teagasc and partners in the higher education sector, have recently established Sensory Food

Network Ireland, which will be utilised for the consumer testing of new products by Irish food companies to meet the ongoing challenges of competitiveness and penetration of new markets.

- Ireland's cereals sector faces severe challenges to generate adequate returns for producers. Competitiveness can be enhanced through research that is designed to uncover relationships between cereal crop varieties and the functionality that is required by the bakery and brewery sectors and that establishes new uses for these crops.
- Small scale food processors and artisan producers will require continued support for new product development through 'start-up' support, technical training and access to product testing and 'scale up' facilities.

Teagasc's Role

To take advantage of the opportunities and respond to the challenges, our future strategy aims to ensure the continuation of a strong agricultural production base that is competitive and sustainable; contributes to a secure and sustainable global food supply; is compatible with the urgent requirement to reduce greenhouse gas emissions; contributes to future energy needs; addresses wider environmental concerns; is able to respond to market demands; and helps sustain vibrant rural communities.

Teagasc's well-proven core activities in education, research and advisory/extension will continue to be mobilised in an integrated fashion to support the objectives of **Food Wise 2025**. We will deliver on a number of initiatives that will further enhance our ability to support the drive for "sustainable profit from productivity" in our agri-food sector.

Teagasc is also committed to playing this role in support of **Innovation 2020** and all other relevant Government policies by working in partnership with other research and knowledge providers in Ireland and internationally.

Need for New Science and Technology

Innovation 2020

Innovation 2020 is Ireland's five year strategy on research and development, science and technology. Innovation 2020 sets out the roadmap for continuing progress towards the goal of making Ireland a Global Innovation Leader, driving a strong sustainable economy and a better society.

Agricultural and food research will be asked to address issues that require both multi- and inter-disciplinary responses and which focus more on enhancing the innovative capacity of the sector. This means supporting the development of new ways to generate wealth, reduce input

costs, add value, strengthen sustainability and resilience and develop new competitive and comparative advantages. These, in turn, will require new ways to optimise national scientific capacity, focusing on R&D collaboration across the supply chain and increasing the emphasis on technology transfer and commercialisation.

Increasingly rapid advances in ICT and molecular biology have the potential to transform the sector. It is essential for the success of Irish agri-food and related industries that Ireland is a central player in this transformation. Investment in new and existing technologies will play a decisive role in enabling the sector to sustainably intensify production and to grow output, exports and jobs while respecting the environment. Harnessing this transformation will not only enable ambitious increases in the export of world-class agricultural produce, but will also drive the completion of a dynamic circular bioeconomy² creating new jobs and new opportunities.

Technologies for the Future

Teagasc Technology Foresight 2035

Teagasc Technology Foresight 2035 focuses on the identification of key technologies that will drive the competitiveness and sustainable growth of the Irish agri-food sector over the next 20 years. Its goal is to identify new areas of technology in which Ireland should invest.

With the input of more than 200 experts who contributed to the foresight process, and in consultation with industry stakeholders, the following five technology themes have been identified as being the priorities for Irish research and innovation in the coming years:

1. Plant and Animal Genomics and Related Technologies

2. Human, Animal and Soil Microbiota

3. Digital Technologies

4. New Technologies for Food Processing

5. Transformation in the Food Value Chain System

The full text of this report, along with all of the project's background papers, are available to download as PDF files from **www.teagasc.ie**.

The focus of the **Teagasc Technology Foresight 2035** strategy is on those technologies which, when embedded in our existing research and knowledge transfer programmes, will have the greatest potential for economic impact and transformation by 2035 and for addressing key challenges such as the reduction of greenhouse gas (GHG) emissions from our livestock sector.

² The circular economy concept emphasises the need to keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each production cycle.

Teagasc is currently working with its partners and stakeholders to develop long-term research and knowledge transfer programmes that will reflect the five priority areas. It is also conducting a major review of its education provision to determine how best it can respond to the long-term needs of learners in the land-based sector.

Harnessing the power of new technologies will also require Teagasc to fill staff and expertise deficits in the areas of animal and plant genomics, in precision animal, grassland and crop agriculture and precision soil management, in modelling and data analytics, in microbiota research as it relates to soil, animal and food applications, in advanced food technologies, and in value chain analysis and development. Other expertise required such as in sensor development and networking and 'big data' analytics are likely to be at least partially met by partnering with other institutions with expertise in these areas. Addressing these deficits will allow the contribution of new technology areas to be harnessed in enhancing productivity and profitability, mitigating climate change, improving water quality and strengthening food innovation.

