

Scope

Teagasc has defined sustainability as an approach to farming that we can sustain into the foreseeable future. In other words: a way of farming that: 1) will be even more efficient and productive in ten or twenty years than it is today; and that: 2) will maintain and shape our countryside as a high-quality place in which to work and live. In the widest sense of the word, sustainability includes farm economics, social equity, and the environment:

- Economic sustainability means that there is a viable future in farming.
- Social sustainability means that the benefits of economic sustainability are shared amongst all of those who contribute to it.
- Environmental sustainability means careful and efficient use of natural resources such as water, soil and nutrients; thereby minimising the negative side-effects of farming on our own environment.

Capacity

Since 1988, Teagasc has developed unrivalled capacity in research, advisory and education on sustainability. As a result, Teagasc is seen as a leading institute in sustainable agriculture, not only in Ireland, but also across Europe and indeed the globe.



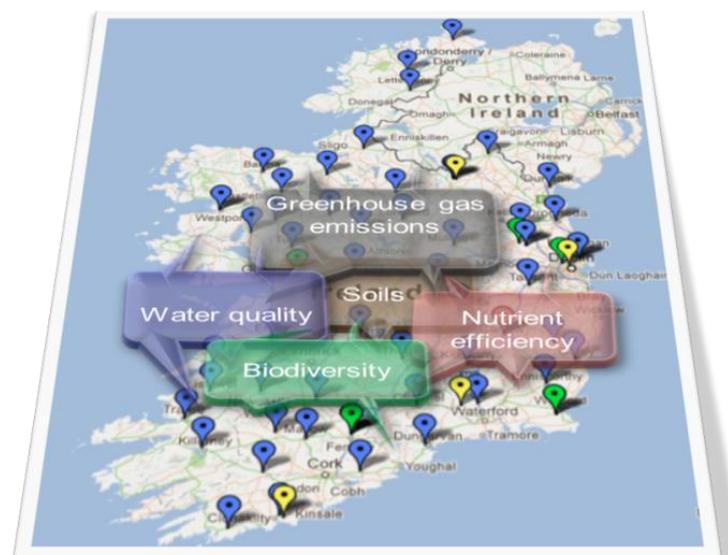
This commitment is reflected in the staff numbers who work on the many aspects of environmental sustainability (shown above); these include 26 researchers, >20 postgrads, 5 environmental specialists and 36 new soils & environment advisors. Approx. €10m was invested in the Sustainability Programme in 2013.

Mainstreaming Sustainability

Teagasc provides a unique integrated service to the agricultural industry, combining research, advisory and education. That means that, through our advisory services, farmers have first-hand access to the latest research breakthroughs. At the same time, the latest findings are fed directly into the curriculum of Ireland's next generation of farmers at our colleges.

The integrated service is facilitated by Teagasc's Working Groups on Sustainability (working groups on water quality, greenhouse gases, biodiversity, soils and nutrient efficiency)

In this document, we highlight some of the key activities and achievements of our Sustainability Programme.



The Carbon Navigator

“The Carbon Navigator provides practical guidance to farmers to further reduce the carbon footprint on his or her own unique farm”

“The Carbon Navigator is a unique partnership between Teagasc and Bord Bia, combining the strengths of both organisations”

“During 2014, the Carbon Navigator has been rolled out through all Discussion Groups”

What is it?

The Carbon Navigator is a simple, jargon-free tool that identifies actions for farmers that will further reduce the carbon footprint *and* costs on their own farm, taking account of their individual circumstances. Unlike other contemporary ‘carbon calculators’, the Carbon Navigator does not compute a ‘carbon-footprint’ but focuses on incentivising adoption of best practices to reduce GHG emissions and increase efficiency and profitability.

The Carbon Navigator allows advisors and farmers to set individual targets and ambition. It compares ‘like with like’, as it benchmarks each farm against similar farms on the same soil in the same county.

What is involved?

