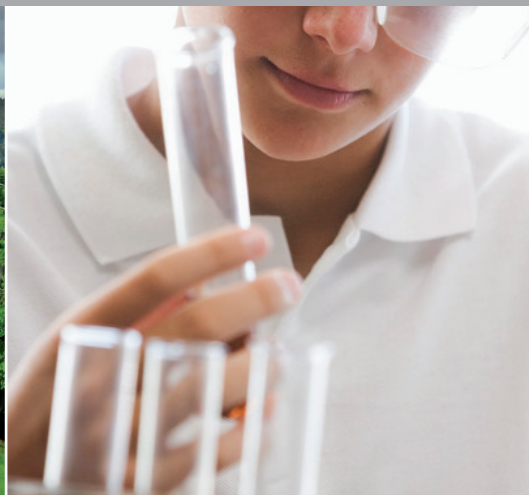


# Crops, Environment & Land Use Programme





## Teagasc

Teagasc is a Development Agency of the Department of Agriculture, Food and the Marine. The primary function of Teagasc is to support science-based innovation in the Agri-Food sector and the broader bio-economy.

### Teagasc Mission

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

### Teagasc Vision

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

### Statement of Values

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

### Crops, Environment and Land Use Programme

The aim of the Teagasc Crops, Environment and Land Use Programme is to develop and transfer cost-effective crop production systems along with evidence based knowledge to support and underpin the development of a profitable, competitive and environmentally sustainable agri-food sector.

Given the current and burgeoning future challenges to our food supply and to the environment, **sustainable intensification** of agricultural production is emerging as a priority for policymakers and international development agencies. Sustainable intensification has been defined as producing more from the same area of land while reducing negative environmental impacts and increasing contributions to natural capital and the flow of environmental services.

The Teagasc Crops, Environment and Land Use Programme is at the heart of the sustainable intensification of the Irish agri-food sector.



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## Teagasc Strategic Goals 2012–2015

Teagasc has four goals that are designed to:

### Goal 1

#### **Improve the competitiveness of agriculture, food and the wider bio-economy**

Enhanced levels of productivity, reductions in costs and a single-minded focus on market orientation are critical components in driving growth in Irish agriculture and food. This will require the development of new technologies and systems and their dissemination and adoption.

### Goal 2

#### **Support sustainable farming and the environment**

Future food production systems must be sustainable in terms of delivering a supply of safe, healthy food with low environmental impacts. This will require a hugely enhanced level of innovation, involve major improvements in efficiency and waste reduction and access to new types of technology.

### Goal 3

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

High quality social science research and policy advice are needed to contribute to improving the competitiveness, profitability and sustainability of Irish agriculture and enhancing the quality of life in rural Ireland, including safety and health.

### Goal 4

#### **Enhance organisational capability and deliver value for money**

Develop our people, processes and technology to ensure that we are a capable, responsive and results-oriented organisation.





## The Crops, Environment and Land Use Programme contributes to Teagasc strategic goals as follows:

### **Crop Agronomy and Sustainable Crop Production**

- To contribute to and increase profitability of crop production.
- To reduce the cost of production at standard input prices by 5%.
- To increase the yields by 10% by 2020.

### **Soils and the Environment**

- To improve nutrient efficiency and soil fertility on farms.
- To reduce the impact on Water Quality arising from nutrient losses from agriculture.
- To achieve a sustainable reduction in GHG emissions and carbon footprint of Irish agriculture produce.

- To maintain and improve biodiversity in agricultural systems.