Partnering and collaboration are needed more than ever to understand and integrate the diverse new sources of knowledge and data that will drive new services, systems and management practices. These will enable growth based on sustainable intensification while addressing policy and regulatory issues that will arise in response to the concerns of consumers and citizens in Ireland and in export markets.

Section 3

Goals, Objectives and Strategic Actions

Teagasc Goals

GOAL 1

Improve the competitiveness of agriculture, food and the wider bioeconomy

GOAL 2

Support sustainable farming and the environment

GOAL 3

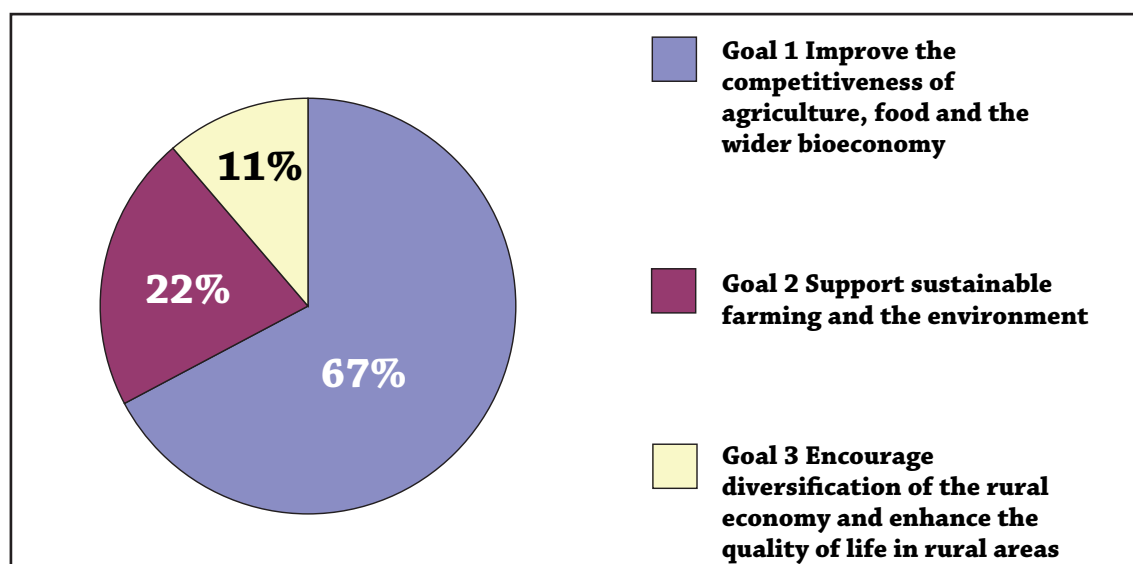
Encourage diversification of the rural economy and enhance the quality of life in rural areas

GOAL 4

Enhance organisational capability and deliver value for money.

These Goals are consistent with the overall vision for the agri-food sector set out in **Teagasc Technology Foresight 2035** and in **Food Wise 2025** and reflect the EU thematic axes on rural development policy. Figure 4 shows the current allocation of resources between the three programme goals based on the stated primary objectives of Teagasc programmes. Strategic actions listed include the Teagasc actions listed in **Food Wise 2025**.

Figure 4: Resource Allocation by Goals and Primary Programme Objectives



Strategic Objectives

Goal 1: Improve the competitiveness of agriculture, food and the wider bioeconomy.

- i. Undertake scientific research programmes focused on developing cutting edge sustainable processes and technologies to underpin the profitability, competitiveness and sustainable growth of the agri-food sector.
- ii. Generate, procure and disseminate knowledge and technologies to the farming and food industry through targeted best practice advisory and education methods to enable farmers and companies exploit opportunities for development and maximise the efficiency, profitability and sustainability of their enterprises.
- iii. Engage in collaborative research and partnerships with industry to strengthen the relevance of research and enhance the transfer and delivery of new knowledge to the end-user
- iv. Develop the capacity, skills and knowledge base of farmers and agri-food industry personnel to ensure a quantifiable impact on profitability, competitiveness, exports and employment.
- v. Assist the farming community to improve health and safety by applying the Total Worker Health approach (NIOSH, USA), which integrates safety and health protection within a broader health promotion focus that acknowledges interactions between health and well-being and workplace injuries.
- vi. Support the ‘Whole of Government’ approach to international development by working with Irish Aid and other partners to maximise agricultural productivity so as to sustain economic growth at the household and country levels and to tackle food insecurity.