The Carbon Navigator was developed jointly by Teagasc and Bord Bia, combining the strengths of both organisations. It uses data collection from Bord Bia quality assurance schemes and the relationship between farmer and adviser to improve the farmers understanding of his/her role in contributing to and mitigating GHGs. The best practices, mitigation options and financial benefits of the Navigator are firmly based on the ten years of research, collated in Teagasc’s Marginal Abatement Cost Curve.

What is the impact?

- The Carbon Navigator has facilitated the ‘start of a conversation’ with farming stakeholders on climate-friendly farming, without jargon or undue rhetoric.
- It has mainstreamed the main message that “carbon-efficiency = economic efficiency”.
- The Navigator has attracted attention worldwide, with approaches by New Zealand, France, The Netherlands and Latvia.

Bord Bia Teagasc Carbon Navigator

This facility will apply Farm Enterprise Information collected at the last audit to the Carbon Navigator.

Herd: B1111199

Potential impact of meeting all targets: -20.0% GHG change, +€13445 € benefit

Year 2010		Current	Target	Chart	GHG change	€ benefit
Grazing season - suckler cows	Turnout Date	24/Mar	10/Mar	Grazing Season Suckler Cows 	-2.5%	+€1509
	Housing Date	01/Nov	15/Nov			
Grazing season - yearlings/followers	Turnout Date	24/Mar	10/Mar	Grazing Season Yearlings Followers 	-1.9%	+€2208
	Housing Date	01/Nov	15/Nov			
Age at first calving	Age at first calving (months)	30.2	28.0	Age At First Calving 	-0.7%	+€773
Calving Rate	Calving rate (calves/cow)	0.8	0.9	Calving Rate 	-8.3%	+€3010
Live weight performance	System	Steers & Heifers	Steers & Heifers	Live Weight Performance 	-0.4%	+€4497
	Lifetime live weight per day of age (g)	860.00	946.0			
Nitrogen Efficiency	Total CAN and equivalent N in Compounds (t)	18.0	7.0	Nitrogen Efficiency 	-1.9%	+€1300
	Total urea used (t)	0.0	5.0			
	Total concentrate fed (t)	12.0	12.0			
Slurry Spread Timing	Output kg beef live / ha	473.8	500.0	Manure Management 	-4.3%	+€148
	% in Spring	30	70			
	% Summer following 1st cut	30	30			
	% Later in Summer	40	0			
	Application Method	Splash Plate	Splash Plate			

Interesting fact:

All measures in the Carbon Navigator increase farm income.

Kildalton Open Source Farm

“Kildalton Open Source Farm will train the next generation of farmers in the concept and practical aspects of agricultural sustainability.”

“Kildalton will be transformed on a phased basis starting with proven technologies before moving on to emerging ones”

“Kildalton Open Source Farm will kick-start the adoption of sustainable farming practices on Irish farms”

What is it?

Kildalton Open Source Farm is a Teagasc/GILL partnership that demonstrates win:win technologies to farmers, policy makers and (national and international) industry leaders at Kildalton College. It will:

- Provide a unique facility to showcase an integrated approach to delivering sustainable food production
- Train the next generation of farmers in the concept and practical aspects of agricultural sustainability.
- Showcase GILL's pioneering sustainability agenda and Teagasc's leadership and knowledge base on sustainable agriculture.

What is involved?