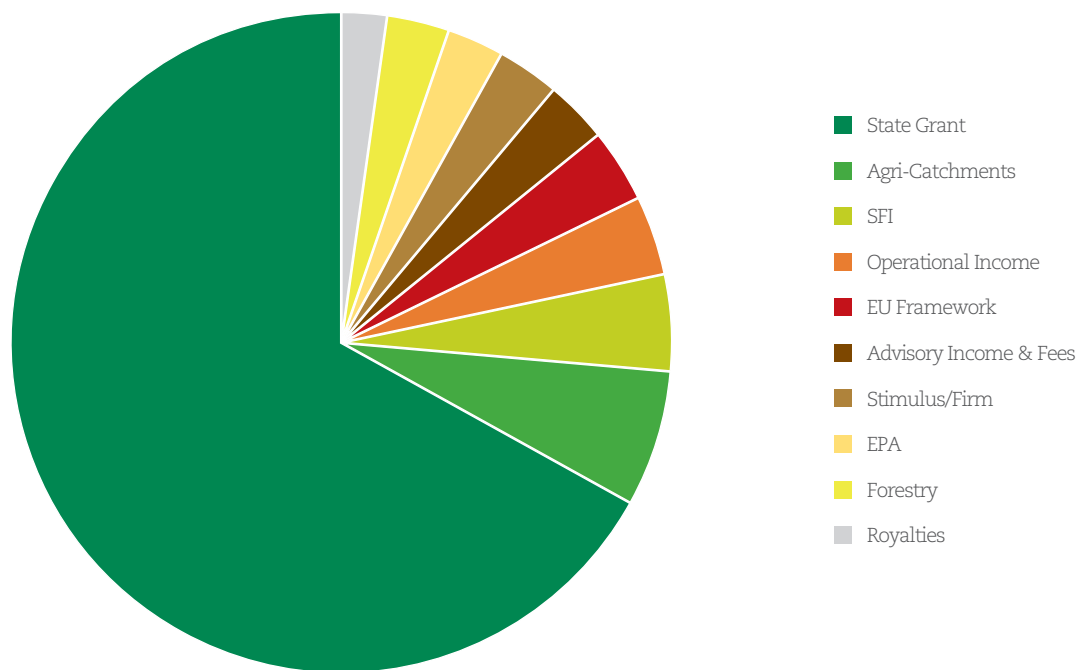
### **Forestry**

- To support the achievement of 12% forest cover by 2018 amounting to 800,000 hectares.
- To contribute to a 9% improvement in conifer farm forest profitability through management interventions by 2018.

### **Horticulture**

- To generate and provide science based innovation and advisory support to the Horticulture Sector.
- To underpin the profitability, competitiveness and sustainability of the Horticulture Sector.

## Crops Environment and Land Use Programme Funding Sources



### People

Teagasc is a knowledge intensive organisation which relies on its expertise, innovative capacity and research infrastructure for success. In total there are 182 staff involved in CELUP, comprising of 24 permanent scientists, 31 knowledge transfer staff, 38 technical staff, 15 administrative staff and 40 farm staff. In addition there are 34 contract research staff.

The quality of the science is reflected in the publication output for the programme, with an average of 150 peer reviewed publications per annum in addition to staff participation in editorships, memberships on national and international expert/advisory committees and working groups, and recognition in the form of both national and international awards.

CELU Programme staff actively engages with the agricultural industry and are involved in collaborative and contract research with many companies.

### Teagasc Students

Annually, postgraduate fellowships are awarded under the Teagasc Walsh Fellowship Postgraduate Programme (mainly to PhD level). The training of Walsh Fellows is aligned with Teagasc's mission to promote innovation in the Agri-Food sector. These young scientists will become the future drivers of Ireland's growing Agri-Food industry. The CELU programme normally has 50 Walsh Fellows making a major contribution to the programme.