Strategic actions during the lifetime of this strategy will include:

Farm Productivity and Sustainability

- Commence the implementation of **Technology Foresight 2035** recommendations and continue to implement **Food Wise 2025** actions.
- Improve the use of genomic technologies and better breeding to enhance the sustainability of the national herd, with particular emphasis on the national beef herd and sheep flock.
- Increase the uptake of best practice technologies focused on farm improvement including: grass management, animal breeding, animal health, soil nutrition, land improvement, market requirements, financial management and sustainability.
- Continue to develop and deliver a focussed **Dairy Farm Expansion Service**.
- Continue engagement in joint industry and **BETTER Farm** programmes.
- Increase the participation of Teagasc clients in Knowledge Groups and Discussion Groups.

- Continue to direct maximum advisory effort towards the implementation of sustainable farming systems, including a focus on ensuring the highest animal welfare standards.
- Roll out the **Virtual Irish Centre for Crop Improvement**.
- Commence the Teagasc **'Grass10 Campaign'** to achieve 10 grazings/paddock/year utilising 10 tonnes grass DM/ha in the process.
- Target an increase of 2,500 in the number of farms participating in **Pasture Base Ireland**.
- Continue development of the pig meat sector by addressing the specific Teagasc actions set out in **Food Wise 2025**.

Food Industry

- Construct a **Food Innovation Hub** to promote greater collaboration between industry and public research.
- Lead collaborative research to derive applications from state investment in foods for health.
- Establish the Enterprise Ireland-funded **Meat Technology Centre**.
- Continue to organise **Gateways** and to develop our unique **Customer Relations Management** system to enable the food industry to engage more easily with Teagasc so as to exploit opportunities arising from our research outputs and to access our know-how, expertise and infrastructure in a more efficient manner.

Building Capacity

- Develop Teagasc **Education Vision 2050** which is being framed to provide a land-based vocational education service that's fit for the agriculture of the future.
- Implement Teagasc's strategy to accommodate the unprecedented demand for adult part-time and distance education courses.
- Develop a capability within Teagasc to optimise the use of social media tools to enhance the process of knowledge transfer.
- Develop an industry-based **Walsh Fellowship** scheme to enhance the absorptive capacity of the food SME sector.
- Develop advisory methods under the umbrella of the **Certificate for European Consultants in Rural Areas (CECRA)** focusing on improving communication skills.
- Roll out the Teagasc **ConnectEd** service to professionals within the agri-food industry.
- Engage in collaborative research on emerging precision technologies, data analytics, sensor technologies, DNA technology and possibilities for mining 'big data'.
- Continue to provide leadership in the development and interaction of advisory services and programmes across the EU.
- Implement the Teagasc occupational health and safety programme to increase awareness of farm safety.

- Support the **National Rural Network** across a range of planned new activities.
- Support the promotion of the **European Innovation Partnerships (EIPs)**.

International Agricultural Development

- Agree a revised MoU with Irish Aid which will specify areas of Teagasc support for Ireland's objectives of reducing hunger and under-nutrition in developing countries
- Work with Irish Aid, NGO partners and the Government of Eritrea to implement the 'Eritrea – Ireland Climate Resilient Agriculture Partnership Programme 2017-2021.'
- Continue to support the activities of Sustainable Food Systems Ireland (SFSI).
- Support specific capacity building activities in research and knowledge transfer in Vietnam and Kenya.
- Build relationships with CGIAR centres and collaborate on projects of mutual interest.

Goal 2: Support sustainable farming and the environment

- Continue to deliver the 'smart, green growth' that underpinned the original vision of **Food Harvest 2020**.
- Provide independent science-based research informing government policy and sustainable production practice.
- Improve knowledge and understanding of the interaction between agriculture and the environment and optimise the use of resulting data for the benefit of sustainable production.
- Improve the capacity of the agri-food sector to manage soil nutrients and pesticide usage at farm level in a manner that lessens the impact on the environment.
- Provide independent best practice advisory and education programmes focused on sustainable agricultural production practices.

