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Analytical overview of the achievements of the 2016 strategic approach to agricultural research and innovation and Food 2030 research and innovation framework and insights from stakeholder consultation activities

Accompanying the document

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

New Strategic Approach to Research and Innovation for competitive, resilient and sustainable agriculture, forestry, rural areas and food systems

Future-proofing EU agri-food through AgRI 2040 and Food 2040

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Glossary

Abbreviation or acronym	Meaning or definition
AKIS	Agricultural knowledge and innovation systems
BIC	Bio-based Industries Consortium
BBI-JU	Bio-Based Industries – Joint Undertaking
CBE-JU	Circular Bio-based Europe – Joint Undertaking
COFUND	A co-funding instrument under Horizon Europe to support partnerships
CSA	Coordination and support actions
EFSA	European Food Safety Authority
EIC	European Innovation Council
EIP-AGRI	European Innovation Partnership for Agricultural Productivity and Sustainability
EIT	European Institute of Innovation and Technology
EJP	European joint programmes
ERA-NET	A co-funding instrument under Horizon 2020 to support partnerships
FNSSA	EU-AU Research and Innovation Partnership on Food and Nutrition Security and Sustainable Agriculture
H2020	Horizon 2020
HE	Horizon Europe
IA	Innovation actions
IPR	Intellectual property rights
JRC	Joint Research Centre
JU	Joint undertaking
KIC	Knowledge and information communities
PCP	Pre-commercial procurement

PPI	Public procurement of innovative solutions
PRIMA	Partnership for Research and Innovation in the Mediterranean area
R&I	Research and Innovation
RIA	Research and innovation actions
SCAR	Standing Committee on Agricultural Research
SMEs	Small and medium-sized enterprises
TRL	Technology readiness level

1. INTRODUCTION

Research and innovation (R&I) are essential to support a competitive, resilient, sustainable, fair and attractive agri-food sector[1] in the European Union. In a context marked by climate change, biodiversity loss, pressure on natural resources, including soil health, geopolitical instability, changing consumer expectations, and the need to strengthen Europe's competitiveness and strategic autonomy, EU-funded R&I has a central role to play in generating knowledge, developing solutions, supporting uptake, and informing policy.

This Staff Working Document (SWD) reviews the implementation and achievements of two complementary EU R&I strategic approaches launched in 2016: **the strategic approach to EU agricultural R&I**[2], and **Food 2030**[3], the EU R&I framework for food systems transformation. Together, these approaches have helped guide investments under Horizon 2020 and Horizon Europe 2021-2027 in closely connected areas: agriculture, forestry and rural areas on the one hand, and wider, post-primary production food systems on the other hand, including food processing, consumption, nutrition, and health-related aspects.

The analysis presented in this SWD brings together evidence on implementation, achievements and emerging lessons from both strategic approaches. It aims to take stock of past investments and provide an evidence base for the preparation of the **new EU strategic approach to R&I for competitive, resilient and sustainable agriculture, forestry, rural areas, and food systems.**

The SWD is based on the analysis of Horizon Dashboard[4] data, project-level information, stakeholder consultations, workshops, surveys and contributions from Member States and associated countries, across the agri-food R&I sectors. It also covers information from the implementation of Horizon 2020 and Horizon Europe projects up to the most recent final data available; as Horizon Europe 2021-2027 is still ongoing at the time of publication of this SWD, further results will emerge over time.

2. THE ROLE OF COLLABORATIVE RESEARCH AND INNOVATION IN THE CURRENT EU INNOVATION ECOSYSTEM FOR AGRICULTURE, FORESTRY, RURAL AREAS AND FOOD SYSTEMS

The 2016 strategic approach to EU agricultural R&I and Food 2030 are **distinct but complementary R&I frameworks**. Both have been implemented mainly through collaborative R&I activities under the previous Horizon 2020 and current Horizon Europe programme, and have relied on **common R&I instruments, programming tools, stakeholder communities and cooperation platforms**.

This section presents an overview of the Horizon Europe 2021-2027 instruments, and in particular collaborative R&I instruments and their programming tools that have been used to fund R&I activities related to the agri-food sector. These activities are connected to the priorities identified in the 2016 strategic approach to EU agricultural R&I and Food 2030.

[1] For the purpose of this Staff Working Document, the agri-food sector covers agriculture, forestry, rural areas and food systems.
[2] https://ec.europa.eu/newsroom/horizon2020/items/33294/en.
[3] Food 2030 - Research and innovation - European Commission.
[4] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-dashboard.

Sector-specific statistics on collaborative R&I programming over the 2014 - 2024 period (covering Horizon 2020 and Horizon Europe) show trends in investments supporting the R&I journey towards a sustainable, competitive and resilient agri-food sector.

The final three years of the Horizon Europe 2021-2027 Framework Programme (2025-2027) are not considered in this analysis, so the data presented below is likely to change by the end of the programme. The data underpinning this analysis is publicly available as it was entirely sourced from the Horizon Dashboard.

Annex I describes the methodology in detail. The list of projects included for the analysis is accessible online as supplementary material to this staff working document.

2.1. Support for the innovation journey under Horizon Europe 2021-2027

The innovation journey starts with fundamental and frontier research or the identification of shared challenges and the generation of knowledge, often where risks are highest and market incentives are weakest. In the EU, this stage is primarily supported under the Horizon Europe 2021-2027 Pillar I (Figure 1).

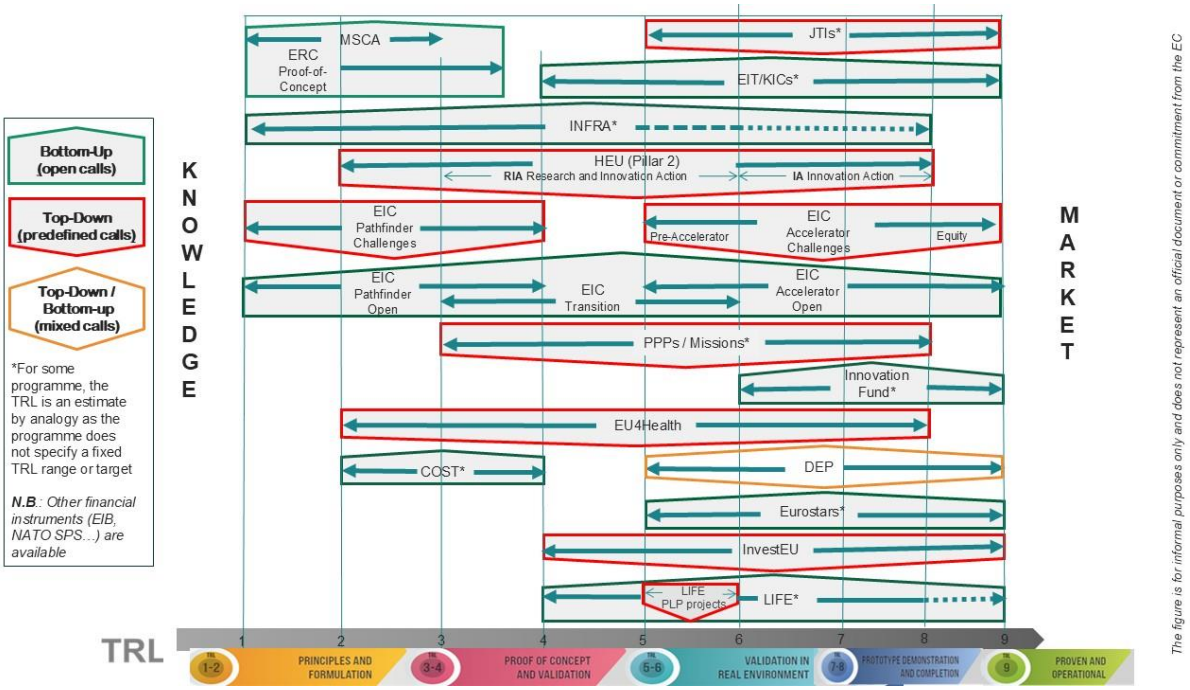

Figure 1. The 'innovation journey' and the different EU-funded instruments available to support the transformation of scientific knowledge into market-ready solutions

As innovation progresses, the focus shifts to applied research, development, testing, and demonstration under real conditions advancing on the technology readiness level scale[5], characterised by high financial and operational risks, particularly for small and medium-sized actors. Targeted public support helps bridge this gap by improving readiness for further investment. The current Horizon Europe Pillar II, organised into six thematic clusters, plays a substantial role in this phase. It supports applied and collaborative research, skills development, and scientific excellence, and prioritises demand-driven approaches to ensure practical impacts that align with end-user needs. Farmers, foresters, rural communities and wider food systems

[5] European Commission: Directorate-General for Research and Innovation, Trucco, P., van Lopik, J. and Zanobetti, L., *Scaling up ideas – Using Technology Readiness Levels to analyse technology progression in Horizon Europe*, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2777/1580173.

actors are placed in a central position, in particular in the R&I activities funded under Cluster 6 'Food, Bioeconomy, Natural Resources, Agriculture and Environment', facilitating co-creation, adoption, and accelerated uptake of innovations.

At a more advanced stage, innovation requires deployment and effective market uptake. This requires capacity to mobilise investment, skills development and trust among value chain actors. At EU level, the current Horizon Europe Pillar III, in particular the European Innovation Council (EIC) and the European Institute of Innovation and Technology (EIT), offer dedicated support tools.

The EIC supports startups and small and medium-sized enterprises (SMEs) working on agriculture- and food-related innovation, including through its Agriculture & Food portfolio and relevant EIC Accelerator Challenges calls[6], helping to advance scaling, manufacturing capacity and market uptake[7].

The EIT funds knowledge and innovation communities (KIC), such as **EIT Food[8]**. **EIT Food supports startups, scaleups, education activities and innovation programmes across the agricultural and food systems**, including regenerative agriculture, food waste reduction, protein diversification, food biotechnology, circularity and healthier diets[9]. Directly complementing the current Horizon Europe Pillar II, EIT Food is a key innovation ecosystem support tool that facilitates turning innovations into market-ready commercial solutions, creating an impactful change in agricultural and food systems and improving industrial competitiveness.

The innovation journey is also supported through the building of synergies between Horizon Europe 2021-2027 and other EU programmes, for example with the EU's environment and climate programme **LIFE[10]**. Horizon Europe 2021-2027-funded projects typically generate results that subsequently can be further demonstrated and tested through LIFE projects, ensuring continuity and tangible impact, particularly for a sustainable agri-food sector, on dietary patterns and environmental outcomes.

Building on the Horizon 2020 programme 'Spreading Excellence and Widening Participation' (WIDESPREAD), widening actions to strengthen R&I capacity in countries and regions with lower participation in the Framework Programme continued under Horizon Europe 2021-2027 with the 'Widening Participation and Strengthening the European Research Area' (WIDERA) programme. As **cross-cutting Horizon instruments, widening actions complement thematic R&I investments by supporting excellence, networking, research management capacity**

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[6] Examples of agri-food sector relevant EIC calls include HORIZON-EIC-2023-ACCELERATORCHALLENGES-06: Novel technologies for resilient agriculture; HORIZON-EIC-2024-ACCELERATORCHALLENGES-04: Food from precision fermentation and algae; HORIZON-EIC-2025-ACCELERATOR-02-CHALLENGES-02: Biotechnology driven low emission food and feed production systems, HORIZON-EIC-2026-ACCELERATOR-02-CHALLENGES-03: Biotech for regenerating agricultural soils.

[7] Examples of startups and scaleups supported by EU funding: **Melt&Marble** is a good example of a company which received an EU grant and through precision fermentation placed into the EU market a functional bio-active lipid for skincare and hair-care cosmetics products. The company's focus is, however, alternative proteins/meats which mimic meat and dairy fat functionality and they are pursuing this through the GRAS route for a 'generally recognised as safe' designation in the US. Another EU company following the GRAS route is **Onego Bio** that uses precision fermentation to produce Bioalbumen®, a fermentation-derived ovalbumin identical to the main protein in egg whites and designed as a functional ingredient for food manufacturers. **Solmeyea[7]** is another example of a biotech company that produced high-protein powder through biomass fermentation of microalgae.

[8] EIT Food.

[9] Test Farms - EIT Food.

[10] Programme for the Environment and Climate Action (LIFE).

and innovation ecosystems. Several projects have contributed to areas relevant to the agri--food sector. These areas include sustainable agriculture, food security, plant sciences, agrobiodiversity, digital biology, circular bioeconomy, climate-resilient agriculture and food value chains. In doing so, those projects **have broadened the capacity base for a competitive, resilient and sustainable agri-food sector**[11].

2.2. Scaling impact through the current Horizon Europe Pillar II collaborative instruments

To deliver on the 2016 strategic approach to EU agricultural R&I and Food 2030, the Commission has been strongly investing in collaborative R&I under the current Horizon Europe Pillar II, fostering the generation of knowledge and solutions to support the agri-food sector with transnational consortia involving public and/or private bodies from EU Member States, associated countries or third countries.

Building on stakeholder input from AgriResearch Conferences and Food 2030 workshops and conferences, the programming of collaborative R&I projects on the agri-food sector supporting the objectives set in the 2016 strategic approach to EU agricultural R&I and Food 2030 has been structured around evolving R&I thematic and enabling "roadmaps/pathways for action" reflecting R&I priorities.

To deliver on the priorities, the Commission invested in a wide set of complementary collaborative R&I projects, including:

- research and innovation actions (RIA) of high scientific excellence that establish new knowledge and/or explore a new or improved technology, practice, product, process, service or solution;
- innovation actions (IA) that produce impactful plans or designs for new or improved products, processes or services including prototyping, testing, demonstrating, piloting, large-scale product validation and market replication;
- coordination and support actions (CSA) that improve cooperation between legal entities from the EU and associated countries to strengthen the European Research Area including, for example, standardisation, dissemination, awareness-raising, communication and networking activities, policy dialogues, mutual learning or studies;
- Co-funded partnerships (COFUND) are R&I initiatives that align European and national or regional priorities and funding and enable long-term collaboration between the EU's various partners.

This broad spectrum of activities contributes to developing and deploying innovative tools, practices, technologies, products, and governance and business models to support the agricultural sector and food systems.

[11] Under Horizon 2020, WIDESPREAD calls supported the establishment or upgrading of centres of excellence with relevance to agriculture, forestry, rural and food-related R&I, including ANTARES in Serbia for advanced technologies in sustainable agriculture and food security, PlantaSYST in Bulgaria for the translation of fundamental plant research into sustainable bio-based technologies and BIOPOLIS in Portugal for environmental biology, ecosystem research and agrobiodiversity. Under Horizon Europe, WIDERA calls continued to fund capacity-building and innovation ecosystems in agri-food sector-relevant areas, including the Centre for Digitalisation of biology DIGIBIO to strengthen capacities in digital biology and bio sustainability in Estonia, the European Excellence initiative TALLHEDA supporting higher education alliances in digital agriculture in widening countries, and the Excellence Hubs EXCEL4MED, AGRI-BIOCIRCULAR-HUB and CARBONICA, respectively focused on Mediterranean food value chains, smart agriculture and circular bioeconomy in Poland, Latvia and Ukraine, and carbon farming for climate-resilient agriculture in Cyprus, Greece and North Macedonia.