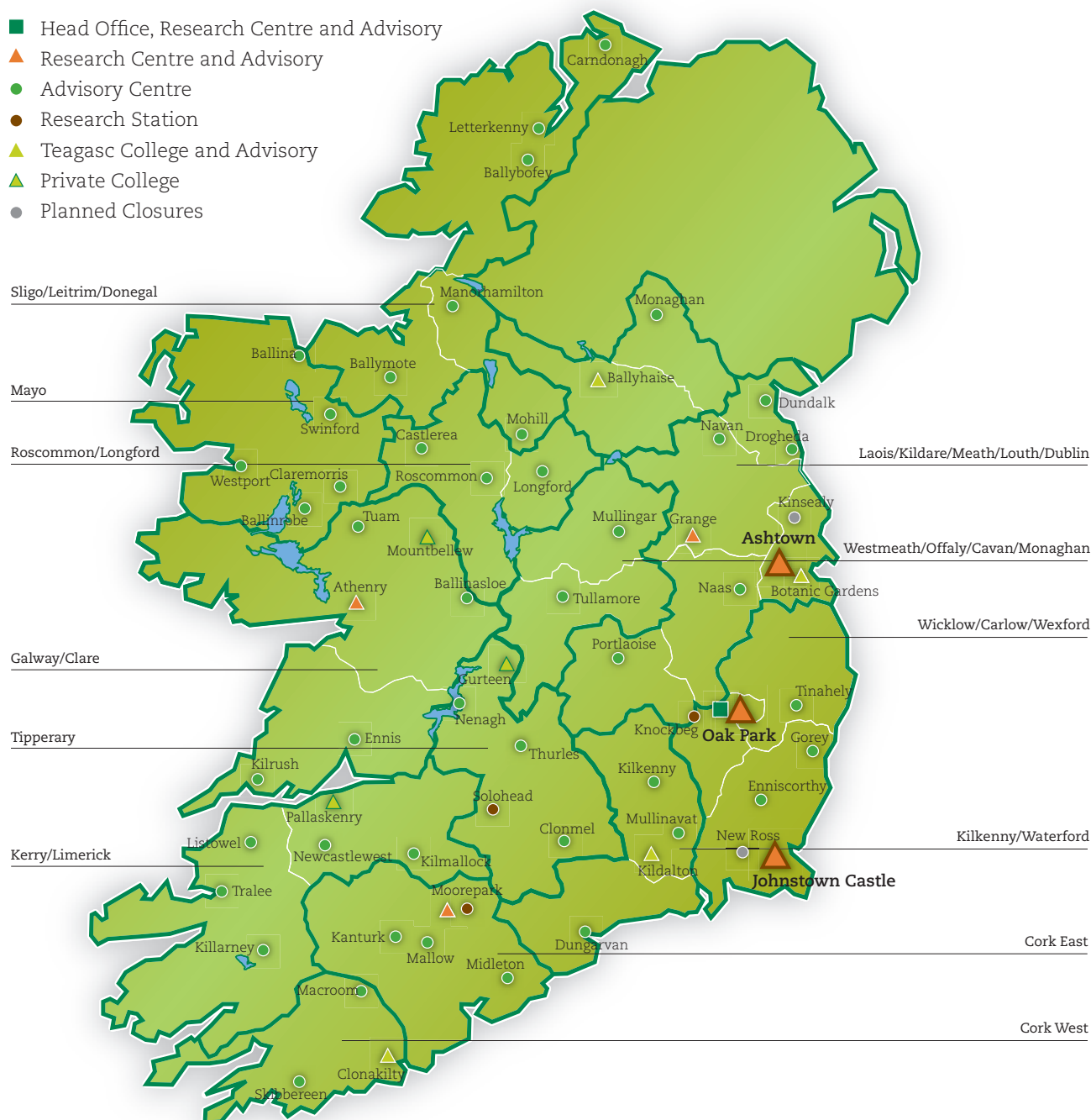
### Research Facilities

Field Research is carried out at Oak Park Carlow, Johnstown Castle Wexford, Ashtown Dublin and at many on-farm sites located around the country. There are also elaborate laboratory facilities at Oak Park, Johnstown Castle and Ashtown. The suite of laboratories at Johnstown Castle includes Gas, Water, Soil, Plant, Soil Physics, Ecology, Chemical and Molecular laboratories as well as 6 walk-in controlled environment Growth Chambers.

Facilities at Oak Park include extensive greenhouse and climate control facilities adjoining a level 1 and level 2 licensed containment laboratory for GMM and GMO experimental work.

 CELUP Research Centres

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- Map of Ireland showing county boundaries and names. The map is color-coded by county: Sligo/Leitrim/Donegal (dark green), Mayo (light green), Roscommon/Longford (medium green), Laois/Kildare/Meath/Louth/Dublin (yellow-green), Westmeath/Offaly/Cavan/Monaghan (light yellow), Wicklow/Carlow/Wexford (pale yellow), Galway/Clare (light green), Tipperary (medium green), Kerry/Limerick (dark green), and Cork East/Cork West (light green). Major towns and cities are marked with dots and labeled. The map shows the coastline and major roads.



## Teagasc Research Centres



Oak Park Research Centre

### Oak Park Crops Research Centre

Oak Park is the national centre for tillage and bio-energy crops research. The site covers 239ha and all of the main tillage and energy crops are grown, including; wheat, winter and spring barley, oilseed rape, beans, triticale, camelina, miscanthus, willow and hemp. In addition, the perennial ryegrass and white clover breeding programmes are based on-site and there are 81ha of woodland.

The highly successful Teagasc potato breeding programme is also based in Oak Park, but in addition, uses sites as far away as Donegal to develop varieties suited to all the variations in climate in Ireland.

In addition to carrying out research at Oak Park, field experiments are carried out in all of the main tillage areas of Ireland from Cork up to Meath and across into Wexford.

There is the full range of up-to-date field experimentation and monitoring equipment and extensive glasshouse facilities including contained glasshouse facilities for transgenic research. In addition there are state of the art laboratory facilities including; dedicated cereal and potato pathology laboratories, a licensed transgenic suite and three molecular biology laboratories.