Strategic actions during the lifetime of this strategy will include:

- Lead a national campaign to improve soil fertility across all Irish farms as a key component of the '**Grass10 Campaign**'.
- Prepare a rigorous scientific response to the forthcoming **Nitrates Action Plan**.
- Implement Phase III of the **Agricultural Catchments Programme** with an increased focus on knowledge transfer beyond the immediate catchment areas.
- Develop Teagasc's **National Farm Survey** sustainability indicators to measure and monitor Ireland's sustainability and publish an annual sustainability report.
- Update Teagasc's **Marginal Abatement Cost Curve (MACC)** for Irish agriculture.

- Actively participate in industry-led initiatives to improve water quality.
- Continue to develop and roll out Teagasc NMP online and the Teagasc/Bord Bia **Carbon Navigator**.
- Develop the Kildalton **‘Open Source’** sustainability demonstration farm into a best practice demonstration of a sustainably intensive production system.
- Explore the feasibility of alternative pig slurry usage and disposal options, such as anaerobic digestion.
- Embed sustainability fully into all research, advisory and education programmes covering a range of areas, including efficient nutrient and water use, adopting an IPM approach, smart animal health policies and improved biodiversity.
- Improve the general awareness and understanding among the agri-food community of measures to mitigate GHG emissions.
- Coordinate a national campaign on behalf of all relevant stakeholders, including the Forest Service, to increase the rate of afforestation as part of Ireland’s contribution to the mitigation of GHG emissions.
- Support the implementation of the **Sustainable Use Directive**.

Goal 3: Encourage diversification of the rural economy and enhance the quality of life in rural areas

- i. Analyse transformations in the food value chain and opportunities to create new value chains in the rural economy.
- ii. Improve the skills of stakeholders to enable them to exploit income-generating opportunities both on- and off-farm.
- iii. Improve the understanding of macro-economic issues and trends by all agri-industry stakeholders.
- iv. Interpret trends and changes in markets and policy and communicate these to stakeholders in a timely fashion to enable them to make better informed decisions.
- v. Provide advice, training and tools to support our stakeholders in making decisions that enable their businesses to be more effective.

Strategic actions during the lifetime of this strategy will include:

- Undertake research to interpret trends and changes in markets and policy to enable each of our stakeholders to make better decisions.
- Publish a report on the viability of marginal farms based on the recently completed special survey of low-income farms.
- Further develop the **Get Farm Financially Fit** campaign in partnership with external stakeholders.

- Develop a rural development advisory service aimed at improving family farm viability on low income farms.
- Encourage the adoption of support tools to help producers hedge against price volatility.
- Identify who adopts technology, why potentially beneficial technologies are not adopted and how adoption rates can be increased.
- Identify and monitor simple KPIs for all farm enterprises as the major driver of efficient production.
- Focus on farm succession through the development of a **Farm Family Partnership Model**.
- Promote collaborative farming and long-term leasing to aid land mobility.
- Provide the evidence base for a national bioeconomy strategy and options for other new rural-based value chains.
- Collect timely, quality information in an efficient manner to support decision making by our stakeholders.
- Encourage diversification through off-farm enterprise via the **Teagasc Options Plus Programme**.
- Provide support and deliver training to equine and organic **Knowledge Group**.
- Use Teagasc's economic modelling capability to monitor and assess the impact of the **Brexit** process on the agri-food sector.

Goal 4: Enhance organisational capability and deliver value for money

- i. Maintain the programme of organisational reform in accordance with the **Public Service Reform Plan 2014-2016**.
- ii. Strengthen monitoring and evaluation processes within Teagasc.
- iii. Ensure that Teagasc's business processes operate in an effective and efficient manner.
- iv. Ensure that Teagasc adheres to 'best practice' risk assessment and management practices and, in particular, operates within its budgets, that income and expenditure are optimised and appropriately authorised and that financial policies and procedures are up-to-date and implemented correctly.
- v. Manage Teagasc's land, buildings, plant, and other property assets in a coherent manner and maintain them in a fit-for-purpose state.
- vi. Enhance Teagasc's estate of information systems, hardware and communications infrastructure to ensure that they meet the current and future needs of the organisation.
- vii. Optimise the organisation's procurement practices to ensure that best value is achieved in the procurement of goods and services.
- viii. Facilitate high staff engagement and recruit, develop and retain the best talent possible while complying with public sector regulations.
- ix. Improve staff occupational health and safety.