In addition to transnational collaborative research projects, the current Horizon Europe Pillar II offers other key instruments, in particular co-funded partnerships, institutionalised partnerships (including Joint Undertakings) and five 'EU Missions' (large-scale, time-bound initiatives designed to deliver concrete solutions to society's greatest challenges by 2030, combining research with citizen engagement and policy action). These instruments are contributing to reinforcing synergies and aligning R&I agendas between the EU, Member States and associated countries and the private sector.

'European Partnerships' are strategic instruments that pool resources and strengthen collaboration and knowledge exchange across Europe and beyond. They help reinforce the global position for European R&I and enhance industrial investment by sharing risks and ensuring investment predictability[12].

By fostering and implementing **co-funded partnerships on Agroecology[13], Animal Health and Welfare[14], Agriculture of Data[15], Forest[16] and FutureFoodS[17]**, the EU has been catalysing strategic investments and collective actions around common objectives and priorities for agricultural, forestry and rural R&I, as well as on food systems. Guided by strategic research and innovation agendas co-created in most cases with the Standing Committee on Agricultural Research (SCAR), which aim to ensure impactful results, their focus is on the practical challenges faced by the sectors. These strategic partnerships have so far been able to bring together **421 participants** (242 unique participants) from **25 EU Member States and 11 countries associated** to Horizon Europe 2021-2027 and catalyse a total budget of almost EUR 700 million, with an EU contribution of almost EUR 250 million. The partnerships on Agroecology, Animal Health and Welfare, and FutureFoodS are in the process of receiving top-ups to their grant agreements. Once these amendments are finalised, the total budget allocated to all co-funded partnerships will increase to over **EUR 1 300 million**, with an overall EU contribution of more than **EUR 500 million.**

There are two types of **institutionalised R&I partnerships** contributing to long-term collaborations between the EU and private and public partners: **joint undertakings (JUs), and joint programmes between the EU and partner countries. JUs** are partnerships between the European Union and industry and/or Member States that fast-track next-generation technologies, keeping Europe ahead in global markets. By co-funding large EU-wide projects that no single country or sector could fund alone, and by connecting industry, SMEs, startups, academia, and public bodies, these public–private partnerships enhance EU competitiveness, resilience and sustainability.

Joint undertakings are set up for impact at scale: with a **shared public-private investment and risk, they build a full innovation chain from lab to market**. They speed up commercialisation, bringing innovations to Europeans faster, strengthening Europe's industrial edge, opening global market opportunities, while creating jobs and new income sources locally.

Building on the public-private partnership Bio-Based Industries Joint Undertaking (BBI JU) (2014-2020) and running from 2021 to 2031, the **Circular Bio-based Europe Joint Undertaking**[18] (CBE-JU) is a EUR 2 billion partnership between the EU and the Bio-

[12] Performance of European partnerships - Publications Office of the EU.
[13] https://www.agroecologypartnership.eu/en/ - https://cordis.europa.eu/project/id/101132349.
[14] https://www.eupahw.eu/ - https://cordis.europa.eu/project/id/101136346.
[15] https://agricultureofdata.eu/ - https://cordis.europa.eu/project/id/101197332.
[16] https://cordis.europa.eu/project/id/101272463.
[17] https://www.futurefoodspartnership.eu - https://cordis.europa.eu/project/id/101136361.
[18] CBE-JU: Circular Bio-based Europe Joint-Undertaking.

based Industries Consortium (BIC), funding R&I projects delivering sustainable bio-based solutions to address the challenges faced by bioeconomy actors. The main goals of the CBE JU are to: (i) accelerate the innovation process and development of bio-based innovative solutions; (ii) accelerate market deployment of the existing mature and innovative bio-based solutions; (iii) ensure a high level of environmental performance of bio-based industrial systems. The **CBE-JU helps support sustainable biomass use, circularity, and the development of new value chains for primary producers and innovative bio-based or food and feed ingredients**. Concretely, as many as 17 of its 26 'flagship' projects (projects with high technology readiness levels) support innovation and deployment in the area of food and feed ingredients, with a significant amount of EU funding involved[19].

The **Partnership for Research and Innovation in the Mediterranean area (PRIMA)[20]** is an example of a joint programme between the EU and partner countries from the Mediterranean area focused on water availability, sustainable agriculture and food production.

The EU launched five '**EU Missions'** as new large-scale initiatives under Horizon Europe 2021-2027 [21]. They address pressing societal challenges – climate change, soil and water health, and cancer – by going beyond traditional instruments and placing R&I in a new role. EU missions set clear, ambitious and time-bound objectives and mobilise coordinated action around them, engaging researchers, citizens, policymakers and stakeholders to deliver concrete solutions. **Individual R&I projects remain at the core but are integrated into a systemic approach to achieve each mission's goals**. Citizen engagement is a key element for the EU missions. This allows the missions to produce societal impact and long-term transformation in line with their objectives.

One of those five EU missions is **'A Soil Deal for Europe' ('Mission Soil')**[22]. It contributes directly to addressing food security and the competitiveness, sustainability and resilience of the agri-food sector by striving to achieve healthy soils by 2050. It is a large-scale initiative focused on protecting and restoring soils and promoting sustainable management practices in urban and rural areas. 'Mission Soil' pioneers, showcases, and accelerates the transition to healthy soils through ambitious R&I actions and its goal of establishing 100 'living labs and lighthouses' by 2030. Other EU missions, such as 'Adaptation to climate change' and 'Oceans & Water', also contribute to the Commission's strategic R&I objectives to support the agri-food sector.

Figure 2 focuses on the type of actions programmed for agriculture, forestry and rural areas on the one hand, and for food systems on the other hand during the period 2014-2024: RIAs, IAs and CSAs under Horizon 2020 Societal Challenge 2, Horizon Europe 2021-2027 Cluster 6 and Mission Soil[23], co-funded European partnerships (COFUND)[24], European Joint Programmes (EJP)[25] and ERA-NET[26] (a co-funding instrument under Horizon 2020 to support public-public partnerships). **R&I for agriculture, forestry and rural areas** under Horizon 2020 and Horizon Europe 2021-2027 dedicated the largest share of funds to RIAs, with a small decrease

[19] Projects | Circular Bio-based Europe Joint Undertaking (CBE JU).
[20] PRIMA.
[21] EU Missions in Horizon Europe - Research and innovation: Adaptation to climate change, Cancer, Climate-neutral and smart cities, A Soil Deal for Europe, and Restore our Ocean and Waters.
[22] Mission Soil platform.
[23] Notwithstanding that other EU-funded projects outside the scope of this analysis contribute directly or indirectly to R&I in agriculture, forestry and rural areas.
[24] Horizon Europe COFUND includes AGROECOLOGY, EUPAHW, FutureFoodS and AgData.
[25] Horizon 2020 European Joint Programme Cofund (EJP Cofund) including One Health EJP and EJP Soil.
[26] Horizon 2020 ERA-net cofund, including ICRAD and ICT-AGRI-FOOD.

between programmes (from 65 to 61%). These shares represent 158 projects and EUR 969.8 million in H2020, and 174 projects and EUR 1 118.5 million in Horizon Europe. The share of IAs remained similar in Horizon 2020 and Horizon Europe (11%) and translated into 37 projects and EUR 258.6 million and 55 projects and EUR 318.6 million, respectively. There was a slight increase in the share of CSAs (from 11% to 14%), which totalised 69 projects and EUR 167.7 million in Horizon 2020 and 65 projects and EUR 254.9 million in Horizon Europe. The share of funding granted through co-funded instruments[27] also slightly increased (from 7% to 8%), from 4 projects and EUR 98 million to 3 projects and EUR 147.2 million.

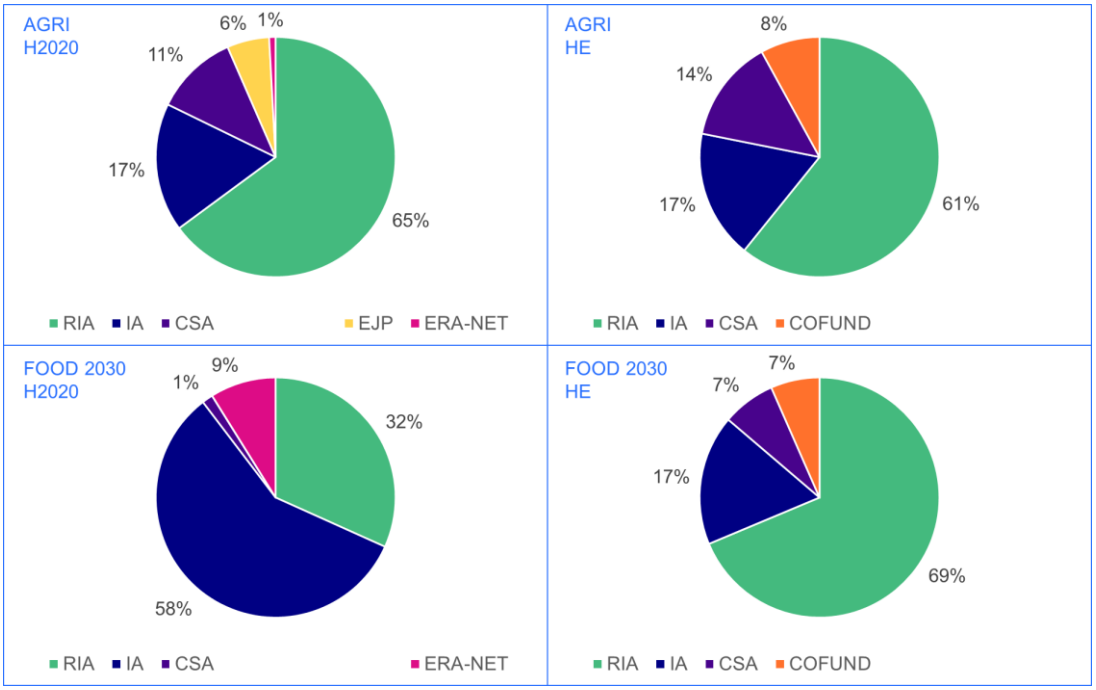

Figure 2. Share of EU funding per type of action in H2020 (2014-2020) (left) and Horizon Europe (2021-2024) (right) related to collaborative research in agriculture, forestry and rural areas (AGRI) and food systems (Food 2030). Note that EJP and ERA-NET actions were implemented during H2020 and COFUND during Horizon Europe 2021-2027.

The figure illustrates a shift in the type of actions funded by Food 2030- related projects. In Horizon 2020, the emphasis was mainly on IAs (36 projects, EUR 274.7 million) compared to RIAs (20 projects, EUR 150.5 million). Under Horizon Europe, the focus was more on RIAs (53 projects, EUR 336.7 million) compared to IAs (16 projects, EUR 86 million). The number of CSAs increased from 3 projects in Horizon 2020 (EUR 7 million) to 10 projects in the current Horizon Europe (EUR 35.2 million). The number of partnerships (ERA-NETs under Horizon 2020, COFUND under Horizon Europe 2021-2027) decreased from 8 in Horizon 2020 to 1 in Horizon Europe 2021-2027. However, the average funding per partnership increased from EUR 5.3 million under Horizon 2020 to EUR 32 million (until 2025) under the current Horizon Europe.

2.3. Tools to boost and facilitate impact of collaborative R&I

The EU Framework Programmes for Research and Innovation provide a set of programming tools implemented in collaborative R&I projects that contribute to knowledge sharing and the

[27] EJP and ERA-NET under Horizon 2020 and co-funded partnerships under Horizon Europe 2021-2027.

uptake of innovation in the agri-food sector. The 2016 strategic approach to agricultural R&I and Food 2030 have been instrumental in fostering the impact of such tools.

Introduced in the Horizon 2020 Framework Programme and reinforced under Horizon Europe 2021-2027, the **multi-actor approach** is a programming tool for interactive and transdisciplinary R&I that makes the R&I process co-creative and inclusive with relevant stakeholders including potential users of results, and thus its outcomes are more co-owned, reliable, demand driven and relevant to society[28]. When included as an eligibility condition in relevant topics, the multi-actor approach ensures the genuine involvement of farmers, foresters, rural and other food system actors in the R&I process, making them both recipients of the new solutions, and active contributors to the development of new knowledge, tools, and services.

The development and implementation of the multi-actor approach benefited from the experience gained through **European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) Operational Groups**, which pioneered interactive innovation and co-creation approaches in agriculture and rural areas. This approach in Horizon Europe 2021-2027 implies meeting seven mandatory requirements, ensuring the quality of the co-creation process in R&I activities. It is implemented under the current Horizon Europe Cluster 6, Mission Soil, and the CBE-JU, including under all 'flagship' projects with high technology readiness levels. From 2014 to 2024, **the Horizon portfolio implementing tools related to the multi-actor approach have been used for 3 681 unique organisations, including over 1 000 SMEs (28%)[29].**

The 2016 strategic approach to agricultural R&I has been instrumental in further mainstreaming the multi-actor approach. Most projects in agriculture, forestry and rural areas apply this approach, accounting for **195 projects in Horizon 2020** and **219 in the current Horizon Europe** to date (Figure 3 and 4). In terms of investment, it amounts to EUR 1 040.7 million in Horizon 2020 and 1 241.8 million in Horizon Europe. These projects are also the main contributors for the shares in Societal Challenge 2 (195/213) and Pillar III (195/229) of Horizon 2020, as well as Cluster 6 (219/322) and Pillar II (219/391) under the current Horizon Europe.

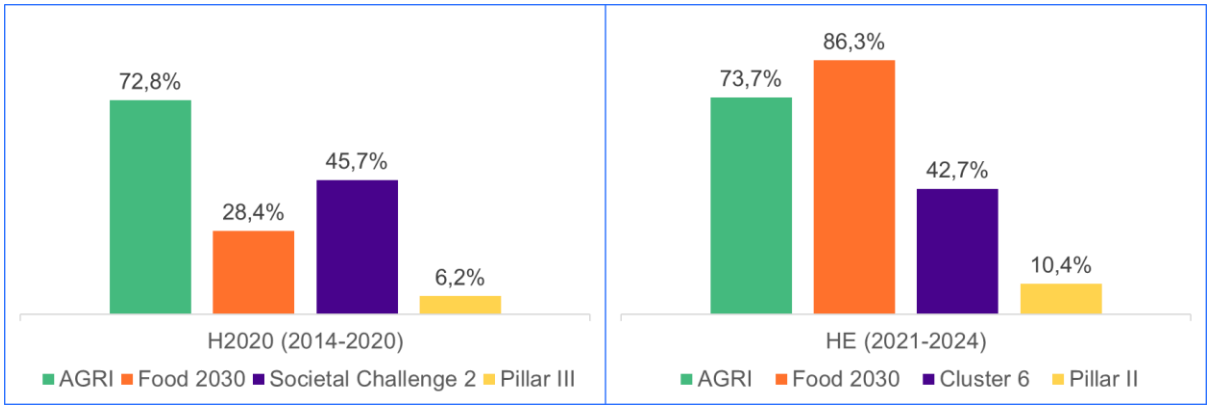

Figure 3. The share of projects applying the multi-actor approach for agriculture, forestry and rural areas (AGRI), Food 2030, Societal Challenges 2 and Pillar III in Horizon 2020 (left) and for AGRI, Cluster 6 and Pillar II in the current Horizon Europe (right), considering RIAs, IAs, CSAs, EJP, ERA-NET and COFUND

[28] Multi-actor approach - Agriculture and rural development.
[29] European Commission. Data from CORDIS — EU Research Results. Available at: https://cordis.europa.eu.