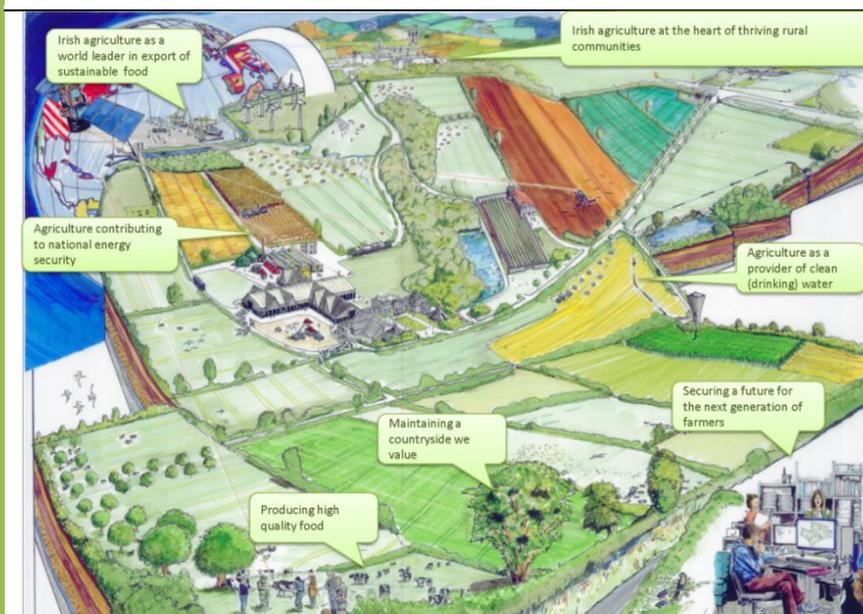
The farm at Kildalton college will be transformed in phases over a 7-year period, focusing on resource use efficiency.

- Phase 1 (year 1): benchmarking of the sustainability performance of the Kildalton farm 'as is'.
- Phase 2 (years 2-3): implementation of technologies and practices that are "ready for roll-out". Examples include the 5-point plan for nutrient management and implementation of the Carbon Navigator.
- Phase 3 (years 4-5): adapting Kildalton's infrastructure including the farm and college buildings and the ecological infrastructure including existing woodlands and hedgerows and new areas of agro-forestry to potentially provide shelter, fuel and timber for building whilst sequestering carbon and providing habitats for biodiversity.
- Phase 4 (years 6-7): implementation of emerging technologies, e.g. use of automated distributed sensors for soil nutrient management.

What will be the impact?

Kildalton Open Source Farm will:

- Kick-start the knowledge transfer and adoption of sustainable farming practices and technologies in the region and ultimately nationwide.
- Provide evidence to GILL's customers of their intent to be world leaders in sustainable sourcing and production of milk products.



Interesting fact:

Kildalton is Ireland's largest agricultural college with over 500 students taking courses in Agriculture, Horticulture, Machinery, and Equine Studies.

Agricultural Catchments Programme

“The Agricultural Catchments Programme is Europe’s largest outdoor laboratory supporting environmentally and economically sustainable farming”

“In the Agricultural Catchments, farmers, advisors and researchers work together as a team to develop sustainable farming solutions”

“The Catchments Programme has identified indicators of positive change such as reduced numbers of fields with excessive soil phosphorus and improving lake water quality”

What is it?

- The Agricultural Catchments Programme integrates research with farm advice to support the development of an environmentally and economically sustainable agri-food sector.
- The programme is built on a partnership with 300 farmers in six intensively farmed catchments across a range of soil/landscape settings.
- The Department of Agriculture, Food and the Marine funds the programme which is central to meeting Ireland’s obligations under the Nitrates Directive.
- It is operated by Teagasc which spreads the programme’s outputs to a national and international audience through its dissemination network.

What is involved?

- The programme is pushing out the boundaries of catchment science to evaluate the effectiveness of the nitrates regulations and the role of farming in ensuring that Ireland meets its water quality objectives.
- By using the latest technologies and high-resolution data, the programme has developed a unique capability to develop a deeper understanding of the biophysical and socio-economic processes and interactions in agricultural catchments.
- Through one-to-one contact between advisors and farmers in the catchments and consultation at local and national level, stakeholders play an active role in the direction and operation of the programme.

What is the impact?

- The Agricultural Catchments Programme and its research findings were pivotal in the 2013 review of Ireland’s NAP and derogation.
- Nutrient management approaches developed in the programme have been adopted in the design of the new Teagasc Online Nutrient Management Planning (NMP) package to be launched in 2015.
- The programme has identified indicators of positive change such as reduced numbers of fields with excessive soil phosphorus, improving lake water quality and has identified practices such as earlier application of manures which can be extended through the advisory service to the broader farming community.
- The programme has positioned Ireland at the forefront of catchment science internationally.