Teagasc will focus on the following strategic actions:

Financial Management

- Develop the organisation's finance function to transition to a "business partner" model for service delivery.
- Implement SLAs with business units for the delivery of financial services and the management of local budgets.

Property Management

- Target infrastructure investment to maximise value for money.
- Centralise property management facilities.

ICT Systems and Infrastructure

- Restructure the ICT Department service delivery model to more effectively support research ICT initiatives.
- Maintain the security and technical relevance of existing ICT infrastructure.
- Continue to evolve electronic collaboration facilities.
- Deliver new information systems to increase staff productivity.
- Enhance the ability of mobile workers to do more, independent of their location.

Procurement

- Utilise **Office of Government Procurement** services and contracts where advantageous to Teagasc.
- Implement **Low Value Purchase Cards** and catalogue-based / online procurement systems.
- Implement a contract management system.
- Ensure strict adherence to all State Aid and Competition Regulations in transactions with commercial entities.

Human Resources

- Build a more flexible and responsive high performance culture in the organisation.
- Overhaul Teagasc's recruitment practices and systems.
- Review and enhance existing training and staff development programmes to deliver more to staff and the organisation.
- Introduce an enhanced and more efficient approach to performance management with a strong emphasis on the manager's role.
- Review some grading structures to eliminate anomalies.
- Utilise expertise of Leadership Development Programme graduates on strategic projects and implement a Teagasc Leadership Alumni Association.
- Prepare a diversity and gender strategy.
- Implement a 'fit for purpose' health and safety management system.

Section 4

Strategy Implementation

This Statement of Strategy will be implemented through the annual business planning process and will require the full commitment of the Authority and staff and the continued strengthening of our internal business planning process. The overall planning process will ensure that all of our activities are directed towards meeting our mandate and mission.

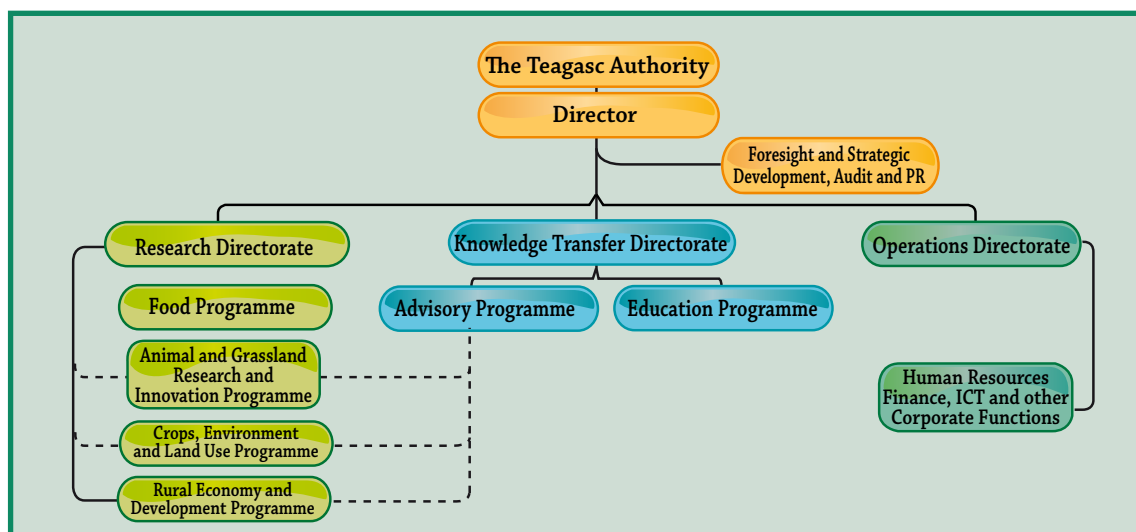
Organisational Structure and Resources

The organisational structure is represented in Figure 5. Following three organisational Change Programmes, Teagasc has radically rationalised and re-organised and is now organised into three integrated directorates: Research, Knowledge Transfer and Operations.

The Research Directorate is organised around four operational programmes:

- Food Programme.
- Animal and Grassland Innovation Programme.
- Crops, Environment and Land Use Programme.
- Rural Economy and Development Programme.