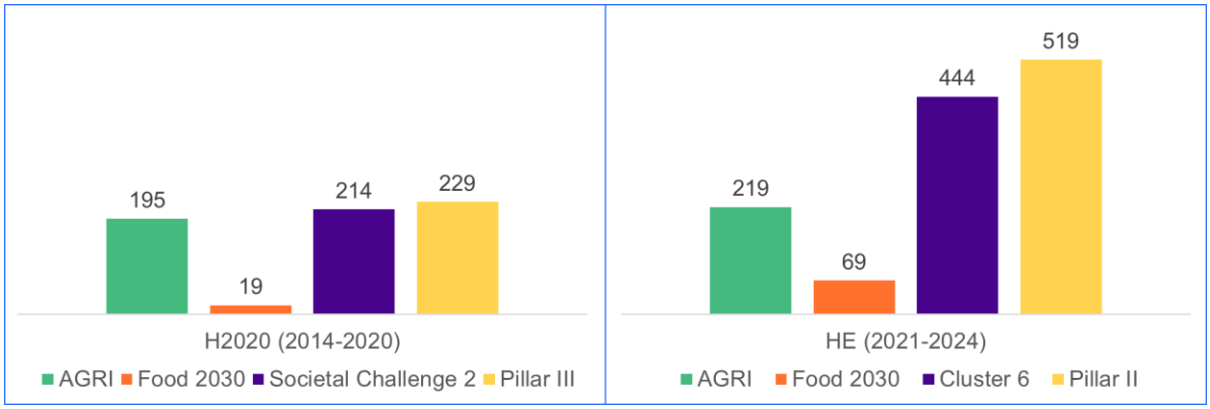

Figure 4. The total number of projects applying the multi-actor approach for agriculture, forestry and rural areas (AGRI), Food 2030, Societal Challenges 2 and Pillar III in Horizon 2020 (left) and for AGRI, Cluster 6 and Pillar II in the current Horizon Europe (right), considering RIAs, IAs, CSAs, EJP, ERA-NET and COFUND.

Figure 4 highlights a marked increase in the adoption of the multi-actor approach within the Food 2030 related projects, rising from 19 projects in Horizon 2020 to 69 projects in the current Horizon Europe. Overall (across both programmes), 60% of the Food 2030 projects have reported applying the multi-actor approach. This can be explained by the efforts developed under Horizon Europe 2021-2027 to include multi-actor approach as part of the eligibility conditions.

Building on the success of the multi-actor approach, the Commission has been strongly promoting the establishment of other specific instruments that are user-centred, directly engage farmers, foresters, rural communities and other food system actors in collaborative R&I, and enable **place-based innovation**: the **Living Labs and lighthouses.**

Living Labs are dynamic, open innovation ecosystems where R&I and experimentation unfold in real-life, placing end-users at the centre of the innovation process, thus ensuring that new solutions are demand driven. Living Labs are the key instruments used under Mission Soil and the agroecology partnership.

Lighthouses are places to demonstrate exemplary innovative solutions, such as technologies, practices, trainings and peer-to-peer learning, allowing testing under real-life conditions to stimulate uptake of innovation.

Horizon tools such as **cascade funding** (also known as 'financial support for third parties' - FSTP) under Article 207 of the Financial Regulation[30] have been used to stimulate the inclusion of small actors, such as SMEs (including farmers and foresters) in the implementation of the projects. This kind of support rewards small actors for carrying out concrete R&I activities, in particular those related to the testing and validation of results brought about by researchers and innovators.

The **mainstreaming of social sciences and humanities** such as economics, sociology, anthropology, management, arts, and psychology, **including by promoting interdisciplinary approaches integrating science, technology, engineering and mathematics (STEM) and social sciences and humanities disciplines,** reinforced the scope of R&I activities supporting the agri-food sector. An important added value of the collaboration between researchers and experts from STEM and **social sciences and humanities** disciplines is to take a human-centric

[30] Regulation (EU, Euratom) 2024/2509 on the financial rules applicable to the general budget of the Union.

approach to addressing technical and societal challenges, ensuring that scientific advancements deliver benefits to society. The meaningful and effective integration of research activities involving social sciences and humanities disciplines is important to ensure the alignment of the R&I activities with the needs and expectations of the end users, and therefore to facilitate the adoption of the solutions proposed and increase the societal and economic impact.

Between 2014 and 2020, 52.6% of projects related to collaborative R&I in agriculture, forestry and rural areas integrated **social sciences and humanities**, whereas between 2021 and 2024, 29.3%[31]. In this regard, projects on agriculture, forestry and rural areas under Horizon 2020 were within the average of Societal Challenge 2 and Pillar III, while for the current Horizon Europe, the data shows a lower average, although the data is still incomplete for the whole Horizon Europe 2021-2027 period (Figure 5). In Food 2030 projects, there has been a notable rise in projects integrating social sciences and humanities activities and expertise, increasing from 43 in Horizon 2020 to 62 in the current Horizon Europe.

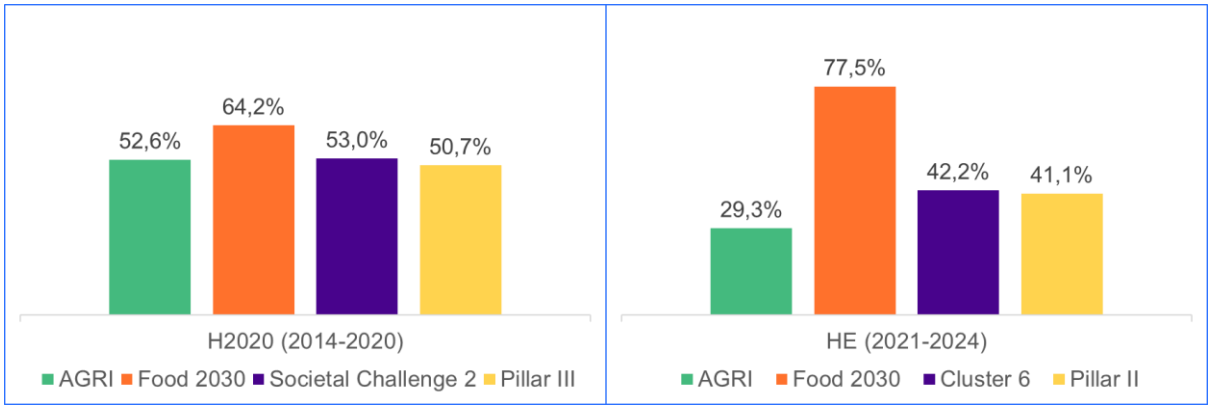

Figure 5. Share of projects flagged with social sciences and humanities for agriculture, forestry and rural areas (AGRI), Food 2030, Societal Challenges 2 and Pillar III in Horizon 2020 (left) and for AGRI, Cluster 6 and Pillar II in the current Horizon Europe (right), considering RIAs, IAs, CSAs, EJP, ERA-NET and COFUND

The effective contribution of social sciences and humanities disciplines enables the development of more adequate solutions to the challenges and opportunities faced by agricultural, forestry and rural communities. SSH are crucial to better understand and navigate practitioners' needs and conditions, and to identify barriers and enabling conditions for the successful uptake and deployment of innovation. Behavioural analyses and agri-food sector modelling activities help inform decision-making processes, as well as the design and impact assessment of policies.

Monitoring and knowledge-management capacities help translate R&I outputs into policy-relevant evidence for the agri-food sector. For example, the European Food Safety Authority (EFSA) has a research platform that provides information on EU-funded research projects and on external research projects involving EFSA, supporting access to evidence that could be relevant to food safety and risk assessment[32]. Furthermore, the Joint Research Centre (JRC) is an active partner in R&I projects on the agri-food sector, to facilitate the science to policy interface.

[31] Horizon Dashboard.
[32] Research Platform | EFSA.

The EU's cooperation with third countries and actors and with international organisations in R&I on the agri-food sector has received increased focus in the programming of Horizon 2020 and Horizon Europe 2021-2027 due to its strategic potential.

Bilateral R&I cooperation opportunities have been pursued with the African Union (AU) and China, through the **EU-AU Food and Nutrition Security and Sustainable Agriculture Partnership (FNSSA)**[33], part of the AU-EU High-Level Policy Dialogue on Science, Technology and Innovation, embedded in the Joint Africa-EU Strategy, and the **EU-China Flagship on Food, Agriculture and Biosolutions**[34].

Cooperation with African partners has supported the 2016 strategic approach on agricultural R&I objectives on sustainable primary production, resilience, agricultural innovation, knowledge exchange and food security. This cooperation has also contributed to the Food 2030 agenda, which includes nutrition, urban and territorial food systems, value chains, governance and systemic approaches to resilience.

The experience under the FNSSA is a good example of how R&I cooperation connects primary production, food security, nutrition, sustainability and innovation uptake across regions inside and outside the EU. It also helps align **EU internal and external action, including with wider cooperation frameworks such as Global Gateway**, while ensuring that international R&I partnerships remain mutually beneficial and responsive to regional needs. For example, the FNSSA benefited from reinforced synergies between Horizon Europe 2021-2027 and key initiatives such as the AU Research Grant programme[35] and DeSIRA (Development Smart Innovation through Research in Agriculture)[36], thereby supporting climate-relevant, productive and sustainable food-system transformation in low- and middle-income countries.

3. DELIVERING ON THE 2016 STRATEGIC APPROACH TO AGRICULTURAL RESEARCH AND INNOVATION

Farming, forestry and rural areas are core to the European way of life, competitiveness and food security and constitute strategic sectors for the Union, supported by a common agricultural policy (CAP)[37] since 1962.

R&I play a key role in making the agricultural and forestry sectors and rural areas more competitive, resilient, sustainable, fair and attractive and inform the design and implementation of public policies by providing the necessary knowledge and evidence base. Investments under Horizon 2020 and Horizon Europe 2021-2027 have been aligned with successive policy developments. R&I activities contributed to addressing R&I needs to support the successive reforms of the common agricultural policy, the Sustainable Development Goals[38], the initiatives under the European Green Deal (including the European Climate Law[39], the Nature Restoration Law[40], the farm to fork strategy[41], the forest strategy for 2030[42], the EU

[33] Partnership on Food and Nutrition Security and Sustainable Agriculture (FNSSA) - Research and innovation.
[34] International cooperation with China in research and innovation.
[35] Funding and support - Research and innovation - European Commission.
[36] DeSIRA | Capacity4dev.
[37] CAP at a glance - Agriculture and rural development - European Commission.
[38] Sustainable Development Goals - European Commission.
[39] Regulation - 2021/1119 - EN - EUR-Lex.
[40] Regulation - EU - 2024/1991 - EN - EUR-Lex.
[41] EUR-Lex - 52020DC0381 - EN - EUR-Lex.
[42] EUR-Lex - 52021DC0572 - EN - EUR-Lex.

biodiversity strategy for 2030[43] and the EU soil strategy for 2030[44]), the EU action plan on the development of organic production[45], and the long-term vision for the EU's rural areas. More recently, R&I contributed to the vision for agriculture and food, to the strategy for generational renewal in agriculture[46], to the strategy for a competitive and sustainable EU bioeconomy[47], and to the life sciences strategy[48]. Policy initiatives have also been continuously fed by evidence from R&I, for example the Soil Monitoring Law[49] or the fertiliser action plan[50].

Sustained investment in R&I is essential, ensuring that solutions are scalable, accessible and adapted to the diversity of practitioners and territories, so that no community or sector is left behind. The vision for agriculture and food[51] published in February 2025 reiterated the enabling role of knowledge, skills, research and innovation for the transformation of the agri-food sector.

In 2016, the European Commission published a strategic approach to EU agricultural R&I ('the 2016 strategic approach'). The **2016 strategic approach aimed to harness EU investments in the Framework Programme for Research and Innovation** with a view to ensuring food security in the long term; addressing the environmental sustainability and resilience of competitive land-based primary production; boosting the sustainable growth of rural territories; and improving the delivery of research results for policy impact.

The 2016 strategic approach built on five priority areas for agricultural R&I:

Three of these priority areas concerned creating value from land - sustainable primary production:

- resource management, in particular soil, water and biodiversity
- healthier plants and animals
- integrated ecological approaches from farm to landscape level

Two concerned enhancing rural innovation - modernising rural territories and policies:

- new openings for rural growth
- enhancing human and social capital in rural areas

The 2016 strategic approach, which guided the Horizon 2020 and Horizon Europe 2021-2027 strategic planning[52], has been **instrumental in introducing the new Horizon way of programming and implementing R&I for agriculture, forestry and rural areas. It** has promoted co-creation with all relevant stakeholders as the basis for identifying and designing key R&I priorities and long-term impacts at various levels. This was achieved by working closely with the Member States and associated countries, through the Horizon 2020 Societal Challenge 2 'Food security, sustainable agriculture and forestry, marine, maritime and inland water research, and the bioeconomy' and the current Horizon Europe Cluster 6 Programme

[43] EUR-Lex - 52020DC0380 - EN - EUR-Lex.
[44] EUR-Lex - 52021DC0699 - EN - EUR-Lex.
[45] EUR-Lex - 52021DC0141R(01) - EN - EUR-Lex.
[46] EUR-Lex - 52025DC0872 - EN - EUR-Lex.
[47] EUR-Lex - 52025DC0960 - EN - EUR-Lex.
[48] EUR-Lex - 52025DC0525 - EN - EUR-Lex.
[49] Directive - EU - 2025/2360 - EN - EUR-Lex.
[50] EUR-Lex - 52026DC0310 - EN - EUR-Lex.
[51] EUR-Lex - 52025DC0075 - EN - EUR-Lex.
[52] European Commission: Directorate-General for Research and Innovation, Horizon Europe strategic plan 2021-2024, Publications Office of the European Union, 2021, https://data.europa.eu/doi/10.2777/083753.

Committee. The prioritisation and programming of R&I under the 2016 strategic approach also benefited from the advice of expert groups, such as SCAR[53], and the engagement of important stakeholders through public and stakeholder consultations, AgriResearch Conferences[54], workshops, and project clustering events.

Three editions of the EU AgriResearch Conference took place in 2016, 2018 and 2023. They have been instrumental for the co-creation and implementation of the long-term strategic approach to EU agricultural R&I, in particular for the identification of R&I needs. The input gathered during those conferences has guided R&I programmes in agriculture, forestry, and rural areas during the second half of Horizon 2020 and under Horizon Europe 2021-2027. Programming has thus been driven and structured to deliver solutions to the sectors' challenges with a coherent and complementary approach, jointly addressing:

- What are the R&I needs to address the challenges and/or seize the opportunities for agriculture, forestry and rural areas?
- How should those needs be delivered through R&I?