Interesting fact:

On average farmers in the Agricultural Catchments Programme use less fertiliser phosphorus than they are allowed under the Nitrates Regulations.

Greenhouse Gas Research

'In Europe, Ireland's emissions profile is uniquely high, and in the developed world, only New Zealand has a higher proportion of emissions from agriculture.'

'A mosaic of strategies that combine improved efficiencies, low-emission technologies and carbon sequestration can further reduce agricultural GHG intensity.'

'The Teagasc Marginal Abatement Cost Curve on greenhouse gases has underpinned Irish and European agricultural emissions policies'

What is it?

Irish agricultural greenhouse gas (GHG) emissions are dominated by methane (from ruminants and manures) and nitrous oxide (from fertiliser and animal deposition). While emissions have been falling steadily (-17.6%) since 1998, the sector remains a significant proportion (32%) of total national GHG emissions. Achieving Food Harvest productions, whilst delivering emissions reductions remains a key sectoral challenge. Teagasc's approach involves:

- Developing cost-effective GHG mitigation strategies for livestock and tillage systems to our Soils & Environment advisors
- Development of GHG-efficient farm systems
- Providing climate-smart decision-support to farmers

What is involved?

- The programme seeks to understanding the key processes involved in the production of methane and nitrous oxide emissions
- The development of key mitigation strategies such as manure management, fertiliser technologies as well as researching future technologies and quantifying the carbon sequestration potential of agricultural soils
- Coordinating national GHG research across all research institutions via the Agricultural GHG Research Initiative for Ireland

What is the impact?

Teagasc have ranked mitigation strategies based on efficacy and economic cost/benefit in a Marginal Abatement Cost Curve. These underpin the Carbon Navigator. Teagasc are engaged in improving the national GHG accounting methods in order to better reflect agricultural mitigation.

Teagasc GHG research has informed national and international policy via

- DAFM's 2020 low carbon roadmap for agriculture
- Position papers to inform EU 2030 Climate Policy
- Carbon-Neutrality Report: A roadmap to reduce emissions by 2050



Interesting fact:

Teagasc's research on methane emissions from cows was featured in National Geographic Magazine in January 2013 (picture above).

Sustainable Intensification of Animal Production

“Cost-effective mitigation strategies are based on production efficiencies, i.e. achieving higher output per unit input.”

What is it?

Farm sustainability is a key focus of the expansion processes associated with the Food Harvest 2020 strategy. Efficient animal production is a cornerstone of both economic and environmental sustainability. Decades of research on efficiency in livestock production have allowed us to:

- Develop models capable of estimating the sustainability of the production systems in a verifiable manner, thus providing a benchmark of change over time.
- Develop cost-effective mitigation strategies based on production efficiencies, i.e. achieving higher output per unit input. This will result in an increase in overall sustainability over time.

“Teagasc is widening the sustainability focus to include energy, water, biodiversity and nutrient use efficiency”

What is involved?

- Teagasc has developed a number of complex mechanistic models that are capable to quantifying the GHG emissions.
- These models are used by Bord Bia for quantifying the carbon footprint of beef and dairy products.
- Currently Teagasc is widening that sustainability focus to include energy, water, biodiversity and nutrient use efficiency through a Department of Agriculture Stimulus funded project (E-Ruminant).
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“Teagasc developed the scientific models underpinning the Bord Bia Sustainability programme”

What is the impact?

- Teagasc have developed the carbon footprint models that have been Internationally certified and included in the Bord Bia Audit programmes
- Teagasc have refocused the international debate around emissions intensity rather than the reduction of absolute emissions.
- Teagasc are key contributors to international working groups. For example Irish methodologies are now used in the new FAO carbon-footprinting (LEAP) guidelines and the methodologies of the International Dairy Federation.



Interesting fact:

Irish milk and pork have the lowest carbon footprint in the European Union, while Irish beef has the fifth lowest footprint.

Nutrient Management Planning

“The Teagasc “Green book” on nutrient advice provides advisors and farmers with the knowledge to underpin sustainable production”

What is it?

