European Commission

RESEARCH & INNOVATION

Safeguarding food security and reinforcing the resilience of food systems

September 2022

Environmental challenges such as climate change, biodiversity loss, pollution, water and resource scarcity are putting food systems all over the world under increasing pressure. The unprovoked Russian invasion of Ukraine has further destabilised already fragile agricultural markets, with serious consequences for global food security, negatively affecting vulnerable countries and populations. The immediate impacts include risks for food production and access, increasing costs throughout the food supply chain and the destabilisation of agricultural markets due to increases in energy and fertiliser costs. In response to this crisis, the European Commission adopted the **safeguarding food security and reinforcing the resilience of food systems communication**, outlining measures to safeguard global food security and support EU farmers and consumers.

The current challenges call for even greater **urgency** in the transition towards sustainable, resilient and fair food systems in the EU and globally in alignment with the **European Green Deal**, in particular the **farm-to-fork** and **biodiversity strategies**. The communication highlights that: 'Innovation through research, knowledge, technology, agro-ecology and adoption of best practices can mitigate pressure on input costs without hurting production capacity, leading to long-term progress in productivity to achieve the green transition.'

"Food sustainability is key for food security and the resilience of global food systems"

Research and innovation (R&I) are key drivers in accelerating the transition to sustainable, healthy, inclusive and resilient food systems relying on food from land and sea; from primary production to consumption. Important areas for R&I include:

agro-ecological practices
that enhance agricultural production thanks to healthy soil and ecosystems and reduce dependency on chemical inputs;

carbon farming
to lessen greenhouse gas (GHG) emissions while providing a better income for farmers;

shifting consumption
trends to healthier and sustainable (mainly plant-based) diets;

improving **sustainable biogas and biomethane production**, in particular at farm or farming cooperative level.

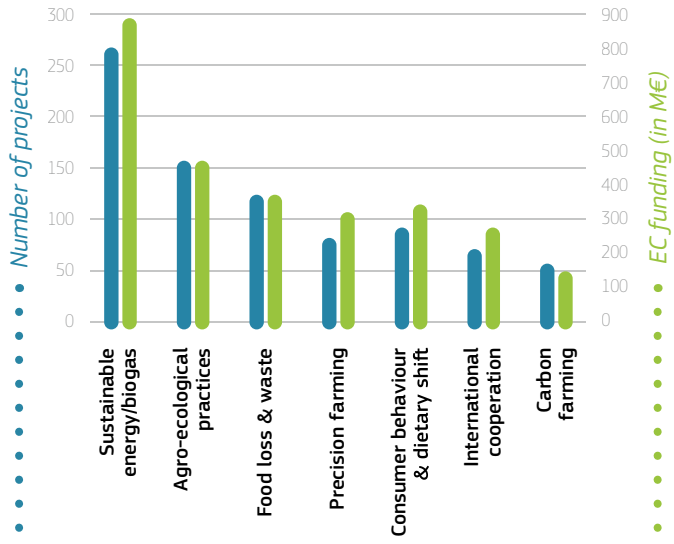
precision farming
that reduces dependency on and use of synthetic/mineral fertilisers and chemical pesticides;

minimising food loss and waste
to reduce pressure on limited natural resources and water;

fostering
international cooperation;

R&I policy can mobilise a wide diversity of stakeholders across disciplines, sectors and countries to further our knowledge, develop impactful solutions, help overcome barriers and lock-ins and uncover new market opportunities relevant to safeguarding food security and reinforcing the resilience of food systems.

FACTS AND FIGURES ON EU RESEARCH AND INNOVATION INVESTMENT IN FOOD SECURITY (2007–2020)



The figure shows the level of EU R&I investment (2007–2020) in the key areas mentioned above. For example, the EU invested EUR 294 million in 75 projects that contribute to reduce the dependency on synthetic and mineral fertilisers and chemical pesticides and EUR 352 million in 119 projects to help tackle food loss and waste.

Source: EC CORDA and CORTEX databases.Some projects focus on a broader set of challenges, while others are more targeted. This represents the best available estimate.

Between the **Seventh Framework Programme** (FP7, 2007–2013) and **Horizon 2020** (H2020, 2014–2020), the number of EU-funded R&I projects relevant to food security has more than doubled, from approximately 200 to over 450. Through the **LIFE** programme, 93 projects supported the testing of innovative solutions and the implementation of best practices to improve sustainability. Given the ambition spelled out in the European Green Deal and the challenges associated with the war in Ukraine, there is a clear need for more investment to support innovative and sustainable solutions and help them reach market take-up.

Currently, further investments are being mobilised by **Horizon Europe** (2021–2027), in particular via its Cluster 6 'Food, Bioeconomy, Natural Resources, Agriculture and Environment' (EUR 9 billion) and the flagship missions 'A soil deal for Europe', 'Adaptation to climate change' and 'Restore our ocean and waters by 2030'. In addition, key partnerships – including 'Sustainable Food Systems for People, Planet & Climate', 'Accelerating farming systems transition: Agro-ecology living labs and research infrastructures', 'Agriculture of data', 'Animal health and welfare', 'Biodiversa+', 'Sustainable blue economy' and 'Water 4 All – Water Security for the Planet' – will be important to align and leverage further public and private R&I investments in these areas.

In the agricultural domain, projects are embedded in a wider innovation framework established by the common agricultural policy: the **European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI)** supports cooperation between farmers, advisors, researchers and businesses to test solutions and speed up innovation to ensure a steady supply of food, feed and biomaterials. More than 2 500 operational groups have been set up since 2014 to advance innovation in the agricultural and forestry sectors. Under the new **common agricultural policy**, this number is expected to increase significantly.