The EU **has invested more than EUR 3 billion in 565 R&I projects in the period 2014-2024**, led by the 2016 strategic approach, addressing key challenges for the EU's farming and forestry sectors and for rural areas. This investment through Horizon 2020 and Horizon Europe 2021-2027 collaborative R&I delivered an array of opportunities for generating new knowledge and innovations, such as practices and technologies, to support the competitiveness, sustainability and resilience of the EU agriculture, forestry and rural sectors.

This section presents an overview of the EU-funded R&I activities in the area of agriculture, forestry and rural areas implemented through collaborative R&I in Horizon 2020 (2014-2020) and Horizon Europe (period 2021-2024), connected to the priorities identified in the 2016 strategic approach to EU agricultural R&I.

This overview is complemented by a sector-specific analysis of key collaborative R&I implementation and statistics over the 2014-2024 period, covering Horizon 2020 Societal Challenge 2, the current Horizon Europe Cluster 6 and Mission Soil[55], as well as Horizon 2020 Pillar III and the current Horizon Europe Pillar II. This makes it possible to reflect on trends and the impacts of the investments made to support the R&I journey towards sustainable, competitive and resilient agriculture, forestry and rural areas.

3.1. Boosting demand-driven and interactive innovation, and the uptake of R&I results through synergies with the common agricultural policy

Strengthening the links between science and policymaking has been at the core of the 2016 strategic approach. R&I efforts under the EU Framework Programmes for R&I help deliver on the cross-cutting objective of the CAP to address the needs of agriculture, forestry and rural areas, helping them become more competitive, sustainable and resilient. In this regard, R&I actions have built on and further strengthened synergies between two main EU policies: the **EU Research and Innovation Framework Programme Horizon Europe 2021-2027, and the CAP**. Working in synergy through the European Innovation Partnership for

[53] https://scar-europe.org/.

[54] European Commission: Directorate-General for Agriculture and Rural Development, 2023 AgriResearch Conference – Knowledge, innovation and skills for sustainable horizons – 31 May-1 June 2023, Brussels – Conference report, Publications Office of the European Union, 2024, https://data.europa.eu/doi/10.2762/614982.

[55] Notwithstanding that other EU funded projects outside the scope of this analysis contribute directly or indirectly to R&I in agriculture, forestry and rural areas.

Agricultural Productivity and Sustainability (EIP-AGRI)[56], both policies have stimulated co-creation, exchange of knowledge and innovation, ensuring demand-driven research and impactful results facilitating uptake by practitioners.

Agricultural knowledge and innovation systems (AKIS)[57] emerged as a key framework to enable agricultural innovation both in Europe and internationally. AKIS refer to 'the combined organisation and knowledge flows between individuals, organisations, and institutions who use and produce knowledge for agriculture and interrelated fields'[58], including public decision-makers alongside farmers, foresters, rural actors, researchers, educators, advisory and extension services, the private sector, and other stakeholders. Farmers are at the centre of these systems, within the 'knowledge triangle' – comprising research, education, and extension services – empowering them to co-develop and adopt innovative, sustainable agricultural practices.

AKIS aim at enhancing and organising knowledge flows among actors involved in agriculture and related sectors. Within AKIS, the EIP-AGRI promotes an innovation model based on the co-creation, knowledge sharing and multi-actor collaboration. It makes it possible to capitalise on complementary knowledge and expertise of different actors, including farmers, foresters and rural actors, which supports the transition from research to the deployment of the solutions developed, thus reinforcing the innovation ecosystem.

Importantly, both Horizon Europe 2021-2027 and the CAP support the effective functioning of AKIS, through initiatives aimed at accelerating innovation and the adoption of R&I outcomes. Setting up and reinforcing an integrated AKIS became a mandatory element in the CAP 2023-2027, requiring Member States to develop their national strategies for AKIS.

Under Horizon, the EU has funded a number of projects specifically to support the implementation of AKIS across the different Member States. It has also funded **thematic networks** and **advisory networks to support knowledge sharing and innovation uptake**.

Thematic networks collect and disseminate existing knowledge across regions and sectors, facilitating the scaling out of proven solutions. Advisory networks connect advisors across Member States, associated countries, and support them in sharing their knowledge and expertise, staying up to date with cutting-edge knowledge and innovation, and contribute to translating science into practice by making advisors better equipped to accompany farmers, foresters and rural actors.

Building on the experience with thematic and advisory networks, **EU Thematic Knowledge Hubs** are being funded under the Horizon Europe Work Programme 2026-2027. They will encourage gathering of knowledge and advice under a cohesive thematic umbrella. This will help users identify go-to sources for valuable thematic content and mitigate fatigue among advisors, whose presence is often requested in multiple initiatives.

EIP-AGRI is bringing together AKIS actors with complementary knowledge - farmers, foresters, researchers, advisors, businesses, environmental groups, consumer interest groups or other NGOs - to co-create practical solutions for agriculture, forestry and rural communities in innovation projects.

Under the CAP, over 5 200 EIP operational groups have been established since 2014[59]. Operational groups are spaces where ideas are tested, adjusted and made to work in real

[56] About EIP-AGRI projects | EU CAP Network.
[57] AKIS | EU CAP Network.
[58] Regulation - 2021/2115 - EN - EUR-Lex.
[59] https://eu-cap-network.ec.europa.eu/operational-groups-eu-member-states_en.

farming conditions, following the 'interactive innovation model'[60]. Starting from farmers' concrete needs, these bottom-up projects draw on existing knowledge and innovations from EU, national or regional programmes and adapt them to local realities. More than 6 600 projects are planned for the period 2023-2027.

In synergy, the Horizon Europe 2021-2027 Cluster 6 Work Programmes have (i) promoted the involvement of operational groups in R&I projects through the multi-actor approach, (ii) supported the dissemination of knowledge generated by operational groups in several countries, and (iii) promoted links between operational groups and Living Labs. The reverse integration - testing solutions from Horizon projects in operational groups to translate them into practical, locally tailored solutions - appears to need more work[61]. Furthermore, the EU CAP network supports the implementation of the CAP by connecting actors across Member States, facilitating peer learning, thematic exchanges, and dissemination of best practices and project results from Horizon projects and operational groups.

To guarantee the release of actionable outcomes from multi-actor projects, **practice abstracts** have been implemented across Horizon multi-actor approach projects and operational groups and collected in the EIP-AGRI project database, resulting in the development of over 14 000 practice abstracts. These practice abstracts - following a common EIP-AGRI format - are meant to offer valuable practical information for projects to pass on to users for application in real-world settings.

The establishment of place-based innovation such as living labs and lighthouses was strongly promoted under the 2016 strategic approach, valorising their potential to reduce technical, economic, and social risks associated with the adoption of innovative practices. Living Labs and lighthouses are central tools in the **co-funded partnerships on agroecology, agriculture of data, and forest, and in the EU mission 'A Soil Deal for Europe'**. EIP-AGRI operational groups provide a complementary mechanism for testing, adapting and implementing innovations in real farming and forestry conditions, often serving as entry points for scaling innovations developed in research projects and Living Labs.

Demonstration farms – set up both under Horizon and CAP, in certain Member States – also deserve mention in this respect, as effective tools in providing farmers with opportunities to exchange knowledge with their peers and with experts, jointly solving problems through hands-on activities[32], strongly influencing farmers' decision to innovate.

Farmer involvement in R&I has also been stepped up through other means, such as through relevant governance structures. For instance, the CBE-JU established a working group dedicated to enhancing the role of primary producers along the bio-based value chains[62].

3.2. Analysis and key achievements on priority thematic areas

In this section, key achievements of the implementation of the 2016 strategic approach in priority thematic areas are presented, with an overview of the projects funded and selected success stories and flagship examples of R&I activities.

To deliver on the four objectives of the 2016 strategic approach, R&I activities have been programmed in a landscape of thematic areas, regularly reviewed based on the input of stakeholders during the AgriResearch Conferences. Together, these thematic areas

[60] Article 127 of the Regulation - 2021/2115 - EN - EUR-Lex.

[61] European Court of Auditors, special report 09/2026 "European innovation partnership in the common agricultural policy – A key tool for innovation in EU agriculture falling short of its full potential", Publications Office of the European Union, 2026.

[62] Working group on primary producers | Circular Bio-based Europe Joint Undertaking (CBE JU).

comprehensively address R&I needs on specific sector or thematic, and on cross-cutting challenges. In this section, we provide an overview of the R&I activities funded under Horizon 2020 and Horizon Europe 2021-2027, under the **13 thematic areas** defined following the 2023 AgriResearch Conference:

1. Climate smart agriculture
2. Biodiversity friendly agriculture
3. Sustainable management of land, soil, water and nutrients
4. Sustainable management of forests
5. Healthy, sustainable and resilient cropping systems
6. Healthy, sustainable and resilient livestock systems
7. New farming, food and bio-based systems
8. Rural opportunities
9. Fostering agroecology and organic farming at the farm and landscape levels
10. Strengthening socio-economic performance and modernising policies
11. Unlocking the potential of digital and data technologies
12. Enhancing knowledge flows and skills
13. Strengthening international cooperation

3.2.1. Climate-smart agriculture

Impacts of climate change are becoming increasingly evident. People working with and on the land are most directly affected. To limit further concentration of greenhouse gases in the atmosphere, emissions must be cut through mitigation measures and carbon sequestration must be strengthened, while resilience against unavoidable impacts must be built through adaptation measures and climate smart solutions. Climate-smart solutions are innovative strategies designed to address climate change and foster sustainable development.

EU-funded R&I is driving advances in **climate-smart agriculture** through projects such as ClieNFarms, ClimateSmartAdvisors, Climate Farm Demo, ClimateSmartResearch. Projects such as CREDIBLE, MARVIC, MRV4SOC help farmers, foresters and rural communities adapt to changing climate conditions, reduce GHG emissions, and improve carbon removals.

Peatlands are crucial carbon sinks and natural water regulators, but decades of drainage-based agriculture have led to CO_2 emissions, soil degradation, and water problems. Paludiculture, sustainable cultivation on wet and rewetted peatlands, offers a nature-based solution that restores water retention, reduces nutrient runoff, and supports biodiversity. Paludi4All, PALUS DEMOS, and PaluWise are driving this transition by assessing socio-economic and environmental impacts, establishing large-scale demo sites, and scaling multi-actor strategies across Europe. Together, they aim to reduce emissions, protect water resources, and promote resilient, low-impact farming systems.

Flagship stories

ClieNFarms (Climate Neutral Farms, 2022-2025, IA) responded to the dual challenge facing European agriculture: reducing its contribution to climate change while building its resilience to the droughts, heatwaves and floods that increasingly threaten agricultural productivity. Working directly with farmers and a broad range of stakeholders including

advisors, banks, agri-food actors and investors, the project developed, tested and validated a portfolio of systemic farm-level climate solutions covering both livestock and crop farming.

Solutions to these challenges range from feeding animals with specific herbs or plant extracts to reduce methane emissions, to establishing permanent vegetation cover under olive trees to reduce soil erosion, and approaches to better manage soil, reduce fertiliser use and improve animal nutrition and rearing. All solutions were tested and validated in real-world scenarios and compiled into a publicly accessible Catalogue of Climate Solutions, with locations and production systems explorable via an interactive map.

Beyond individual farm practices, the project developed transition roadmaps to help agri-food actors adapt climate-neutral practices, a scaling toolbox providing step-by-step guidance for doing so, microlearning content to support adoption, and policy briefs identifying potential barriers to achieving climate-neutral production.

The project's results continue to have impact through the EU-funded ClimateSmartAdvisors and Climate Farm Demo projects, as well as the Farming for Climate platform. More about the project results can be found here.

Climate Farm Demo (A European-wide network of pilot farmers implementing and demonstrating climate smart solutions for a carbon-neutral Europe, 2022-2029, CSA) is an ongoing pan-European initiative building the largest network of its kind to accelerate the transition to climate-smart farming, with 1 460 pilot demo farms across 28 countries and all major pedoclimatic zones.

The project connects farmers with more than 230 dedicated climate farm advisors who support them in developing individual adaptation and mitigation plans, grounded in carbon audits and tailored to each farm's conditions. Technical and social innovations are demonstrated to the wider farming community through six annual demo campaigns, with a target of 4 500 demonstration events over the project's lifetime, and new climate-smart solutions are co-created in 10 living labs operating across Europe.

To underpin the transition with robust evidence, the project benchmarks carbon and climate assessment tools used across the EU and is developing a monitoring, reporting and verification process to quantify greenhouse gas reductions at farm level, with consolidated data from 1 460 farms set to constitute a unique pan-European dataset. A framework for rewarding mechanisms has been initiated to help equip farmers and advisors to engage with emerging incentive systems, feeding into EU policy recommendations grounded in real field experience.

An online knowledge repository gathers project activities, registered farms, demonstration events and results, supporting knowledge exchange both within the network and with the broader agricultural community. The project aims to reach 250 000 stakeholders, including 150 000 farmers, becoming a real-world laboratory for testing climate-smart practice transfer at scale.

ClimateSmartAdvisors (Connecting and mobilising the EU agricultural advisory community to support the transition to Climate Smart Farming, 2023-2030, CSA) is a pan-European multi-actor network covering 27 countries. Its aim is to boost the EU agricultural advisory community, leading to an acceleration of the adoption of climate smart (CS) farming practices by the wider farming community within and across EU AKIS.

The project unites 1 500 advisors, 27 national coordinators, and 12 thematic leaders in a shared effort to advance climate-smart agriculture in Europe. Its core mechanism is the creation of 260 advisory 'communities of practice', peer-to-peer knowledge exchange

groups organised around 12 thematic areas covering climate change mitigation and adaptation.

A Farming for Climate knowledge repository, bringing together climate-smart advisory tools, carbon assessment tools and mitigation and adaptation practices, is under development as a lasting open resource for the advisory community.

CLIMED-FRUIT (Adaptation to climate change and mitigation for perennial crops in Mediterranean Area, 2022-2025, CSA) had built on the results of nine EIP-AGRI operational groups to compile and share field-tested knowledge on climate adaptation and mitigation covering several Mediterranean perennial crops in 7 different countries (France, Spain, Portugal, Greece, Italy, Croatia, Serbia).

This thematic network structured its work around five thematic areas: soil conservation and carbon storage; improving crop resilience to climatic hazards; innovative practices for water stress management and dry farming; adaptation of food chain processes to climate change; and diversification and biodiversity preservation in Mediterranean crops.

It published a comprehensive technical review that brought together innovative strategies and real-world results from operational groups and EU projects, covering practices ranging from cover crops and composting techniques to smart irrigation systems and post-harvest innovations. By translating research and on-farm experience into practical, accessible guidance, the project aimed to equip Mediterranean farmers with concrete tools to sustain productivity while protecting the region's ecosystems under increasing climate pressure.

3.2.2. Biodiversity-friendly agriculture

Agrobiodiversity is a vital foundation for resilient farming systems, yet its practical uptake can be constrained by economic, technical, knowledge-related and implementation barriers. As farms face growing pressures from climate change, soil degradation, biodiversity loss and market uncertainty, the challenge is to better understand how diverse crops, species, varieties, habitats and management practices can be effectively integrated and scaled into productive, viable and sustainable farming systems.