Nutrient Management Planning is the corner stone of efficient and economically viable production systems on all Irish farms. Management of soil fertility underpins farm productivity while helping to reduce the loss of valuable nutrients to the environment. As a result, Teagasc leads the way in :

- Providing integrated nutrient advice to farmers through soil analysis and fertiliser planning.
- Making most up to date recommendations on all aspects of nutrient management through the Teagasc “Green Book” of nutrient advice .
- Delivering a toolkit for all agricultural professionals to produce high quality nutrient management plans which are easily understood and implemented by farmers through NMP Online which will be launched in 2015
- Educating farm advisors, farmers, industry and policy makers on NMP and its role in improving water quality and reducing GHG emissions

“Nutrient Management online will revolutionise sustainable soil fertility management on farms”

What is involved?

- Research on nutrient management focuses on better understanding soil nutrient availability and crop requirements to optimise nutrient supply and demand.
- Refining nutrient advice to underpin both production and environmental objectives sustainably.
- With developments in soil mapping and characterisation, provide farmers with soil specific nutrient advice to further improve the sustainability of Irish farming systems

“Nutrient Management Planning has enabled farmers to target expensive fertilisers in areas which result in production benefits and avoid environmental losses”

What is the impact?

- Nutrient management planning has led to improved nutrient use on farms and reductions in nutrient losses: between 2003 and 2008, the average grassland fertilization rates of N declined by 27%. The rate for P declined by 55%.
- Reduced nutrient losses have saved farmers money and improved the financial and environmental sustainability of Irish farming systems.
- Improved utilisation of nutrients contained in manure and slurry applied within farms helping to offset expensive inorganic fertiliser.



Interesting fact:

The ‘Nitrogen-footprint’ of Irish produce has been reduced by c. 25% since 1990. This means that Irish farmers now apply 25% less nitrogen fertilizer per kg food produced.

Enhancing agricultural biodiversity

'BurrenLIFE been highlighted as an example of a successful multi-actor project/operational group to guide future European Innovation Partnership projects'

'The AranLIFE project represents the only large-scale, action-based nature conservation initiative ever to have been planned for the Aran Islands.'

'Teagasc research on protecting and enhancing biodiversity has highlighted the importance of spatial targeting which has been adopted as part the Irish RDP 2014-20.'

What is it?

- Halting the loss of biodiversity is an important goal for policy makers within Ireland and across the EU.
- Biodiversity contributes to human well-being through the delivery of ecosystem services such as provisioning services' (e.g. food and fuel), 'regulatory services' (e.g. flood mitigation, water purification), 'supporting services' (e.g. soil formation, nutrient cycling) and cultural services (e.g. aesthetic, recreational).
- Teagasc engages proactively with farmers to develop and identify best practices to protect and enhance biodiversity within rural Ireland.

What is involved?

- BurrenLIFE provided farmers with targeted and practical management practices to conserve species-rich grasslands, improve livestock production and increase farm sustainability.
- AranLIFE is developing and demonstrating the best conservation management practices for farming on the designated Natura 2000 sites of the three islands
- KerryLIFE will demonstrate land use management for conserving freshwater pearl mussel populations, for which Ireland accounts for 46% of the EU species population.
- Teagasc advisers work with farmers to identify actions and areas on their farms where habitats can be maintained or improved through support of Agri-environmental schemes and through initiatives such as "Ten things you can do on your farm to improve biodiversity"

What is the impact?

- BurrenLIFE has directly increased the sustainability of farms and enhanced the regional biodiversity and landscape. This has directly informed the expansion of Targeted Output Based Agri-Environmental Projects in the planned Irish RDP 2014-2020.
- AranLIFE will for the first time provide evidence based biodiversity conservation plans for the Islands to support sustainable farming.
- KerryLIFE provides targeted management practices to underpin sustainable farming and protect the internationally important fresh water pearl mussel.



Interesting fact:

'Ireland has 46% of the European population of the fresh water pearl mussel. Further enhancing sustainable land management practices is crucial for the protection of this protected species.'

