

# EASAC (2017)

‘Opportunities and challenges for research on food and nutrition security and agriculture in Europe’ – relevance to Ireland

**At the Royal Irish Academy, we champion research and promote awareness of how science enriches our lives and benefits society. As we believe that good research needs to be promoted, sustained and communicated, we bring academia, government and industry together to address issues of mutual interest, and in doing so, we contribute to public debate and policy formation.**

**As a Member of the European Academies Science Advisory Council (EASAC), the Royal Irish Academy welcomes this EASAC report: *Opportunities and Challenges for Research on Food and Nutrition Security and Agriculture in Europe*. EASAC is the collective voice of the National Academies of Science of the EU member states, Norway and Switzerland, providing independent scientific advice for policy-makers in the EU's institutions, member states and Europe generally.**

This EASAC report has implications for policy-makers working on food, nutrition, health, the environment, climate change, and agriculture. Combating malnutrition in all its forms is a problem faced by all countries, and research and innovation will therefore be central to finding solutions to such a challenge. As part of an unprecedented global InterAcademy Partnership project by 130 science academies, a team of scientists from across Europe undertook a two-year, extensive analysis on the future of food, nutrition, agriculture, and health. Top line findings by the panel of scientists include:

- Food consumption will need to change to improve consumer health.
- Farming and agriculture have significant impacts on human health and the environment.
- Europe should not stall on opportunities offered by genome editing, precision agriculture and the use of large data sets.

The briefing paper is prepared by Dr Aifric O'Sullivan, University College Dublin, and the Royal Irish Academy's nominee to the EASAC Working Group on Food, Nutrition, Security and Agriculture. It will highlight some of the important discussion points for food, nutrition and agriculture that are of particular interest to Ireland. Many of the challenges identified in the EASAC report are identified in Ireland's FoodWise 2025, a ten-year plan for the agri-food sector in Ireland, and are therefore worthy of our attention.



## The Author

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*Disclaimer: The views and opinions expressed by authors are their own and do not reflect the position of the Royal Irish Academy.*

## Introduction

Our food system, from agriculture to food production and consumption, is unsustainable, in a world where population growth, demand for land and climate change are compounding pressures. Malnutrition remains a major public health concern globally, with undernutrition, micronutrient deficiencies and obesity often co-existing. The InterAcademy Partnership has called the four regional academies from Europe, Africa, Asia and the Americas to action, to describe how science can and will address sustainable food and nutrition security and agriculture. The European Academies of Science Advisory Council (EASAC) recently published their report on “Opportunities and challenges for research on food and nutrition security and agriculture in Europe”. This commentary will highlight some of the important discussion points for food, nutrition and agriculture that are of particular interest to Ireland. Many of the challenges identified in the EASAC report are identified in Ireland’s FoodWise 2025. This commentary will focus on the research priorities to meet key challenges for the food system, nutrition, agriculture and sustainable development.

## Food system

Food waste, food safety and the application of technology in food science were highlighted as focus areas for scientific research. Improving food waste is a necessity. One of the first steps for research is to define, evaluate and quantify food waste. Science can also contribute to food waste reduction through improving food storage solutions, creating smarter logistics across the food system, improving public understanding of food spoilage, developing recycling technologies and developing new products from food industry waste streams.

In Europe, the European Food Safety Authority is responsible for food safety issues and there is ongoing research and monitoring for bacteria and virus contamination in the food chain; however, there are several other areas related to food safety that warrant attention from the scientific community including fortified foods, biogenic amines, and chemical contaminants such as packaging. The EASAC report acknowledges that novel technologies will improve strategies for food authentication and integrity, which is another important consideration with regards to food safety in today’s global food system.

The working groups expressed concerns for food science and technology being marginalised with the current focus on sustainable agriculture and nutrition security. However, food science and technology can provide solutions for these challenges and others including food waste, food safety and new product development. Research should target fragmentation in the food supply chain, increasing sustainable food production, and product development that is consumer-driven and innovative to benefit health.

The European food system is part of an increasingly globalised food system. EASAC recommend that European research should provide a better understanding of market volatility, the effects of policy on global markets, trade flow and how natural resources and transportation underpin flow, and the connections between global market prices, local food systems and ultimately food intake.