Wild pollinators are declining across Europe and beyond, with alarming consequences for functioning ecosystems and agricultural production. EU-funded projects such as RestPoll, Safeguard, ProPollSoil, and AGRI4POL address this challenge by restoring habitats, identifying emerging threats, assessing the role of soil management and land use, and exploring how crop varieties, agricultural practices and landscape features can better support pollinators.

To assess the impact of practices, monitoring agrobiodiversity is vital to advance sustainable agriculture. EU-funded projects such as BioMonitor4CAP, SOB4ES, BIOservicES, SHOWCASE and FRAMEwork address this challenge through complementary approaches: developing advanced monitoring systems, integrating soil biodiversity indicators into land management, assessing the role of soil organisms, testing incentives for biodiversity-enhancing practices, and supporting farmer-led collaboration and knowledge exchange.

Soil degradation and climate change increasingly threaten biodiversity, ecosystem services and agricultural resilience, highlighting the need for more sustainable soil management. EU-funded projects (including those under Mission Soil) address this challenge through complementary approaches: MultiSoil co-creates farmer-led guidelines for soil health and functional biodiversity; SOILRES implements agroecological strategies to strengthen soil health, crop resilience and biodiversity; SOILGUARD developed predictive tools to support policy and management decisions.

SoildiverAgro and EXCALIBUR advanced innovative soil management practices by developing guidance for farmers and policymakers, testing practical solutions, and harnessing soil biodiversity through microbial bioproducts and soil-improving approaches.

A dedicated CORDIS results pack *Enabling nature-based solutions in sustainable agriculture* brings together these examples and more, highlighting how EU-funded R&I projects, alongside key European initiatives such as the agroecology partnership and Biodiversa-plus, are supporting the uptake of sustainable farming approaches, including agroecological and nature-based solutions that strengthen agrobiodiversity, resilience and long-term sustainability.

Flagship stories

SHOWCASE (SHOWCASing synergies between agriculture, biodiversity and Ecosystem services to help farmers capitalising on native biodiversity, 2020-2025, RIA) addressed the persistent gap between scientific evidence on farmland biodiversity and its actual adoption by the farming sector. The project established a multi-actor network of experimental biodiversity areas across 11 sites in 10 European countries, bringing together farmers, researchers, advisors and local communities to test and demonstrate biodiversity management strategies under real-world conditions.

Field studies produced concrete evidence of biodiversity gains. The project developed biodiversity indicators and key performance indicators based on easily quantifiable land-use characteristics to support large-scale monitoring. Farmers demonstrated high willingness to accept the indicators most strongly linked to biodiversity outcomes. A practical handbook entitled Farming with Biodiversity was produced as an evidence-based guide for farmers, advisors and policymakers, alongside awareness-raising materials linking biodiversity to food security and pest control. More about the project results can be found here.

SoildiverAgro (Soil biodiversity enhancement in European agroecosystems to promote their stability and resilience by external inputs reduction and crop performance increase, 2019-2025, RIA) set out to demonstrate that enhancing soil biodiversity is a practical pathway to more sustainable and resilient European agriculture, reducing dependence on external inputs while maintaining or improving crop yields and farm profitability.

Through 15 case studies across six European pedoclimatic zones, the project tested a wide range of crop management practices adapted to local conditions, focusing on potato and wheat in both monoculture and diversified cropping systems.

The project developed a predictive tool using infrared spectroscopy and basic climatic and soil parameters to estimate soil biodiversity variables. It also developed a complementary decision support tool integrating machine learning models in order to estimate wheat production and soil biodiversity indices from readily accessible field data. Network analysis of over 10 000 taxonomic units identified key relationships between specific soil organism groups and ecosystem services such as carbon sequestration, nutrient cycling, water retention and erosion control across different European regions. These results were translated into Best Practice Guidelines for wheat, potato and vegetable crops, alongside policy recommendations to accelerate adoption of biodiversity-positive practices at local and European levels. More about the project results can be found here.

3.2.3. Sustainable management of land, soil, water and nutrients

European agriculture depends on healthy soils, reliable water availability and efficient nutrient cycling. However, soil degradation, water scarcity, pollution and dependence on external

fertiliser inputs are putting farm productivity, ecosystem services and food security under pressure. EU R&I support integrated approaches that improve soil health, water resilience and nutrient efficiency while helping farmers adapt solutions to local agro-ecological conditions.

Mission Soil: 'A Soil Deal for Europe'

The Mission Soil 'A Soil Deal for Europe' aims to accelerate the transition towards healthy soils through research, innovation, engagement and living labs and lighthouses. The mission is proving an essential tool for generating and facilitating access to knowledge, data, and innovative practices on soil health to farmers, foresters and other land managers and landowners, helping them to increase their productivity, resilience and competitiveness sustainably. Since its launch in 2021, 45 living labs have been established, contributing to the objective of setting up 100 living labs by 2030. With 63 research and innovation projects funded in 2021-2024 under Mission Soil, the current investment amounts to EUR 469 million, with nearly 1 400 organisations involved.

Living labs: Mission Soil living labs are user-centred, place-based and transdisciplinary research and innovation ecosystems that bring together land managers, scientists, citizens, businesses and local authorities to co-design, test, monitor and evaluate solutions to improve soil health in real-life settings. Collaboration across sites enables partners to replicate actions, compare results, exchange good practices, validate methodologies and promote cross-fertilisation at local and regional level.

The funded network of living labs focuses on different land uses, soil challenges and pedo-climatic conditions. The projects in this network include LivingSoiLL, GOV4LL, iCOSHELLs, SOILCRATES, LILAS4SOILS, Nemesis, GroundWork, TRAILS4SOIL, and URSOILL. The projects PREPSOIL, NATI00NS, SOILL-Startup, and SOILL-Stepup support the preparation, deployment and operationalisation of the network of living labs.

For example, the **LILAS4SOILS** project established five living labs in real-life settings across six different countries to co-create and co-implement carbon farming practices based on regional agricultural contexts. Farmers are an active part of the research process by co-creating, testing and validating practices such as manure incorporation, reduced tillage, grassland maintenance, cover cropping, among others. Their involvement in the R&I is partly bottom-up implemented through an open call and cascade funding mechanism. The cross-fertilisation of knowledge between living labs is also promoted to enhance the transfer and uptake of innovation.

Mission Soil is also fostering a growing innovation ecosystem of stakeholders around soil health, strengthening its ties with the private sector, including finance and funding providers, and international organisations, such as UNESCO. The **Mission Soil Manifesto,** a voluntary, non-binding commitment has gathered so far over 3 500 signatures, including nearly 700 legal entities.

Mission Soil's citizen engagement initiatives are also supported by a range of projects, communication activities and information materials. Since its first edition in 2023, the **European Mission Soil Week** has been a flagship event for the European soil community, bringing together around 300–350 participants in person each year. The network of 37 **Mission Soil Ambassadors**, who operate primarily at local and regional level, supports efforts to raise public awareness of the importance of soil health and to promote the mission's activities on a large scale. Complementing this, the Mission Soil Investment Forum is an annual event dedicated to improving soil health through innovative business models and strategic investments.

Mission Soil is also enhancing awareness of the societal role of soils, to ensure access to soil health education and training, to strengthen citizen participation in soil and land-oriented activities, and to reward best practices. Soil literacy is fundamental to the success of this initiative. Through targeted communication, peer-to-peer knowledge exchange, practitioner-led research, and digital learning opportunities, the aim is to embed soil awareness across society, with schools, training institutions, and universities playing a central role in driving the green transition.

Soil health is an important component of the CAP's environmental and climate objectives. Through conditionality requirements, eco-schemes, and rural development measures, the CAP supports practices that protect soil, enhance soil fertility, increase organic carbon, and reduce erosion and degradation. **Mission Soil complements the CAP by developing, testing, and demonstrating innovative solution**s for soil health through research and living labs, generating knowledge and evidence that can be scaled up and implemented through CAP instruments across the EU.

Mission Soil also plays a central role in the implementation of the Soil Monitoring Law, as it supports the development of soil monitoring systems, indicators, data and practical approaches needed to safeguard and assess soil health across Europe.

As outlined in the Mission Soil Implementation Plan, the mission's project portfolio is organised around several complementary thematic clusters, each contributing to the mission's objectives.

A harmonised EU soil health monitoring framework is being developed through BENCHMARKS, AI4SoilHealth, and WHEATWATCHER, with dedicated projects addressing specific threats: erosion (EUROSION), desertification (TERRASAFE, MONALISA), and nitrogen fluxes (NitroScope). Cross-cutting objectives are supported by SoilWise (which curates an open-access knowledge and data catalogue) and SOLO (which identifies R&I priorities for the soil health agenda).

Knowledge generation to improve soil literacy and broaden stakeholder engagement is driven by NBSOIL, LOESS, CURIOSOIL, ECHO, SOILSCAPE, and SoilTribes.

Mission Soil has established **innovation hotspots** across four thematic areas:

- **biodiversity**: SOIL O-LIVE, SOB4ES, BIOservisES, MultiSoil, ProPollSoil, SOILRES;
- **carbon farming:** MaRViC, MRV4SOC, CREDIBLE, DeepHorizon, SUS-SOIL, OGCR, CAFAMORE, ForPeat;
- **soil pollution and remediation:** ARAGORN, ISLANDR, EDAPHOS, SOILPROM;
- **circular solutions for soil health:** DeliSoil, Waste4Soil, BIN2BEAN, FENIX, bioSOILUTIONS.

Mission Soil also addresses cross-cutting dimensions spanning new business models for soil health (NOVASOIL, SoilValues, InBestSoil), international cooperation (AUSO), digital innovation (PHISHES, E-SPFdigit), and territorial approaches (HuMUS, SPADES).

Mission Soil supports dedicated research into the soil–water nexus through SpongeWorks, Path4Med, and SEACURE. Hort2thefuture and SPIN-FERT are developing sustainable, circular alternatives to peat for horticultural production, reducing pressure on vulnerable peatland ecosystems while supporting the EU's commitment to peatland restoration and climate neutrality.

Water resilience and efficient water management are becoming critical for European agriculture as climate change increases droughts, water scarcity and variability in water availability. Improving water-use efficiency, retention and reuse is essential to strengthen agro-ecosystem resilience, maintain productivity and reduce pressure on natural resources.

Research in this area spans several complementary themes. **Drought resilience and climate adaptation** are addressed through projects focused on improving crop resilience to water stress via breeding, root system optimisation, and resilient farming systems (Root2Res, TOMRES, SolACE, BRESOV). Complementing this, **efficient irrigation and water-use optimisation** are pursued through the development of precision irrigation technologies, digital monitoring, and decision-support tools to improve water efficiency at farm level (RAINS, FATIMA, FERTINNOWA, FARMWISE, SHui, MOSES).

At landscape scale, **water retention and nature-based solutions** are enhanced through projects that improve soil water retention and biodiversity, and ecosystem-based approaches to build resilience against both droughts and floods (BOOSTER, STRATUS, SpongeWorks). **Water reuse, circularity, and integrated management** are promoted across agricultural systems and value chains through circular approaches and integrated water governance (WATERAGRI, OPTAIN, MASLOWATEN, SuWaNu Europe, Circular4Farm, GEORGIA, WATERPROTECT, AYUMI).

Nutrients and fertilisers are essential to sustain agricultural productivity and food security, but their inefficient use contributes to soil degradation, water pollution, eutrophication, and greenhouse gas emissions. At the same time, the EU remains highly dependent on imported fertilisers and raw materials, highlighting the need for more circular, resource-efficient and resilient nutrient management systems.

This challenge is addressed across four interconnected areas. **Nutrient-use efficiency** and the reduction of **environmental losses** are tackled through improved fertiliser application practices and nutrient budgeting (NutriBudget, ECONUTRI). **Nutrient recovery and circular bioeconomy** initiatives recover nutrients from agricultural, urban, and industrial waste streams to produce recycled fertiliser products (Nutri2Cycle, CIRCULAR AGRONOMICS, WalNUT). The development of **bio-based and alternative fertilisers** further reduces dependency on imported mineral inputs by bringing sustainable fertiliser products to market (RUSTICA, SEA2LAND, FERTIMANURE, LEX4BIO). Dedicated **knowledge transfer and advisory support** activities provide farmers, advisors, and value-chain actors with practical tools, guidance, and business models to accelerate uptake (NUTRIMAN, Trans4Num).

Flagship stories

EJP SOIL (Towards climate-smart and sustainable soil management, 2020-2025, COFUND) brought together a group of 26 leading European research institutes and universities in 24 countries. The project has mobilised over EUR 40 million, in addition to the EU contribution of EUR 40 million. The project addressed key societal challenges including food and water security, climate change adaptation and mitigation, biodiversity preservation and ecosystem services, recognising agricultural soils as a critical resource.

Through three internal and two external calls for research proposals, 26 internal and 19 external projects were selected for funding, generating a substantial body of new knowledge on soil carbon sequestration, soil health indicators, fertilisation guidelines and the impact of sustainable management practices across European conditions.

A roadmap for soil research in Europe was developed, consulted with national stakeholders and updated based on a synthesis of existing research, research needs and gaps to serve as

an agenda and implementation plan for the programme and beyond, in close collaboration with SOLO, PREPSOIL, ORCASA and FACCE-JPI initiatives.

To support long-term monitoring and data sharing, a software framework for a harmonised agricultural soil information system was developed alongside guidelines for mapping and accounting soil carbon, fertility and degradation at different scales, and a network of long-term experimental sites and soil laboratories was established.

Education and training activities included a joint PhD curriculum, topic-specific doctoral courses and seven rounds of a visiting scientists programme, strengthening the next generation of European soil researchers.

Policy dialogue was advanced through EU policy forums and national workshops, translating research findings into evidence-based recommendations for practitioners and decision-makers.

More about the project results can be found here.

SEA2LAND (Producing advanced bio-based fertilizers from fisheries wastes, 2021-2025, IA) demonstrated the large-scale recovery and reuse of nutrients from fish processing waste and other bio-based streams to produce safe and marketable fertilisers across several European regions.

The project developed and validated nine bio-based fertiliser technologies adapted to different crops and soil conditions, while involving farmers, fertiliser companies and public authorities throughout the value chain. By combining technological innovation, field demonstrations and regulatory support, the project showed how nutrient recycling can reduce dependence on imported mineral fertilisers, lower environmental impacts and create new business opportunities within a circular bioeconomy while improving soil health. More about the project results can be found here.

More in-depth examples of Horizon R&I results in this area can be found in the 2026 Cordis results pack on *Nutrient-rich fertilisers from organic waste and renewable biomass*. A dedicated CORDIS results pack - *Soil health: Reaping the benefits of healthy soils, for food, people, nature and the climate* showcases how EU-funded research and innovation projects are advancing sustainable soil management, carbon sequestration, biodiversity and resilience of agro-ecosystems. Complementing this, the results pack on *Innovative research for sustainable fertiliser production and nutrient management* highlights solutions supporting circular nutrient use, fertiliser efficiency and reduced dependency on imported inputs, contributing to more sustainable and resilient farming systems.

3.2.4. Sustainable management of forests

Europe's forests are facing growing pressure from climate change and increasing natural disturbances such as wildfires, storms, pests, and diseases, threatening their biodiversity, resilience, and ability to provide essential ecosystem services. At the same time, forests are critical for climate change mitigation, carbon storage, human wellbeing, and the transition to a circular and sustainable bioeconomy. Addressing these interconnected challenges requires targeted research and innovation investments to protect and restore healthy, resilient, and multifunctional forest ecosystems across Europe.