The Irish Soil Information System

“The Irish Soil Information System is a public, free, online resource that contains all data and maps that have been created during half a century of soil surveying.”

“The 3rd Edition National Soil Map was created using a unique combination of predictive modelling and traditional ground-truthing.”

“Soils differ in their capacity to produce food while impacts on the environment: the Irish Information System now allows for the development of soil-specific farm and nutrient advice.”

What is it?

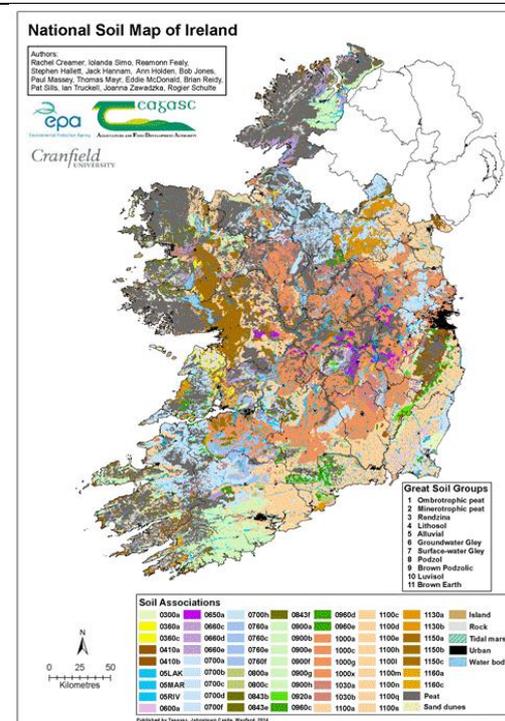
- The Irish Soil Information System is a public, free, online resource that contains all data and maps that have been created during half a century of soil surveying: <http://soils.teagasc.ie>
- In 2014, Teagasc published the 3rd Edition National Soil Map, which uniquely shows the variety and distribution of soils in Ireland at a 1:250,000 scale.

What is involved?

- The Irish Soil Information System has collated and digitised all soils data and information collected during the last 50 years of soil science.
- The 3rd Edition National Soil Map was created using a unique combination of predictive modelling and traditional ground-truthing.
- The map was validated using 10,000 auger points and 200 profile pits.

What is the impact?

- Soils differ in their capacity to produce food, as well as their capacity to minimise risks and impacts on the environment.
- Therefore, sustainable production can be optimised through soil-specific farm and nutrient management
- The Irish Information System now allows for the development of such soil-specific advice.



Interesting fact:

As a result of their glacial history, Irish soils are extremely diverse: over 200 different soil types have been identified in Ireland to date.

Supporting Farm Level Sustainability: The Teagasc Advisory Service

“Agricultural advisors have been the cornerstone for the development of Irish agriculture for over 100 years and will meet the sustainability challenge head on.”

“achieving sustainable farming firstly involves raising awareness and then achieving practice change at farm level.”

“reducing GHG emissions and improving water quality in recent years show that with the right technical and regulatory support progress can be made towards achieving sustainability”

What is it?

- Teagasc has 240 farm advisers supporting the development of Irish agriculture.
- Thirty five Soils and Environment advisers focus on supporting farmers to improve environmental and sustainability outcomes by assisting farmers to comply with environmental legislation and by supporting farmers involvement in agri-environmental schemes.
- Approximately 200 Business and Technology advisers, working mainly through discussion groups, are increasingly combining messages of productivity and sustainability in their message to farmers.

What is involved?

- The Teagasc advisory service has close contact with its 40,000 contracted clients and with up to 100,000 farmers through its open events and publications.
- In conjunction with stakeholders it has set out a programme of activities to support the “Smart Green Growth” objectives of Food Harvest 2020.
- The advisory service, through its discussion groups, public events, one to one interactions, publications and education programmes is improving the understanding of farmers of the need for sustainable intensification and backing it up with support for farm level development, innovation and practice change

What is the impact?