Johnstown Castle Research Centre

### Johnstown Castle Research Centre

The Johnstown Castle Research Centre covers approximately 400 hectares of which 190 hectares is farmland for research purposes. Forestry accounts for 100 hectares. The amenity area covers 53 hectares and includes ornamental grounds and lakes, walled in gardens, castle and the Irish Agricultural Museum.

Johnstown Castle has state-of-the-art laboratory facilities in order to support the research programme with soil, water, plant, air and microbiological analyses. Research resources at Johnstown Castle also include experimental lysimeters, controlled environment growth chambers, glasshouse facilities and land resources for small plot to large scale field experiments.

The centre also operates two research farms on the estate, a dairy farm and a beef farm, in collaboration with the Animal and Grassland Research Innovation Programme in Teagasc. The dairy farm is run as a research facility for winter milk production systems. The beef farm is used for systems research for beef production from male animals from the dairy herd. These enterprises also facilitate field experiments and research on environmental aspects of farming.



# 1. Crops Research

## Introduction

The objective of the Crop Research Programme is to develop *cost effective* crop production systems, including crops for energy and bio-processing, which improve *competitiveness*, *profitability* and *product quality*, and minimise impact on the *environment*. This objective is achieved through the implementation of research projects conducted in three sub-programme areas:

## Crop Agronomy and Sustainable Crop Production Systems

The overall objective of this sub-programme is to acquire knowledge to facilitate the development of productive, competitive, sustainable production systems for Irish arable crops.

To achieve this objective the sub programme focuses on

- **Crop Yield:** Maximising a crop's yield potential is the primary production objective on tillage farms for both economic and environmental reasons. There is a need to develop our understanding of the soil, crop, management and climate factors that limit crop yield. This will lead to improved agronomic practices to deliver increased crop yield potential.
- **Cost Reduction:** To be competitive and economically sustainable in difficult and volatile markets, cost reduction and cost optimization strategies which are compatible with high yields are essential for profitable enterprises.

## Crop Improvement and Biotechnology

The objective of this sub-programme is to contribute to the profitability, competitiveness and sustainability of Irish agriculture by providing a platform for the continued development of improved varieties of forage, tillage and alternative crop species and to monitor the population structure of the major fungal pathogens.



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The specific objectives are:

- To breed improved varieties of potato for a variety of markets and end uses
- To develop biotechnology-based tools for the genetic improvement of perennial ryegrass, white clover, potatoes and other crop species
- To assess the impact of novel transgenic crops in Irish tillage agriculture. This encompasses providing support for policymakers, and developing management strategies for GM crops
- To monitor the population structure of the most important pathogens in Irish tillage agriculture with an emphasis on their ability to overcome fungicides and varietal resistance

## Energy Crops and Bio-processing

The overall objective of this sub-programme is to develop viable bio-energy systems that will

- Improve fuel security
- Maximise sustainability
- Create new revenue streams for farmers
- Expand rural employment
- Increase national wealth

To achieve these objectives the research has focused on the use of renewable biomass as fuel for engines and boilers. These projects have examined the combustion of a range of energy crops as well as grain and straw, the pelleting of these materials to render them suitable for domestic stoves and boilers, and the quality requirements of both liquid and solid biofuels.

## 2. Crops Knowledge Transfer



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The major objective is to improve farm profit by increasing output while keeping costs under control. Improving yield and quality and adding value through innovation in technical and business methods will be key to success. The main focus is on Tillage crops but energy crops are also being developed. Soil and plant nutrition are given specialist attention.

Four Crops Specialists work closely with crops Researchers in Oak Park and Johnstown Castle to develop the Tillage & Energy Crops Programme in consultation with Business & Technology Tillage Crops Advisors and stakeholders representing the crops sector including farmers, the input and output trades and public bodies.

Knowledge is also procured from outside agencies both within Ireland (e.g. Department of Agriculture and UCD) and further afield in the UK and across the world.

A broad range of communication technologies are used to impart the messages from the various sources:

- Group activities and 1 to 1 farm visits
- Public events including conferences, seminars, farm events etc.
- Publications including Crops and Harvest Reports, Newsletters and Web
- Training of Advisors, Farmers and the Industry
- Teagasc Crops BETTER farm programme aims to assist Irish tillage farmers to avail of cutting edge farm technology and business methods, to improve profitability and to develop links between research, advice and tillage farms

## 3. Environment, Soils and Land Use Research

### Introduction

The objective of the Environment, Soils and Land Use research programme is to develop technologies and management strategies that facilitate farmers to combine economic sustainability with environmental sustainability, thus allowing farmers to farm profitably while conserving or improving environmental resources. The work of the department covers a wide range of research areas.