EU-funded projects are addressing these challenges. SMURF and Small4Good projects contribute to sustainable forest management to secure resources, support biodiversity, and help small landowners transition to new business models, while HOMED and FORSAID foster innovation in forest health through holistic management approaches and digital technologies.

Enhancing scientific knowledge and adaptive management on forest ecosystem services and resilience has been key focus. INFORMA, CLIMB-FOREST, and OptFor-EU enhance science-based knowledge on EU forests, including old-growth forests and capacities to mitigate climate change. FORWARDS prototypes the ForestWard Observatory to demonstrate the impact of climate change on forests, guiding decision-making for practical forest management. OptFORESTS supports the protection and sustainable management of forest genetic resources.

Innovative technologies and new value chains are developed to unlock the economic and environmental potential of forests through digitalization and precision tools. The core objective of SINTETIC is to set up and demonstrate a traceability system for trees, logs and boards based on information and communications technology innovations. Projects TIMBERHAUS and WoodStock explore the role of timber-based construction in reducing carbon emissions and promoting sustainable architectural practices.

Collaboration and innovation in forest governance drive the exchange of expertise and the creation of robust research agendas across Europe. One of the main outputs of the EUFORE project is a strategic R&I agenda (SRIA) for forestry and the forest-based sector. The SRIA served as the basis for the European co-funded partnership on 'FOrests, forestry, and the forest-based sector: Research and innovation for a Sustainable Transition (FOREST)'.

To promote the sustainability and resilience of European forests, the EU CAP network focus group on 'Forestry and forest health' brought together experts, practitioners, researchers, foresters, advisors, and policymakers to exchange knowledge and identify practical solutions and future research needs for improving forest health and resilience.

Flagship stories

European Partnership for FOrests, forestry, and the forest-based sector: Research and innovation for a Sustainable Transition ('FOREST Partnership')

The FOREST partnership aims to advance research and innovation that support the transition towards a sustainable and circular bioeconomy rooted in forest ecosystems. The partnership aims to address fragmentation within the sector, strengthen collaboration and knowledge exchange, and enhance the resilience of ecosystems, biodiversity, and soil health, while improving adaptation to climate change impacts.

As a key platform for cooperation among stakeholders from Member States and Associated Countries, the partnership will promote transnationally-coordinated R&I activities, reduce duplication of efforts, and stimulate innovation across the sector. It is designed to support the transition towards a more innovative, knowledge-driven, resource-efficient, productive, and resilient forest-based economy.

The FOREST partnership represents a large-scale ten-year research programme involving 100 organisations from 28 countries during its initial phase. From 2026 to 2036, the partnership plans to launch seven co-funded joint calls, supporting an estimated 200-250 transnational research and innovation projects involving around 400 stakeholders. In parallel, it will establish living labs to enable real-world experimentation and innovation.

3.2.5. Healthy, sustainable and resilient cropping systems

Crops and cropping systems are facing growing pressure from climate change, biodiversity loss, soil and water degradation, and the spread of new and re-emerging pests and diseases, among many other challenges. These pressures rarely occur in isolation; rather, crops are increasingly exposed to multifactorial stress, with several biotic and abiotic factors interacting

at the same time and often reinforcing one another. Together, these challenges increase risks to food security, farm viability and strategic autonomy. Strengthening plant health and enhancing the sustainability and resilience of European agriculture are therefore essential.

EU-funded projects are helping address these challenges and support the transition towards healthy, sustainable and resilient crops and cropping systems. In particular:

- projects like IPMWorks, IPM Decisions, AdoptIPM IWMPraise, Conserwa, Agrosus, GOOD have advanced **integrated pest and weed management**;
- projects like SuperPests, Novaterra, WeLaser, novIGRain, and PestNu have supported **innovative approaches to control plant pests;**
- projects like Viroplant, nEUROSTRESSPEP, Sagropia, NextGenBioPest, MultiSoil and SOILRES have helped develop **safer and more sustainable crop protection solutions**.

Together, these projects have been delivering results including **improved and innovative management strategies, tools to support decision-making alternative control methods,** and **field-tested solutions** that broaden the range of crop protection options available to farmers.

In parallel, networks and thematic actions like AdvisoryNetPest, Oper8, RENOVATE, INNOSETA, SMARTPROTECT, and WINETWORK are bringing **practical solutions and training** closer to farmers, advisors and other end users.

Various projects supporting **EU Plant Health** efforts, including XF-ACTORS, PRE-HLB, FF-IPM, IPM-Popillia, MUSA, VIRTIGATION, TROPICSAFE, HOMED, REACT, Patafest, Nem-Emerge, POMATO, CITRUSBUSTERS, EUFAWReady and BeXyl have targeted **emerging threats to plant health**, including *Xylella fastidiosa, Popillia japonica, Spodoptera frugiperda,* as well as other priority pests in the EU. These projects have contributed to improved **surveillance**, **monitoring**, **preparedness**, **risk assessment** and **integrated management approaches**.

In addition, projects like PurPest, FORSAID, STELLA, CERBERUS, VALITEST, SenseApest, EmergeNOW that support the development of diagnostic tools, monitoring methods and rapid detection capacities have improved the early detection and diagnostics of plant pests.

Breeding plays a central role in enhancing the sustainability, adaptability and resilience of crops and cropping systems. In this context, targeted efforts have focused on **broadening the genetic base of crops** and developing varieties that better meet multiple demands, including **quality, resilience and sustainability.**

- Projects like Neurice, SolACE, UNTWIST and ADAPT have supported the development of crops better adapted to abiotic and biotic stresses and to low-input conditions.
- Root2Res, BarleyMicroBreed and BOLERO have advanced breeding strategies for **climate-resilient crops** through improved root-microbiome interactions.
- IPMorama, SHIELD4Grape and GrapeBreed4IPM have supported **breeding pest-resistant and disease-resistant varieties**.
- Liveseed, Ecobreed, and Bresov have increased the **availability and quality of organic seed**s and developed resilient new cultivars.
- InnObreed, OrganicYieldsUp and Liveseeding aim to **foster and upscale organic crop breeding**.

Together, these projects have generated results including new breeding approaches, improved use of genetic resources, and crop materials with enhanced tolerance, resistance and resource-use efficiency.

The **conservation, characterisation and use of plant genetic resources** have been supported through projects focusing on:

- crop wild relatives, including PRO-WILD, FRUITDIV, COUSIN;
- **pre-breeding activities** (BreedingValue, GEN4OLIVE, Harnesstom, and INCREASE);
- **stakeholder coordination and strategic action** to safeguard genetic resources, including FarmersPride, DYNAVERSITY and GenResBridge;
- **modernisation and use of gene banks and genetic collections**, including AGENT and IMAGE;
- **innovation in plant variety testing**, including InnoVar and INVITE.

Other projects funded focused on:

- **crop diversification and new openings for regional, high-quality products and economic development** (Biovalue, Radiant, CropDiva,Divinfood);
- minor root and tuber crops (ROTATES) and orphan legumes (Prosper).

A dedicated set of projects have also been addressing **protein crops** to boost production and resilience in the EU protein system, particularly through:

- **value-chain development** (VALPRO Path);
- **ecosystem services valorisation** (LEGENDARY, LegumES, VALERECO);
- **intercropping** (LEGUMINOSE, IntercropValuES);
- **legume breeding** (EUCLEG, BELIS and Legume Generation).

Forthcoming projects will focus on protein crops for **feed** use and the sector's **competitiveness**.

More examples of results in this area can be found in the 2021 Cordis results pack on *Plant health: Keeping plants healthy while protecting the environment* and the 2026 Cordis results pack on *Advanced technologies for growing resilient, sustainable crops*.

Flagship stories

XF-ACTORS (Xylella Fastidiosa Active Containment Through a multidisciplinary-Oriented Research Strategy, 2016-2021, RIA) was the first European research project entirely devoted to fighting *Xylella fastidiosa* (Xf), mobilising 29 partners from 14 countries, including 4 non-European research centres (from the United States, Brazil, Costa Rica and Taiwan).

Large-scale genomic sequencing revealed the true origins of Xf in Europe and showed that strains differ in aggressiveness, enabling outbreak-specific management. New insights into host defence mechanisms opened pathways for future resistant-variety breeding. Meanwhile microbiome analysis demonstrated that Xf actively suppresses competing microbes to dominate the plant, a key finding for future biocontrol research. Field and laboratory studies decoded insect vector life cycles, feeding behaviour and transmission dynamics, supporting more targeted and environmentally sound control measures. Finally, epidemiological models and risk maps were developed to prioritise surveillance sites, alongside improved early-detection tools for the bacterium in the field.

XF-ACTORS is a landmark example of how European research funding can mobilise international scientific expertise to confront a cross-border agricultural threat, generating the

foundational knowledge needed for sustainable, long-term solutions. More about the project results can be found here.

ADAPT (Accelerated Development of multiple-stress tolerAnt PoTato, 2020-2024, RIA) addressed one of the most pressing challenges facing European potato production: the increasing frequency of heat and drought events that depress yields and tuber quality even under good agronomic practice. The project mobilised partners across Europe to combine field trials, controlled glasshouse experiments and large-scale data analysis, always keeping commercially grown varieties and marketable yield at the centre of evaluation.

Field trials with up to 54 potato varieties were conducted at sites in Spain, the Netherlands, Serbia and Austria, and a survey of more than 550 growers confirmed that heat and drought are already the dominant pressures in many production regions. Glasshouse studies using high-throughput phenotyping and live-imaging sensor plants tracked stress signalling in real time. Integrated data pipelines combining drone imagery, environmental sensors and molecular readouts enabled patterns to be compared across sites, seasons and varieties, and identified early growth traits as strong predictors of yield under stress.

These results were made openly accessible through the StressKnowledgeMap app, an online tool organising stress-response evidence into connected maps for researchers and breeders. More about the project results can be found here.

GEN4OLIVE (Mobilisation of Olive GenRes through pre-breeding activities to face the future challenges and development of an intelligent interface to ensure a friendly information availability for end users, 2020-2025, IA) addressed the growing threat of genetic erosion in the olive sector, where the rise of high-density monocultures, emerging diseases and climate change increasingly jeopardise long-term productivity in one of Europe's most culturally and economically significant crops. The project brought together 16 partners from seven countries, supported by the International Olive Council and with FAO on its Advisory Board, to mobilise and valorise the untapped diversity held in olive genetic resources.

More than 500 cultivars and wild or ancient genotypes were phenotypically evaluated across five germplasm banks over four seasons, assessing productivity, stress tolerance, phenology and oil quality, revealing previously undocumented variation in oleic acid content and phenolic compounds with direct relevance for breeding and health claims. Genomic and transcriptomic analyses identified molecular markers linked to resistance to *Verticillium dahliae*, *Xylella fastidiosa*, drought and cold. Early selection markers for juvenility were validated to accelerate breeding timelines.

Machine-learning tools were developed for cultivar and disease identification, accessible via mobile devices, and all data were made publicly available through an open online platform hosting a catalogue of over 500 cultivars. Two cascade funding calls engaged 25 SMEs, fostering new public-private collaborations and innovation pathways.

A landmark outcome was the formal inclusion of the Córdoba World Olive Germplasm Bank under the International Treaty on Plant Genetic Resources, ensuring long-term preservation and equitable access to olive genetic material, with selected accessions also prepared for deposit in the Svalbard Global Seed Vault. More about the project results can be found here.

3.2.6. Healthy, sustainable and resilient livestock systems

The livestock sector plays a vital economic and social role in the EU, representing millions of farms. At the same time, it is confronted with many challenges stemming from climate change, increased pressure on natural resources, spread of animal infectious diseases and zoonoses,

misuse of antimicrobials and increased societal demand for better animal welfare and more animal-based products.

EU-funded projects are addressing these challenges in support of healthy and resilient animals. Progress has been made in **understanding animal diseases** (DELTA-FLU, PALE-Blu, PIGSs, DEFEND, Kappa-Flu, WiLiMan-ID, COMBAT, and PREPARE4VBD), the **animal immune systems** (HoloRuminant and 3D-omics), **biosecurity in farms** (HE-FARM and BioSecure), **early detection and diagnostics of diseases** (SWINOSTICS, VIVALDI, DECIDE), **developing vaccines** (SAPHIR, PIGSs, Paragone, DEFEND, VACDIVA, REPRODIVAC, SPIDVAC).

Progress has also been made in addressing practices to **implement the objectives of One Health** via EU-funded projects aiming to reduce the use of antimicrobials and antimicrobial resistance (DISARM, ROADMAP, HealthyLivestock, AVANT, NeoGiANT).

Several EU-funded projects (Inno4Grass, EuroSheep, EuroDairy, SheepNet, BovINE and Grazing4AgroEcology) delivered practice-driven innovations in grass-based and pasture systems, whereas the CoCo project is addressing the integration of pastoralism and wildlife management. Other projects (iSAGE, SmaRT, 4D4F, R4D, Eu PiG and Digi4Live) developed sustainable practices using advanced tools (e.g. precision livestock farming, decision support systems, digital technologies) to respond to challenges like climate change, resource use efficiency and food security.

Several EU-funded projects are also dedicated to animal welfare practices and welfare assessment tools to respond to the increased societal demand on animal well-being (Hennovation, PPILOW, ClearFarm, TechCare and aWISH). Other EU-funded projects aimed to optimise feed formulations in different breeds and management conditions, improve the feed efficiency and explore novel feed sources (Feed-a-Gene, OK-Net EcoFeed, ProFuture, SUSINCHAIN, and NUTRIFEEDS).

The assessment of genotype-environment interactions was the objectives of some EU-funded projects (GENRES, GENE-SWitCH, Re-Livestock) that helped in developing innovative breeding strategies that utilise resilience and efficiency related traits and, at the same time, balance economic, social and environmental challenges. The SheepHeatIT and RUMINATE projects also address how to advance animal breeding and genetics, aiming to tackle challenges posed by climate and environmental changes (e.g., greenhouse gas emissions, heat stress).

Some EU funded projects developed apps to help livestock farmers adopt more sustainable farming practices (mEATquality), enhance transparency in the value chain and build a feedback loop between consumers and farmers (Code Re-farm), and enable consumers to visualise the nutritional and environmental impact of their diets (PATHWAYS).

Emission reduction and climate adaptation drive projects like Re-Livestock and NUTRITIVE, which test feed additives, manure management, and precision farming to cut greenhouse gases and pollution while strengthening resilience to climate change.

Projects such as PATHWAYS and STEP UP, apply systemic approaches and provide policy guidance through interactive platforms, scenario modelling and transition roadmaps. These tools help stakeholders assess impacts, develop strategies, and align livestock systems with sustainability goals. LCA, PLF and decision-support systems help measure impacts, improve farming practices, and bridge research to practical implementation for farmers and policy makers.

More examples of results in this area can be found in the 2022 Cordis results pack on *healthy animals for healthy people*, in the 2024 R&I report on livestock system sustainability[63], and in the 2025 report on R&I on AMR in livestock[64].