## Nutrition and public health

Multidisciplinary policy making and governance is required to make agriculture and food systems more nutrition-sensitive. In addition, social practice theory will help inform strategies to tackle

barriers to behaviour change and design interventions that will drive change. Food and nutrition security and food sustainability must be considered as part of European dietary guidelines. Research on what drives consumer demand and behaviour change and how we can diversify agriculture to meet global nutrition requirements is needed, followed by establishing methods to increase consumption of novel nutritious, sustainable foods. In addition, we need a better definition of what a sustainable diet is and how we can measure it, so that these metrics form part of national surveys and inform policies and interventions to educate consumers on sustainable behaviours and diets.

The complexity of the food and health sphere was acknowledged in the report and the role of new technologies and an integrated systems approach to better understand environment, genetics, family, society and gut microbiota influences was discussed. New technologies are also facilitating a consumer-focused approach to understanding nutrition and health, and behaviour change interventions. For example, smart phone applications and wearable technologies allow minute by minute data collection and monitoring, and the “big data” generated helps inform artificial intelligence based automated feedback which supports consumer behaviour change and maintenance. Further research is needed to determine the accuracy and specificity of self-collected data to inform primary health.

## Agriculture

Animal science research is critical in the current environment considering the forecast increased demand for animal foods globally, at a time when we must switch to sustainable agriculture, food production and nutrition. Genomics has and will continue to play a significant role in animal agriculture. The EASAC working group noted the importance of maintaining animal genome databases. While genetically modified food animals remain controversial in the EU, genome editing is different and offers opportunities particularly in relation to disease resistance. CRISPR (clustered regularly interspersed short palindromic repeats) technology allows precise genome editing. The current focus of this research is on disease resistance and increasing muscle mass but there is huge potential for other applications. Other research priorities include, efficient systems as part of smart agriculture and understanding the role of the microbiome in animal and human health.

Food and biomass from the sea is another critical issue for Ireland. This EASAC report draws on relevant aspects of a recent EASAC publication describing marine sustainability and highlights the role of science research in addressing change to more sustainable fishing and aquaculture. This report acknowledges the under-utilisation of marine resources, but over-exploitation of certain fish stocks. Future food and biomass from the sea will depend on redirecting the fishing pressure to lower trophic levels in the marine food chain, and developing ecologically efficient marine aquaculture to include marine plants.

Plant sciences have and will contribute to further intensified crop productivity and sustainable agriculture. The role of scientific research in plant breeding and the potential implications of successful breeding programmes for higher yield potential, enhance abiotic and biotic stress tolerance and improved quality is discussed in detail. Like animal agriculture genomics is expected to play a key role in plant breeding for cultivar selection as well as genetic modification using GMO (genetically modified organisms) technologies or CRISPR methods. Recommendations for a comprehensive gene bank are also highlighted here which would help identify unexploited nutritious plant species that could be adopted in European agriculture. The link between plant root systems and carbon in soil was also discussed with a view to using this as a method to mitigate climate change.

As described in relation to nutrition research, new technologies are critical for the future of agriculture in Europe. Precision agriculture is a term that describes the use of technologies to improve farming efficiency and animal and breeding. Examples include, autonomous machinery for weed control and crop harvesting, and satellite positioning systems for tailored water and pesticide delivery. Like precision nutrition, the technologies used for precision agriculture will generate “big data” which should lead to improved design and decision making for policy makers, business, farmers and consumers. Data sharing and validation for data generated using new technologies are crucial to enable advances in science and innovation towards sustainable agriculture and food security.

## **Sustainable development**

Agriculture, food and nutrition, place demands on the environment. The final discussion chapter of the report describes the competition for land use and other resources for sustainable rural development. One of the priorities for research, which will be particularly relevant in Ireland, is to facilitate developing a stronger evidence base to underpin the Common Agricultural Policy, Rural Development Policy and the Water Framework Directive. This section also discusses the impact of bioenergy production, the intersection of food and water resources, and the critical role of soil. Broadly there is a need to develop a land use strategy to optimise use for multiple ecosystem services.

## **Further information**

The Royal Irish Academy/Acadamh Ríoga na hÉireann is Ireland’s leading body of experts in the sciences, humanities and social sciences. The Academy champions research, and identifies and recognises Ireland’s world class researchers. It supports scholarship and promotes awareness of how science and the humanities enrich our lives and benefit society. Membership of the Academy is by election and is considered the highest Academic honour in Ireland.

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