- Advisory supported campaigns on timing of slurry application, more efficient utilisation of chemical fertiliser, extending grazing season and improving the economic breeding index provide evidence that the Teagasc advisory service has the capacity to ‘influence’ change and improve sustainability at farm level



Interesting fact:

Farmers are more influenced to change by other farmers than by advisers – hence the importance of discussion groups in advisory work.

Tracking progress: NFS sustainability indicators

“Sustainability Indicators are an important means of ensuring the success of monitoring, controlling and evaluating the sustainable intensification of Irish farming.”

“the indicators measure the economic, social and environmental sustainability of farms of all systems.”

“the indicators show that it is possible to be both economically viable and environmentally friendly. Indeed some of the most profitable farms are also the most environmentally sustainable and this is really a good news story for Ireland.”

What is it?

- For over 40 years the Teagasc National Farm Survey (NFS) has published the only official statistics on farm incomes in Ireland.
- The survey, which is a partner of an EU-wide network of similar surveys, collects data from a representative sample of approximately 1,000 farms each year.
- Originally designed to record farm income, the NFS is now being further developed to record, measure and publish information on the sustainability performance of Irish farms.

What is involved?

- Farm-level indicators reflecting the multidimensional nature of sustainability have been developed using NFS data. This means that the indicators measure the economic, social and environmental sustainability of farms of all systems, sizes and location of production.
- The indicators can be back-cast over the last number of years to see where we have come from and will be recorded on an annual basis moving forward in order to track our progress towards a more sustainable agricultural sector.
- Similar data are available across the EU and a project is underway to develop a set of EU-wide harmonised farm-level indicators of sustainability

What is the impact?

- To date, the results have shown that the most viable farms from an economic perspective are also the most sustainable from an environmental and social perspective. This is evidence that win-win strategies are available and that sustainability can support – rather than constrain – the ‘Smart Green Growth.



Interesting fact:

The Teagasc National Farm Survey is Ireland’s longest running annual survey: for 40 years it has been used to measure farm income.

International leadership on sustainability

“Teagasc has assumed a global leadership position in research and knowledge transfer on sustainable food production and is internationally recognised for its research in support of sustainable agricultural policies”

What is it?

As an exporting nation, Irish agriculture is firmly tied into the global dynamics of food supply and demand. This means that we cannot, and should not, work on sustainability in isolation of international markets. Instead, Teagasc has assumed a global leadership position in research *and* knowledge transfer on sustainable food production. Teagasc is internationally recognised for its research in support of sustainable agricultural policies developed by the Department of Agriculture, Food and the Marine. This evidenced by explicit requests from France, the Netherlands, Denmark and Latvia to share and assist in their policy development.

“Teagasc was unanimously elected to Chair the FAO Livestock Environmental Assessment and Performance (LEAP) partnership, consisting of Governments, Industry and CSOs/NGOs”.

What is involved?

- In October 2014, Teagasc was unanimously elected to Chair the FAO Livestock Environmental Assessment and Performance (LEAP) partnership. This global partnership of Governments, Industry and CSOs/NGOs is developing harmonised global guidelines for the assessment of the environmental sustainability of agriculture.
- Teagasc is proactively contributing to international initiatives such as the Global Research Alliance and the Joint Programming Initiative on Agriculture, Food Security and Climate Change (FACCE-JPI).
- Teagasc is signing a Memorandum of Understanding with Irish Aid to provide expertise to the development of sustainable agriculture in Irish Aid partner countries.

“Teagasc’s international leadership supports Ireland’s green credentials: it underpins our claims on sustainability with facts and science”.

What is the impact?

- Our international leadership supports Ireland’s green credentials: it underpins our claims on sustainability with facts and science.
- Our leadership ensures that international sustainability metrics and policies are cognisant of our Atlantic, grass-based farming systems. (In the past, too often ‘continental’ policies were indiscriminately imposed on Irish farming systems).
- *Vice versa*, our participation in the international dialogue ensures that we continue to apply novel and internationally accepted scientific methods.



Interesting fact:

“The Great Debate on the Battle to Feed a Changing Planet”, organised by Teagasc, was watched live by an audience of over 10,000 viewers worldwide.