Figure 5: Teagasc Organisational Structure



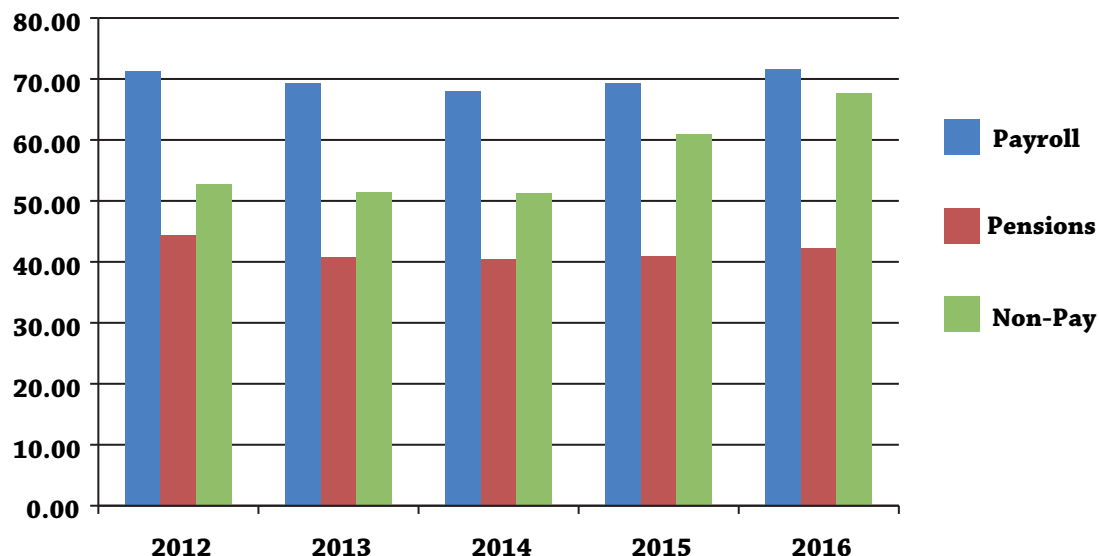
Each of the Research Directorate programmes includes distinct research and knowledge transfer elements.

The Knowledge Transfer Directorate implements two major programmes:

- Regional Advisory Programme delivered through an office network located in twelve geographic regions.
- Educational Programme delivered through four Teagasc colleges, 12 Regional Education Centres and three subvented private colleges. A strong ‘dotted line’ relationship operates between the knowledge transfer departments located within the Research Directorate and the Advisory Programme.

The Operations Directorate comprises a number of centralised functions (Finance, Human Resources, Corporate Services, ICT and Authority Affairs) and also has overall responsibility for the effective delivery of administrative systems across the organisation.

Figure 6: Teagasc Financial Resources (€million), 2012-2016



Total expenditure amounted to €181.4 million in 2016 (Figure 6). Of this, pensions comprised in excess of 23%. Payroll and pension costs have remained stable over the past five years. Non-pay expenditure has increased in line with an increase in Research and KT activities. This increased activity has a matching income stream (Table1). In 2016, generated income, including advisory and course fees, farm revenue and revenue from successful competitive research project tenders, amounted to about €59 million. This is equivalent to 42% of total expenditure, excluding pensions. It is not expected that the overall financial position will vary significantly from the 2016 position over the course of this strategy.

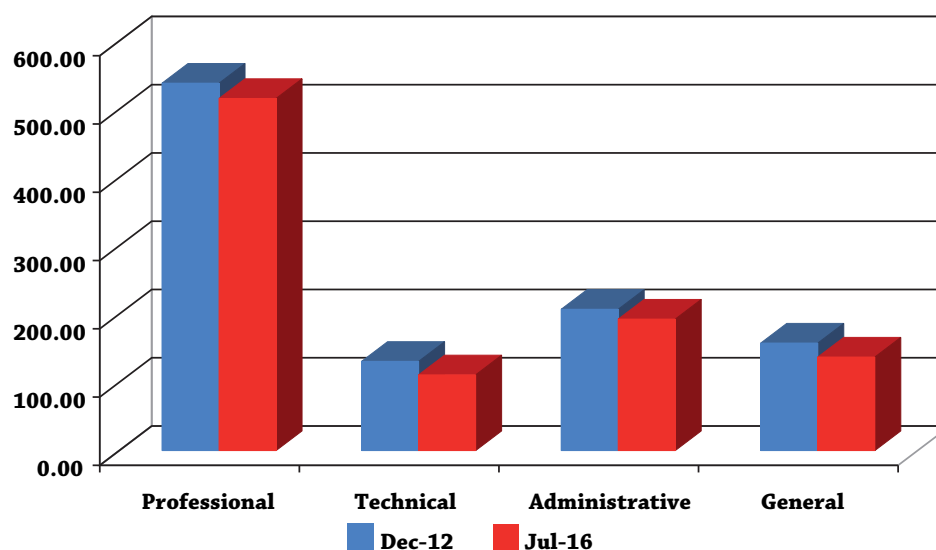
Table 1: Teagasc Generated Income (€million), 2012-2016