Flagship stories

European Partnership for Animal Health and Welfare - EUPAHW

The EU Partnership on Animal Health and Welfare aims **to provide the R&I needed by society to support the development of sustainable livestock, poultry and aquaculture production**. Infectious animal diseases are optimally prevented and controlled with appropriate means, antimicrobials are used prudently, and animal welfare is respected in every phase of the production cycle.

Launched in 2024, the EU partnership on Animal Health and Welfare is anticipated to invest (EU co-funded) EUR 360 million over ten years to boost research and facilitate cooperation between all actors.

The scope goes beyond the animal health and welfare actors to enhance cross sector collaboration and, through a 'one health and one welfare' approach, to provide societal impact. It also contributes to EU risk assessment activities by involving the European Food Safety Authority and of the European Medicines Agency.

The objectives of the EU Partnership on Animal Health and Welfare align with the European Green Deal and the vision for agriculture and food for a fair, healthy, and environmentally friendly food system. In 2026, 55 R&I projects are already on-going under the five priority areas defined by the partnership:

- surveillance/monitoring systems and risk assessment for animal health and welfare;
- procedures, methodologies and tools to analyse animal health and welfare;
- management and husbandry guidelines on farm including aquaculture, during transport and at slaughter;
- vaccines and treatments;
- integrated approach, including socio-economic aspects of animal health and welfare.

3.2.7. New farming, food and bio-based systems

The bioeconomy and new farming approaches offer major opportunities to make agriculture more sustainable, resilient, and competitive, and to ensure food security. By developing bio-based value chains, farmers can diversify their income, valorise agricultural residues, and create new rural jobs, while innovative business models and technologies help attract newcomers in agriculture, meet changing consumer demands and improve environmental and social outcomes. Since 2021, 25 bioeconomy-related projects have been funded under the current Horizon Europe Cluster 6 with a total budget of EUR 122 million. 71 projects were funded under Horizon 2020 with a total budget of EUR 395 million.

[63] European Commission: Directorate-General for Agriculture and Rural Development, Iadecola, F., Feo, E., Santoni, E., Dimitrova, N. et al., *Research and innovation solutions to improve livestock system sustainability (environmental, social, economic) – Report on R&I Project Cluster Analysis*, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2762/1063453.

[64] European Commission: Directorate-General for Agriculture and Rural Development and Kazlauskaite, D., *EU funded research and innovation on veterinary aspects of the fight against antimicrobial resistance – Portfolio analysis*, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2762/1663813.

New farming approaches offer a promising way to increase farmers' competitiveness and address growing global demand for food, with precision agriculture, agroecological practices, controlled environment agriculture and digital tools enhancing productivity while reducing resource use and environmental impact.

Understanding the complex interplay within food systems is key to driving progress across both bio-based initiatives and new farming methodologies. Investigating food chain dynamics and their interaction with non-food sectors can unlock synergies between the agri-food sector and the bioeconomy.

The projects BioRural, BioRural toolkit, MainstreamBIO, RuralBioUp and SCALE-UP are integrating small-scale bio-based solutions into mainstream practice. The PRIMARY, HARWASTING and EMBEDED projects are revalorising biomass and waste from agrifood, feed, and forestry industries into useful products such as fertiliser, bioenergy, and biomaterial packaging.

The Horizon 2020 public-private partnership Bio-Based Industries (BBI) invested from 2014 to 2020 in R&I activities supporting new economic opportunities for farming and forestry from the bioeconomy. Projects such as BeonNAT focused on innovative value chains valorising agricultural and forest biomass for bio-based industry use, while others contributed to the scaling of key bioeconomy infrastructures such as biorefineries in FIRST2RUN or the development of bio-based products such as bio-fertilisers in B-FERST.

The EU has also invested, through Mission Soil, **more than EUR 30 million** in the circular economy to improve agricultural and food systems' sustainability and soil health with soil improvers from bio-waste.

Flagship stories

Circular bio-based Europe Joint Undertaking

The vision for agriculture and food underscores the importance of the bioeconomy in strengthening Europe's food and agriculture sectors. Through targeted funding and strategic initiatives, the Circular Bio-based Europe Joint Undertaking (CBE JU) is supporting the decarbonisation of the sector, increasing resilience, and creating new opportunities for future generations.

Between 2022 and 2025, CBE-JU dedicated around EUR 185 million to funding projects addressing key challenges faced by primary producers in rolling out circular bio-based solutions and innovations while ensuring that they benefit from the opportunities of being part of new and innovative circular and bio-based value chains.

Those projects focus on areas such as:

- **valorising agricultural and forest residues and underused crops** (V-FOREST, MANUREFINERY);
- unlocking new business opportunities (SUSTAINEXT);
- generating new income sources from unused or underutilised resources (PACE, RUBBIO);
- developing bio-based **fertilisers and crop protection** alternatives to fossil-based inputs (ReLeaf, BioCordelia, LANDFEED, ZELDA, CROPSAFE, INSOIL);
- encouraging sustainable land use (pHYBi);

- creating **local circular business models** that offer new income streams and environmental benefits for rural communities (Rural BioReFarmeries, ROBOCOOP-EU).

The funded projects involve 76 entities from the primary sector, in which farmers represent around 73%. More information on how bio-based innovations are strengthening EU's food production is available here.

CBE-JU working group on primary producers (WGPP)

In 2025, CBE-JU established a working group on primary producers to further address the needs of the primary sector. The objectives of this initiative are to empower primary producers in playing an active and rewarding role in circular bio-based value chains, and to ensure they benefit from the socio-economic and environmental opportunities of the bio-based economy.

The working group bring together around 79 representatives from across Europe, including farmers, foresters, fishers, aquaculture producers, cooperatives of primary producers and other entities working closely with them. It is developing an action plan, which will propose actionable and practical solutions to address key challenges faced by primary producers to engage in bio-based economy, such as a lack of awareness and access to infrastructure, financial barriers, and a limited integration in value chains.

The project **RootLinks (Primary Sector Working Group Support Project)** supports and facilitates the efforts of the WGPP.

Projects like C4B, PRIMED, CARINA, MAGIC and PANACEA are securing diversification, competitiveness, resilience and sustainability of farming systems for instance through innovative business models.

Projects such as GI SMART, THEROS, ALLIANCE, and Strength2Food help deliver evidence and recommendations to strengthen the implementation, and improve the traceability and impact of quality schemes (geographical indications, organic etc.) and public procurement on the competitiveness, sustainability and resilience of EU farming systems and rural areas. Organic food innovation labs like InnOFoodLabs and WINN-ORGANIC are reinforcing the entire organic value chain.

The COACH, FOODRUS, FAIRCHAIN, SMARTCHAIN, CO-FRESH, agroBRIDGES, and COCOREADO projects help create short, smart, fair and sustainable food supply chains, while others such as FOX and SHEALTHY develop innovative on or near-farm processing solutions. Innovative food pricing approaches to support the transition towards sustainable and healthy food systems, for example true cost accounting, are explored in projects such as FOODCoST. Thematic and advisory networks are helping deploy and scale innovative farm-to-food solutions (EU4Advice, AUTHENT-NET, COREnet).

Innovative farming systems established through the urban agriculture projects EFUA and FOODCITYBOOST and innovative farming technologies (including controlled environment agriculture (FIT4CEA) and robotics) improve efficiency, increase farm profitability, create jobs, and drive economic growth.

Flagship stories

ALLIANCE (A hoListic framework in the quality Labelled food supply chain systems' management towards enhanced data Integrity and verAcity, interoperability, traNsparenCy, and tracEability, 2022-2025, IA) was a Horizon Europe-funded project that developed an integrated digital framework to strengthen the integrity, transparency and traceability of quality-labelled food supply chains, helping to combat food fraud while supporting more sustainable and resilient agri-food systems. The project focused on organic products and foods protected by PDO, PGI and GI labels, which are increasingly vulnerable to fraud due to complex supply chains and growing market demand. To address these challenges, ALLIANCE combined distributed ledger technologies, internet-of-things sensing devices, portable authenticity testing tools, and AI-driven decision support to improve data integrity, interoperability and evidence-based supply chain management. By validating these technologies in real-world food supply chains, the project aimed to increase consumer trust, enhance food safety and authenticity, and facilitate the adoption of innovative digital solutions across the European agri-food sector.

FOODCoST (FOOD Costing and Internalisation of Externalities for System Transition, 2022-2026, RIA) was a Horizon Europe-funded project working to develop harmonised methods for measuring and internalising the environmental, social and health externalities of food systems, enabling food prices to better reflect their true societal costs and benefits. Current food prices often fail to account for impacts such as greenhouse gas emissions, biodiversity loss, public health outcomes and social inequalities, limiting the effectiveness of policies and market incentives for sustainable food production and consumption.

To address this challenge, FOODCoST developed common valuation approaches, databases and analytical tools to quantify food externalities and assess the impacts of true pricing policies and business strategies. These methods were co-created and validated through eleven case studies across diverse food value chains and regions, providing evidence and guidance to support policymakers, businesses and other stakeholders in the transition towards healthier, more sustainable and equitable food systems.

UNLOCK (Unlocking a feather bioeconomy for keratin-based agricultural products, 2021-2025, IA) was a BBI-funded project working on the conversion of poultry feather waste into keratin-based biodegradable materials for agriculture, showing how bio-based innovation can improve farm resilience, reduce environmental impacts and support circular value chains.

Feathers are a largely underused waste stream: around 15 million tonnes are produced annually, of which 75% remain uncollected, despite containing 90% keratin, a high-value protein suitable for bioplastics and other sustainable materials. To harness this potential, UNLOCK is optimising collection logistics and biorefinery processes to produce keratin-based products such as seed trays, geotextiles and mulch films, which biodegrade in line with crop cycles, enrich soils with nitrogen and reduce waste.

3.2.8. Rural opportunities

Home to 25% of the EU population and covering 75% of its territory[65], rural areas face many challenges (demographic change, service provision, digital gap, lower education and economic opportunities). However, they can also build on many opportunities if the right enabling conditions are in place and tapping into their potential for innovation, within and beyond the

agri-food sector, is necessary to contribute to Europe's competitiveness, sustainability and resilience. Rural areas are diverse; they need tailor-made and place-based innovation approaches.

Since the 2016 strategic approach, the Commission dedicated a total of EUR 183 million (33 projects) to supporting rural areas under Horizon 2020 Societal Challenges 2 and the current Horizon Europe Cluster 6. Moreover, it also provided funding of a total of EUR 250 million to over 60 Horizon Europe 2021-2027 projects that specifically support rural communities under the flagship action 'Research and innovation for rural communities', which is part of the EU rural action plan adopted with the Commission communication on the long-term vision for the EU's rural areas[66].

Examples of those projects include projects working on:

- solutions for better governance by improving indicators for tailored rural policies (GRANULAR, RUSTIK);
- territorial governance and rural-urban synergies (PoliRuralPlus, RURBANIVE);
- necessary infrastructures and services: training centre on rural innovation (RURALITIES);
- smart XG, last-mile and edge solutions for remote farming, forestry and rural areas (XGain, COMMECT);
- smart solutions for smart rural communities (FUTURAL, RURACTIVE, SMART ERA);
- innovations for climate-neutrality (ICONIC, STORCITO);
- emerging trends by investigating societal perceptions and benefits of rural life and jobs (RURALITIC).

Projects have also advanced socio-economic issues related to the working conditions contributing to the competitiveness and attractiveness of the jobs and the generational renewal in rural areas:

- fostering generation renewal (RURALIZATION, PoliRural);
- boosting women-led innovation in farming and rural areas (SWIFT, GRASS ceiling, FLIARA);
- assessing and improving labour conditions and health and safety at work in farming (SafeHabitus);
- developing new business and production models for farmers and rural communities (Greencoop, Nexrur);
- taking into account the wider rural community and the social inclusion in rural areas through the social economy (SIMRA, ESIRA, SERIGO, INSPIRE).

Almost all of those projects have used the multi-actor approach, enabling rural organisations to participate and benefit directly from R&I activities. Several led to the creation of Rural Pact community groups lasting beyond the end of the project.

More examples of Horizon R&I results in this area can be found in the 2021 Cordis results pack on *Developing real solutions for smart and resilient rural areas in Europe*.

[65] Territorial typologies manual - degree of urbanisation - Statistics Explained - Eurostat.
[66] EUR-Lex - 52024DC0450 - EN - EUR-Lex.

Flagship stories

SafeHabitus (Strengthening farm health and safety knowledge and innovation systems, 2023-2026, RIA) offers a systemic approach to Farm Health and Safety, covering physical and mental health, extending to working conditions in general and all factors that contribute to the attractiveness of farming and food security, aiming to identify all the needs to achieve effective generational renewal in the agricultural sector and beyond to contribute to vibrant rural communities.

SERIGO (Social Economy for Resilience, Inclusion and Good life in Rural areas, 2024-2027, RIA) investigates the framework conditions leading to social exclusion (different vulnerable groups identified and intersectional perspective) and focuses on how social innovation approaches (in particular from the social and solidarity economy sector/actors) can help enhance resilience, foster social inclusion, and overall improve the quality of life in rural Europe.

FLIARA (Female-Led Innovation in Agriculture and Rural Areas, 2023-2025, RIA) identified 200 innovations and many different barriers to women-led innovation. It published several policy briefs addressing all the sectorial policies that can support women in their innovation journey (education, digital access and knowledge, advisory services and networks, financial support, political participation, work-life balance, care, social services, culture and sports) and developed a guide to support the improved participation of women in rural and farm innovation.

3.2.9. Fostering agroecology and organic farming at the farm and landscape levels

Agroecology and organic farming are approaches with proofed and recognised potential to accelerate the transition to sustainable, resilient, competitive and fair farming and food systems. These approaches have the potential to simultaneously address the social, environmental, climate, and economic challenges of the agricultural sector, and increase its resilience, by seeking cooperation with other parts of the food and non-food supply chains.

Compared to more conventional approaches, agroecology and organic farming place more emphasis on the potential of farming practices, on innovation and on cooperation with other parts of the food and non-food supply chains to address farming challenges, such as the need to reduce the use and safety related risks of plant protection products and fertilisers.

Both agroecology and organic farming are approaches that deliver a range of valuable ecosystem services. At the same time, they make farming an attractive activity with potential to ensure generational renewal in the agricultural sector, by developing solutions and business models adapted to context-specific challenges. This makes them knowledge-intensive approaches compared to other more conventional ways of farming.

In **diversified farming**, projects have shown that crop diversification can help maintain or increase productivity while reducing the need for chemical inputs.

Practical knowledge on crop combinations, crop management and alternatives for pest and weed control has been developed through Diversify, Diverfarming, DiverIMPACTS, ReMIX, IWMPraise, GOOD, AGROSUS, CONSERWA and Oper8.

Complementary work on **agroecological approaches** such as agroforestry and mixed farming has improved understanding of how land use can contribute to climate action, address land degradation and deliver ecosystem services including soil health, through STARGATE, AFINET, MIXED, AGROMIX, REFOREST, DigitAF and AF4EU.

R&I have supported the development of **organic farming** in line with the EU action plan on the development of organic production[67]. As part of the plan, the Commission intends to dedicate at least 30% of the budget for research and innovation actions in the field of agriculture, forestry and rural areas to topics that specific to or relevant for the organic sector. In the period 2021-2024, the EU invested EUR 490 million in 59 topics relevant for the organic sector.