### Soils

The Soils research programme is focussed on improving our knowledge of spatial variability and classification of soils at a national scale. Research areas being studied include:

- Development of a national soil map at 1:250,000 scale and an associated digital Irish Soil Information System (ISIS)
- Understanding the role of soil biodiversity and ecology in soil functions, processes and quality
- Soil compaction and sustainable soil drainage systems

### Nutrient Efficiency

Current priorities include:

- Development of soil specific nutrient advice for nitrogen and phosphorus
- Technologies for fertilizer and manure management to increase efficiency of nutrient uptake and reduce losses
- Tools to aid with nutrient management planning and cross compliance
- Development of nutrient advice for farmers

### Gaseous Emissions

This area of research focuses on:

- Technologies for reducing gaseous emissions on farms
- Refinement of emissions factors for gaseous emissions that are currently adopted in national inventories
- Quantifying and mitigating nitrous oxide emissions from soils



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- Carbon cycling in agricultural soils, including evaluation of the carbon sequestration potential of grasslands
- Assessing pollution swapping in engineered systems to mitigate N losses

### Water Quality

The emphasis here is on:

- Reducing nitrate leaching through understanding and managing the soil nitrogen cycle
- Development of end-of-pipe technologies for attenuation of nutrients from point and diffuse sources
- Quantifying and reducing the sources and impact of sedimentation on stream and river ecology
- Time lag and transformational processes from source to receptor
- Assessing mitigation strategies to minimise incidental and chronic nutrient losses

### Agro-ecology

This area of research is focussed on developing the scientific knowledge base required to underpin policy and farming activity that will contribute to conservation of farmland biodiversity and ecological resources. Current priorities include:

- Improving the environmental effectiveness and economic efficiency of management plans for High Nature Value farming systems
- Improving the understanding of the relationship between diversity and ecosystem function within agricultural systems
- Development of effective indicators for farm-scale assessments of sustainability that include farmland wildlife

## 4. Agricultural Catchments Programme



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The Agriculture Catchments Programme (ACP) works in partnership with farmers to evaluate Ireland's Nitrates Action Programme and support sustainable farming. It's an integrated research/advisory project operating in six catchments which represent important farming/nutrient-loss-risk scenarios.

The same experiment is conducted in each catchment looking at the continuum from nutrient *sources* to *mobilisation* via *pathways* and *delivery* to water, where an *impact may* occur. By understanding this continuum and its socio-economic background the programme aims to reveal what governs the fate of the nutrients.

Phase 2 of the programme (2012–2015) builds on Phase 1 which found that intensive farming can, potentially, deliver good water quality, however with some substantial lag times between farm practice changes and reduced risk to water quality. By capitalising on its platform of high resolution data and well-matched collaborations the ACP is delving deeper into the nutrient continuum thus maximising its benefits for Irish farmers, the environment and catchment science.

## 5. Environment Knowledge Transfer Department



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### Introduction

The main objective is to improve the sustainability of Irish Agriculture in terms of water quality, GHG emissions, biodiversity and soil fertility while meeting the objectives set out in Food Harvest 2020.

The department has five specialists who integrate with research and advisory colleagues to deliver a programme which integrates with all other Teagasc programmes.

### Knowledge Transfer

Farmer clients are supported in the implementation of technology aimed at increasing their competitiveness and profitability while at the same time achieving stringent environmental standards and Cross Compliance. REPS and AEOS scheme participants are also supported.

### Research Integration

The Environment KT department interacts effectively with the Environment and other research departments to ensure that research that has a capacity to improve environmental outcomes is integrated into KT programmes and to provide a feedback mechanism to researchers and policy makers from farmers and advisers.

### Education

The Environment KT department develops, resources and oversees the delivery of a wide range of courses for farmers and students.



## 6. Horticultural Development Department

### Introduction

The Horticultural Development Department (HDD) is an integrated research and advisory unit. The HDD provides advice, training and research on horticultural related matters. The HDD is grouped into four enterprise teams – mushrooms; vegetables; fruit; nursery stock and cut foliage.