	2012	2013	2014	2015	2016
Income (€ million)	39.80	40.70	42.10	51.80	59.00
% of expenditure, excl. pensions	32	34	35	40	42

Human resources

Figure 7 shows the trend in permanent staff numbers in recent years. Overall, permanent numbers fell by 7% from 1,033 in December 2012 to 956 serving in July 2016. The **2015 Pay and Staff Numbers Strategy**, submitted to the Department of Agriculture, Food and the Marine (DAFM) in February 2015, was approved by DAFM as part of the public-sector ‘Delegated Sanction’ arrangements on 20 October 2015. ‘Delegated Sanction’ gives Teagasc the freedom, within a pay cap, to recruit and make promotions up to the grade of Principal Officer standard (or equivalent) without having to seek prior approval from DAFM. Implementation of the February 2015 Plan (largely in 2016) has resulted in 75 recruits and a number of promotions, bringing the permanent serving staff numbers to 1,025.40 Full-Time Equivalents (FTEs).

The 75 recruits have allowed Teagasc to come close to restoring its advisory staff numbers to the minimum required level of 300 advisors as set out in the **Strategic Review of the Teagasc Advisory Programme and Staffing Requirements 2011-2015**. It also facilitated targeted recruitment of specialised research resources. Additional resources were also assigned to specialised areas such as: finance, procurement, health and safety in order to ensure the highest administrative standards and corporate governance. As long serving staff retire in 2017, under its ‘Delegated Sanction’, Teagasc will be able to recruit replacement staff at entry level in identified priority areas. The position beyond 2017 will be subject to an updated ‘Delegated Sanction’ yet to be approved.

Figure 7: Permanent Staff by Category, 2012-2016

Contract staff numbers, which are fully funded from Teagasc 'generated income', have risen from 105 in December 2012 to 236 serving in July 2016. In 2013, Teagasc introduced a new Post Doc Model in the Research Directorate, and there are currently 65 contract staff recruited under this arrangement. In the education service, Teagasc has 61 contract staff engaged in meeting the need for additional Green Cert places arising from the implementation of several measures to support young farmers in the recent **Rural Development Programme** of the CAP.

The success and impact of the **2011-2014 People, Leadership and Change Strategy** was recognised through an independent external review. The actions and programmes from the strategy will be further built on in a new HR strategy which will be launched in 2017. The focus of this strategy will include improvements in recruitment and promotions systems within the 'Delegated Sanction' framework; the promotion of improved gender diversity in senior roles; career development and coaching staff to reach their full potential, and a greater focus on staff well-being.

Physical resources

Teagasc as a dynamic organisation has on going requirements to invest in its physical infrastructure. A critical need arises in respect of its research and education facilities. Most of the organisation's capital investment needs since its establishment has been funded through the sale of assets, as traditionally it receives only a small annual capital Grant-in-Aid. In this respect, Teagasc is at a significant disadvantage relative to institutes of higher education which can avail of relatively generous financial support for new research and teaching facilities. An over-reliance on the sale of assets is not a sustainable basis for funding the organisation's future capital needs.

Since 2008, Teagasc has substantially reduced the number of its offices, from a total of 91 to 52. It has also rationalised its research sites, in particular through the closure of its Research and Education Centre at Kinsealy, Dublin and the consolidation of research and education activities in the Dublin area at its sites at Ashtown and Botanic Gardens. The opportunities for further asset disposals are very limited for the foreseeable future.