Grants by the **European Research Council** and the **European Innovation Council** are key instruments to support basic research and close-to-market solutions respectively. The Commission also supports the European Institute of Innovation & Technology and in particular **EIT Food**, where education and entrepreneurship in food systems are being developed. Furthermore, the Commission is actively engaged in multilateral international actions with EU Member States via the **Standing Committee for Agricultural Research (SCAR)** and also beyond Europe via the **High Level Policy Dialogue with the African Union on Food and Nutrition Security and Sustainable Agriculture** and the **Partnership for Research and Innovation in the Mediterranean Area** to foster international R&I cooperation. International cooperation is also supported by the **Development of Smart Innovation through Research in Agriculture** initiative and the research and innovation funds of the **Organisation of African, Caribbean and Pacific States**. The Commission also supports the **Joint Research Centre Knowledge Centre for Global Food and Nutrition Security**, which provides a single access point for datasets, reports and information.

SUCCESS STORIES

AGRO-ECOLOGICAL PRACTICES

The EUR 7.7 million **RUSTICA** project provides a technical solution to convert organic residues from the fruit and vegetable sector into novel bio-based fertiliser products. This consists of five combined conversion processes, depending on the available waste streams, and integrated with state-of-the-art technologies such as composting. The project's ambition goes beyond the simple recovery of nutrients, as it includes the development of economically viable and environmentally sustainable alternatives to mineral fertilisers with the same or improved agronomic value. A multi-stakeholder approach guarantees the implementation potential of the technologies in the agro-food chain and will lead to sound business models.

The EUR 10 million **DiverIMPACTS** project aimed to achieve the full potential of diversification of cropping systems. An intelligent application of diverse cropping can deliver a raft of benefits, including a reduction in the use of fertilisers and pesticides, greater food security and a reliable supply of agricultural products for feed, energy and industrial uses, coupled with a greater provision of ecosystem services and an increased efficiency of energy and resource use. The project supported these goals by assessing the performance of crop diversification schemes such as rotation, intercropping and multiple cropping in 10 field experiments.

CONSUMERS AND DIETS

The EUR 8.2 million **Smart Protein** project aims to future-proof protein supply chains with a positive impact on the bioeconomy, environment, biodiversity, food and nutrition security and consumer trust. It is validating and demonstrating innovative, cost-effective and resource-efficient plant protein products from fava beans, lentils, chickpeas and quinoa. Microbial biomass proteins will be created from edible fungi by upcycling side streams from the pasta, bread and beer industries, thus contributing to the circular economy.

PRECISION FARMING AND FERTILISERS

The EUR 30 million **IoF2020** project developed sensors connected to a specially designed interface that tells farmers if their soil contains enough humidity, helping them plan their irrigation schemes. The project also developed spectrometry to tell farmers if a disease is on the verge of spreading in a field and the exact location of the outbreak.

The EUR 2.2 million **STIMUL** project developed an innovative and ecological seed treatment solution to reduce the use of fertilisers and water consumption. It triggered a significant yield increase (3–4 %) for maize, sunflowers and soybeans and could entirely compensate for a 12 % and 18 % reduction in nitrogen inputs for maize and sunflowers respectively.

CARBON FARMING

The EUR 6.8 million **Nutri2Cycle** project uses an integrated approach to enable the transition from the current (suboptimal) nutrient household in European agriculture to the next generation of agronomic practices, characterised by an improved upcycling of nutrients and organic carbon. The project aims to improve nutrient use efficiency by integrating on-farm techniques and systems that allow better reconnection between animal husbandry and plant production requirements.

The EUR 1.7 million **FORAGE4CLIMATE** project demonstrated optimised foraging systems and farm management practices to reduce GHG emissions from the dairy sector while increasing soil carbon in agricultural lands. The project recorded a reduction of GHG emissions from dairy farms ranging from 6 % to above 20 %. Soil carbon content increased by one tonne per hectare per year on average.

FOOD LOSS AND WASTE

The EUR 9 million **REFRESH** project established a blueprint to facilitate the implementation of national voluntary agreements to reduce food waste, involving public authorities, businesses and other stakeholders. The project also developed new technologies to produce fuels and chemicals from household food waste and food fibre from a chicory residue. The project's findings improved our understanding of consumer behaviour in relation to food waste.

INTERNATIONAL COOPERATION

The EUR 4.8 million **InnovAfrica** project developed technologies and approaches to improve food security in sub-Saharan Africa, with positive impacts on agricultural systems. The project led to a substantial increase in the consumption of milk, legumes, maize and sorghum at the household level, contributing to a balanced healthy diet of protein, vitamin A and iron.

The EUR 6 million **WE4F** project scales up climate-friendly, energy-efficient and water-efficient innovations by working closely with the private sector to increase the sustainability of agricultural food value chains. It also addresses environmental and climate resilience in developing countries and emerging markets, with a particular focus on poor people and women. The project is working with promising innovations to support their next level of scaling and open up new calls for innovations within the water–agriculture–food nexus.

SUSTAINABLE BIOGAS PRODUCTION

The EUR 1.6 million **Seemla** project demonstrated the sustainable exploitation of biomass production and raised awareness on the potential of marginal lands (i.e. that are not used for food or feed production and do not pose an environmental threat) by providing land use tools and guidance for landowners and farmers.

The EUR 1.5 million **CIRCforBIO** project demonstrates an innovative biorefinery concept for the production of bioethanol, using bioproducts from biomass produced from households, catering and industrial food waste and agricultural residue. The project also aims to boost biogas production with the removal of volatile fatty acids. It facilitates the circular economy concept for second-generation biomass in Greece by using interactive platforms.

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For more information:

https://research-and-innovation.ec.europa.eu/research-area/environment/bioeconomy/food-systems_en

https://research-and-innovation.ec.europa.eu/research-area/agriculture-forestry-and-rural-areas_en

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