### Major Focus

The major focus of the HDD will be to implement the recommendations of the “Plan for the Development of Horticulture in Teagasc 2010–2013” and the recommendations of Food Harvest 2020 by:

- Exploiting the development potential of horticulture, prioritising mushrooms, fruit / vegetable and nursery stock/cut foliage sectors
  - Support innovation that adds value in the food sector taking advantage of the positive healthy profile associated with fruit/vegetables
  - Support innovation that creates diversity in the nursery stock/cut foliage sector – Implement Teagasc plan for development of Cut Foliage Sector
  - Use Producer Organisations to drive investment and consolidate market developments where possible
- Knowledge procurement and transfer will be advanced by:
  - Collaboration with outside agencies e.g. new Memorandum of Understanding with Horticultural Development Company (HDC) Universities and Institutes of Technology
  - Regulatory compliance is being addressed by appropriate publications, courses and advisory activities. Priority issues include nutrition, pesticides and hygiene
  - The priorities in research include the ongoing projects in mushrooms, vegetable crops, strawberries, nursery stock, phytochemicals in vegetable crops and potatoes, enhancing nutrient content of brassicas and bio-control in a range of crops. A cut foliage project is supporting the establishment of the sector and the enhancement of exports and job creation



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- A range of communications techniques are used to achieve knowledge transfer including:
  - Group activities and 1 to 1 farm visits
  - Public events including conferences, seminars, farm events etc.
  - Publications including Technical notes, Newsletters and Web
  - Short Training courses and study tours

The Horticulture Research facilities at the Food Research Centre Ashtown consist of 5 laboratories, dedicated to research areas such as Plant Pathology, Plant tissue culture, Mushroom Pathology, Entomology and compost research. There are dedicated Molecular and microbiology laboratories to support these areas. Other facilities include a Lachat FIA Soil and Plant analyser and a large plant growth room. There is a 1500m<sup>2</sup> research glasshouse complex along with a modern nursery, consisting of polytunnels. The Horticulture unit also has modern ground cultivation, planting and spraying equipment suitable for research and observational trials.

## 7. Forestry Development Department



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### Introduction

The Forestry Development Department provides integrated forestry research, advisory and education services which allows for rapid and effective dissemination of research through knowledge transfer and educational initiatives.

### Objectives

The objective of the forestry research and knowledge transfer programme is to develop forests and forest management systems that maximize the potential of farm forestry from economic, social and environmental perspectives.

### Forestry Research

Forestry research focuses on broadleaf tree improvement, broadleaf silviculture and thinning and harvesting management. Forestry research projects currently include:

- FORGEN: Birch and Alder tree improvement
- Improvement and selection programme for ash, sycamore and cherry
- B-SilvRD: Broadleaf Silviculture Research – management and thinning
- Supply Chip: facilitating the supply of wood chip from forestry
- Conifer management and thinning research
- AGROCOP: novel Agroforestry – Short Rotation Coppice System

### Knowledge Transfer

Focus on the following areas:

- Unbiased assessment of the suitability of a farm forest enterprise
- Access to technologies and information to assess the status of their crops, the need for thinning and harvesting and mechanisms to effectively and profitably market their produce
- Forestry promotion through different media channels

Successful knowledge transfer is achieved using a number of tools:

- National and regional events
- Wide range of training courses
- Group meetings, and forest walks and consultations
- Initiation and support of various development initiatives
- Wide range of publications
- Website, e-News and social media

The Teagasc forestry knowledge transfer and training programme is provided in collaboration with the Forest Service of the Department of Agriculture, Food and Marine.

### Forest Owner Groups

A particular area of focus is the formation and support of Forest Owner Groups. Forest owners are finding it difficult to single-handedly thin their plantations as the cost of harvesting and transportation can outweigh the financial returns on an individual basis.

To achieve economies of scale and realise an economic return to growers, the organisation of individual growers into local forest groups is seen to be critical. These groups, supported by Teagasc and Local Development companies are striving to achieve a greater understanding of the potential of an individual forest and how to achieve this potential through cooperation with other growers.

Forestry research is carried out on Teagasc lands and on farm forestry sites throughout the country. Up-to-date experimentation, monitoring, evaluating and recording equipment is used in gathering data from trial sites. In addition research facilities are located at Teagasc. Athenry and Teagasc, Ashtown. Laboratory facilities include well-resourced soils, molecular and microbiology laboratories and a large plant growth room. In addition to the dedicated forestry facilities, extensive laboratory and analytical facilities are also available within the AFRC. In 2013 heated and unheated glasshouse, polytunnels and capillary beds will also be constructed.



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