In order to deliver on our obligations under **Food Wise2025** and to remain relevant to our stakeholders, Teagasc needs to maintain a realistic capital programme over the duration of this strategy. The Authority will have to explore creative options for funding its planned capital programme.

Over the period of the strategy, the demands for capital investment throughout the organisation will be considerable. Key projects include the development of the Food Innovation Hub at Moorepark, the construction of new environmental laboratory facilities at Johnstown Castle, the development of conference facilities at Oak Park, the development of college facilities, particularly at Ballyhaise College, roll out of up-to-date ICT systems at colleges, on-going upgrades of facilities on farms, and development support for ICT-based decision-support tools for farmers and food companies.

Business Planning and Programme Evaluation

This Strategy provides a multi-annual context for the organisation's annual business planning process. Teagasc conducts business planning at three levels: Level 3 operates at the department or unit level; Level 2 applies to the programme or directorate level; and Level 1 operates at the organisational level. Progress on the achievement of business plan targets is reviewed at mid-year and end of each year based on a series of Key Performance Indicators (KPIs).

Teagasc has put in place a system of regular external programme evaluation across all programmes, which complement the annual business planning and review processes. They involve an external panel of experts that gives feedback on existing performance and makes recommendations for future programme improvement. In addition, the organisation has in place a biennial review of its scientific activities that is undertaken by an International Scientific Advisory Board (ISAB), whose members are distinguished international agri-food researchers and academics.

Consultation Process on the Strategy

Effective consultation provides a wider perspective on issues through assisting in developing a shared understanding of objectives and results in a focused strategy statement which has more relevance for stakeholders. From an early stage, the Senior Management Group provided leadership in setting the strategic goals and objectives to be achieved over the coming three years. It also engaged in an extensive consultative process with a range of internal and external stakeholders during the drafting of this document. The internal consultative process provided critical input into the final document through input provided by the National Partnership Committee and the various suggestions and views received from staff. The organisation engages in on-going consultation with industry on its strategies and programmes through a network of consultative committees and through the input from industry representatives on the Authority.

Key Collaborations

Teagasc is committed to working in partnership with all sectors of the agriculture and food industry at home and abroad in the delivery of its research, advisory and education programmes. This partnership approach ensures that the organisation's resources are used to best effect. Partnerships continue to be fostered and enhanced with the following organisations and agencies:

Government Departments

Teagasc works closely with its parent Department (DAFM) and The Forest Service to ensure that its programme of activities meets the needs of the sector and is consistent with government policy. It also works closely with a number of other departments including:

- Department of Public Expenditure and Reform
- Jobs, Enterprise and Innovation
- Education and Skills
- Communications, Climate Change and Environment.
- Irish Aid

Government Agencies

Teagasc maintains close linkages with the following agencies:

- Science Foundation Ireland
- Safe Food
- Enterprise Ireland
- Bord Bia
- Environmental Protection Agency
- The Marine Institute
- Quality and Qualifications Ireland (QQI).
- Bord Iascaigh Mhara
- Food Safety Authority
- Sustainable Energy Authority of Ireland
- Sustainable Food Systems Ireland
- Climate Change Advisory Council
- Health and Safety Authority
- COFORD
- Horse Sport Ireland

EU and other International Linkages

Teagasc has a number of bilateral agreements also with comparable institutes around the world. The organisation has developed an extensive network of formal and informal collaboration with its university and Institute of Technology counterparts, particularly through the Walsh Fellowships Programme and QQI-approved agricultural education courses. It agreed a formal strategic alliance in food research and innovation with UCC in 2010 and a partnership in agricultural research, education and innovation with UCD in 2011. These alliances will help strengthen collaborative activities, enhance Ireland's international research reputation and improve the effectiveness and efficiency in delivering a national research and technology transfer programme for the sector.

Joint Programmes with Industry

Teagasc works with all major Irish agri-businesses on joint programmes that focus on improving production efficiency, product quality and new product development consistent with market requirements.

North-South Linkages

Teagasc will continue to advance co-operation with the agri-food development agencies in Northern Ireland on matters of mutual interest. On going contact will be maintained with agri-food research and development and education / training bodies, and all opportunities for cooperation that could yield mutual benefit will be explored.



Teagasc Statement of Strategy 2017-2020

Supporting Science-Based Innovation in Agriculture and Food

by driving sustainable profit from productivity

2017-2020

2017



2020



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January 2017