Projects such as LIVESEED, ECOBREED, BRESOV, LIVESEEDING and InnObreed addressed breeding and seed-related challenges in organic systems. Scale-it, BIO-2, Organic-Plus and RELACS have explored phase-out pathways for contentious inputs and supported knowledge exchange among farmers, advisers and researchers. The specific needs of livestock production under organic conditions have also been addressed, including through PPILOW, which developed solutions to improve animal welfare.

Knowledge sharing and advisory support have also been strengthened through OK-Net Arable, which established the OrganicFarmKnowledge platform, OK-Net EcoFeed, OH-FINE and OrganicAdviceNet, which is establishing a network of approximately 1 000 organic advisers across Europe.

More broadly, the role of **ecosystem services**, **biodiversity** and **incentive schemes** in supporting agroecological transition has been addressed through EcoStack, SHOWCASE, FRAMEwork, Biovalue, Super-G, CONSOLE, EFFECT and Contracts2.0.

LIFT and UNISECO have examined the drivers, benefits and challenges associated with ecological farming systems.

More examples of Horizon R&I results in this area can be found in the 2025 Cordis results packs: *Enabling nature-based solutions in sustainable agriculture*, and *Accelerating agroecology and organic farming for a more sustainable agri-food system*.

European Partnership accelerating farming systems transition: agroecology living labs and research infrastructure

This partnership is one of the key actions of the farm to fork strategy, which called for the promotion of agroecology as one of the farming approaches with capacity to help meet the European Green Deal objectives in relation to the agri-food sector.

The partnership's overall objective is to unlock the potential of agroecology to achieve the environmental, economic, climate and social challenges of EU's farming sector. It was kicked off on 1 January 2024 and will last until 31 December 2033. It is coordinated by Germany (Forschungszentrum Jülich). The total tentative budget is EUR 300 million, half of which the EU is providing).

It is a Europe-wide initiative, involving 111 partners from 31 countries. Consortium members are national and regional authorities, ministries, funding agencies, research performing organisations, and research infrastructures, and it constitutes a key tool to align EU and national R&I agendas on agroecology. As part of its activities, it is funding research and innovation projects through co-funded calls. Three calls have already been published, covering several aspects of the agroecology transition. 38 R&I projects are currently running.

[67] Communication *Action plan for organic production in the EU* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0141R(01).

The partnership is also building a **Europe-wide network of agroecology living labs and research infrastructures** for knowledge sharing and co-creation of agroecological innovations. The network currently involves 55 members.

One of the partnership's key ambitions is to build a **monitoring and data framework** with indicators and tools to monitor and measure the progress of agroecology transition, its social, economic, environmental and climate performances and impacts.

The partnership is also improving the sharing and access to knowledge and innovation on agroecology and helping to reinforce the agricultural knowledge and innovation systems for agroecology across Europe. It is putting in place mechanisms for science-policy dialogue to support the development, implementation, monitoring and evaluation of policies supporting agroecology.

3.2.10. Strengthening socio-economic performance and modernising policies

Agricultural policies aim to address a **growing number** of societal challenges, including food security, farming economic sustainability, resilience to shocks, climate and biodiversity-friendly agriculture and vibrant rural areas. R&I, in particular involving social sciences and humanities **inform decision-making processes and policymaking** on achieving these objectives. Social sciences and humanities R&I help **create an enabling environment and conditions that support farmers, foresters and rural communities in reinforcing the competitiveness, resilience, and sustainability of their sector**.

Through behavioural and experimental research, projects explore the drivers that hinder or foster change towards sustainable, climate-neutral and biodiversity-friendly farming systems (BEATLES, ENFASYS, VISIONARY), and provide a set of social innovations, business models, and recommendations and tools to foster behaviourally-informed policies (PRUDENT, ForestAgriGreenNudge).

EU projects integrating socioeconomics explore and develop innovative markets and policy schemes (PEGASUS, PROVIDE, CONSOLE, Strength2Food, REWARD, ECOPESIA) offering new business models and economic opportunities for farmers who adopt more sustainable farming practices.

Projects integrating economic modelling activities help continuously improve data, models and policy impact assessment tools, informing the design, implementation and evaluation of agricultural policies. Economic modelling R&I support evidence-based policies towards more sustainable food systems (VALUMICS, ACT4CAP27, FOODCoST, SUSFANS, SUFISA) and sustainable trade (BATModel, TRADE4SD, MATS).

Other projects explore effective policy options for achieving environmental sustainability objectives (LANDSUPPORT, BrightSpace, LAMASUS) and reduce critical input dependencies of the agricultural sector (AgEnRes).

Coordination and support projects (SUPREMA, Tools4CAP, MEF4CAP) help decision-makers use data, models and other analytical tools.

Social sciences and humanities R&I also improve knowledge and understanding of the socioeconomic context and challenges of the agricultural sector. Projects help raise awareness and deliver solutions on important issues such as strengthening farmers' bargaining power (Strength2Farm), risk management (SURE-Farm) working conditions, health and safety on the farm (FARMWELL, SafeHabitus), or generational renewal (NEWBIE, RURALIZATION, HARVEST).

Mission Soil-funded projects like BIOservicES, SOB4ES, InBestSoil, SoilValues and NOVASOIL are carrying out research on economic valuation of soil ecosystem services. Other projects like SOILSCAPE and SoilTribes are increasing societal awareness on the importance of soil, by involving cultural and creative industries, and by increasing capacity of public and private institutions from national to regional and local level to engage with the wide public to promote sustainable soil management. LOESS and CURIOSOIL projects are fostering soil education across society, supporting behavioural change and the adoption of sustainable practices both individually and collectively. More broadly, the Mission Soil promotes social sciences and humanities R&I to better understand and engage the societal, cultural, and economic mechanisms and deep societal change at a range of scales through which soil health outcomes can be achieved[68].

More in-depth examples of Horizon R&I results in this area can be found in the 2025 Cordis results pack on socioeconomics*: Supporting EU farming through behavioural and economic analyses*. Cluster events bringing together Horizon projects developing economic models in support to evidence-based agricultural policies were also organised in 2023, 2024 and 2025.

Flagship stories

LAMASUS (LAnd use and MAnagement modelling for SUStainable governance, 2022-2026, RIA) delivers new data and evidence on land use and management practices in the EU, as well as on the role of policies on changes in land use and management dynamics, and their economic and environmental impacts.

The project developed an innovative modelling toolbox with full sectorial coverage from agriculture and forestry to the whole economy, accounting for carbon, biodiversity and other relevant sustainability dimensions, at multiple scales. The toolbox builds on the complementarity between economic and biophysical models and integrates novel approaches mobilising machine learning and citizen science. The toolbox is applied to test policy scenarios and inform decisionmakers from local to EU level, for developing, assessing, and monitoring land-related policies across various geographical scales.

VISIONARY (Food provision through sustainable farming systems and value chains, 2022-2026, RIA) is uncovering the lock-ins holding Europe back from transitioning towards more sustainable food systems, by considering the whole agri-food chain from farmer to consumer. The project's innovative approach combines experimental and behavioural economics, system thinking and policy science, to identify barriers and appropriate behavioural interventions.

VISIONARY translates research into innovation mainly through its science-policy interfaces, experimental case studies and targeted capacity-building, which act as living labs where policymakers, administrators and stakeholders co-create and test policy mechanisms. e.g. for organic public procurement, carbon markets, biodiversity labelling and water governance. The project helps develop new business models and institutional arrangements to support the value chain to accelerate the transition towards sustainable food systems, more effective sustainable food marketing initiatives, better design of advisory services, and the alignment between agricultural and environmental organisations.

VISIONARY has already led to concrete innovations: preliminary results made it possible to identify how aligning food policy procurement would be a key policy lever that has the potential to facilitate system-wide change.

[68] Social sciences, humanities, and the arts in the EU Mission "A Soil Deal for Europe" | Mission Soil Platform.

3.2.11. Unlocking the potential of digital and data technologies

Digital technologies can significantly enhance agriculture, forestry and rural areas by enabling precision management, real-time monitoring and data-driven decision-making, improving productivity, resource efficiency and environmental performance. They can strengthen resilience to climate and market risks through better forecasting, traceability and early-warning systems, while supporting sustainable land and forest management. Digital connectivity and services can also boost rural innovation and inclusion by creating new business models, improving access to knowledge and public services, and supporting employment and quality of life in rural communities.

Through the current Horizon Europe the EU supports the development of innovative digital solutions in agriculture, forestry and rural areas focussing on different technologies (e.g. AI, robotics, internet of things, etc.) and applications (e.g. pruning, spraying, irrigation, decision making support, pest detection). For instance:

- AGRO-WELL, AGROBOOST, AgRimate, and AgRibot leverage robotics and augmented reality to enhance working conditions and strengthen the work force in agriculture;
- projects such as CODECS and Quantifarm assess the impact of digital technologies in agriculture;
- projects like Farmtopia, Guardians, and Phito, have been given specific support to develop digital solutions for small and medium farms, thus helping reduce the digital divide among farmers;
- ICAERUS, SPADE, and CHAMELEON explore the potential of drones as multi-purpose vehicles, including for agriculture, forestry, and rural applications;
- ScaleAgData, CrackSense, and AgriDataValue capitalise on data from different sources (e.g. sensor data) to improve competitiveness and sustainability of the EU agricultural sector;
- CERBERUS, STELLA and FORSAID are developing and testing digital technologies for plant and forest health monitoring and pest detection.

European Partnership of Agriculture of Data

The EU Partnership Agriculture of Data (AgData) aims to enhance agricultural practices through innovative data-driven solutions. By leveraging advanced data analytics and digital technologies, the partnership seeks to develop and support the uptake of digital and data solutions, and improve competitiveness, sustainability and environmental impact in the agricultural sector.

The initiative fosters collaboration among scientists, stakeholders and policymakers across Member States and associated countries to develop strategies that optimise resource use and boost the resiliency of the sector. Through research and innovation, AgData is committed to shaping the future of agriculture in alignment with initiatives such as the European Green Deal.

The partnership started its activities on 1 October 2025 and it is expected to run for at least 7 years. The total tentative budget is EUR 300 million, with a 30% co-funding rate from the EU. By bringing together National Funded Use Cases and Transnational projects funded through Open Calls, AgData is expected to contribute to several objectives outlined in its Strategic Research and Innovation Agenda (SRIA).

3.2.12. Enhancing knowledge flows and skills

Farmers, foresters and rural communities need faster access to knowledge, innovation and skills to address challenges such as climate change, biodiversity loss, digitalisation and generational renewal, while supporting the transition towards more sustainable and resilient farming systems. Working in synergy with the agricultural knowledge and innovation systems (AKIS) implemented under the CAP, EU-funded projects help bridge the gap between research and practice, accelerating the uptake of innovative solutions by farmers, advisors and rural communities.

EU-funded projects are strengthening AKIS by improving knowledge flows and fostering collaboration between farmers, advisors, researchers and educators through a strong **multi-actor approach**. Projects such as LIAISON and PREMIERE have guided the implementation of this collaborative approach to research, by supporting co-creation processes, interactive innovation and methodologies to improve collaboration and uptake of results by end-users.

More than 60 **EU-funded thematic networks** have played a key role in collecting and disseminating practical knowledge in user-friendly formats across areas such as animal health (BROILERNET, B-THENET, EUNetHorse), organic farming (OH-FINE), crop adaptation (CLIMED-FRUIT), forestry (FORADVISE), nutrient management (NUTRI-KNOW) and many more. These projects have fostered peer-to-peer learning and helped scale up solutions developed at national level through CAP-funded EIP-AGRI Operational Groups across Europe (Oper8, Soil-X-Change, AQUAGRI-KNOW).

Advisory services and skills development have also been reinforced through **advisory networks** supporting advisor cross-border cooperation and access to the latest innovation (AdvisoryNetPEST, OrganicAdviceNetwork, STRATUS, FAIRshare, COREnet). In parallel, MODERNAKIS and ATTRACTISS are **helping Member States improve** governance and innovation support services for AKIS.

Efforts have also focused on facilitating access to practice-oriented knowledge and innovation outputs by developing a **common EU-wide knowledge reservoir** for agriculture and forestry, bringing together materials from Horizon projects, EIP-AGRI Operational Groups and national initiatives into a single platform for farmers, advisors and educators (EU-FarmBook).

A cluster event bringing together thematic networks, advisory networks, and projects was also organised in 2025.

Flagship stories

modernAKIS (Modernisation of Agriculture through more efficient and effective Agricultural Knowledge and Innovation Systems, 2022-2029, CSA) aims at improving AKIS actors' capacities to leverage individual, organisational and systemic resources needed for the transformation towards more coherent, effective and efficient AKIS.

To this end, the project is building a European network of actors in AKIS from all EU Member States as well as communities of practice in each Member State. modernAKIS delivers comprehensive resources, tools and methods supporting key AKIS actors to improve the knowledge flows and develop a well-functioning AKIS in line with relevant policy objectives. One aspect of how to use a coherent, effective and context-aware approach the project addresses is capacity building.

The project is also about releasing a co-designed benchmarking tool enabling Member States to (i) assess and monitor their AKIS at national and regional level and (ii) benchmark them against different scenarios, identifying innovative solutions and suitable interventions for their individual situations.

EU-FarmBook (supporting knowledge exchange between all AKIS actors in the European Union, 2022-2029, RIA) is developing an online, multilingual platform (EU-FarmBook) able to bridge EU-funded research and innovation with practitioners across agriculture, forestry and rural development.

This platform should serve as a centralised hub for practical, science-based solutions, consolidating practice abstracts from Horizon multi-actor projects and national EIP-AGRI operational groups, while allowing for links with national platforms to integrate locally generated knowledge. It will serve a broad user community, including farmers, advisors, educators, researchers and policymakers.

Availability in all 24 official EU languages, combined with real-time translation of uploaded material, will ensure easy access across Member States and users. AI will support both search and content upload, ensuring intuitive and efficient use of the platform for users and contributors. The platform will also accommodate diverse knowledge formats – such as videos, podcasts and presentations – complementing written materials and broadening accessibility.

PREMIERE (Preparing multi-actor projects in a co-creative way, 2023-2027, CSA) supports effective implementation of multi-actor approach in Horizon Europe, particularly under Cluster 6. To do so, the project supports project consortia and coordinators, national contact points, external evaluators and other innovation support services in the development of more relevant, coherent and well-prepared project proposal. A particular focus is placed on fostering bottom-up co-creation and ensuring active participation and effective contribution of all relevant actors.

The project also prioritises widening participation by involving organisations with no previous experience in multi-actor projects, including those previously involved in unsuccessful proposals. To this end, PREMIERE provides a range of support services and easy-to-use tools and materials, including training and capacity-building resources, serious games, networking and brokerage events. The project has also piloted a seed-funding scheme for proposal development, including specific measures to engage EIP-AGRI operational groups.

3.2.13. Strengthening international cooperation

The European Commission is strengthening international cooperation in agricultural research and innovation to support the transition to sustainable, resilient and competitive agri-food sector. As climate change, biodiversity loss, soil degradation, water scarcity and food insecurity increasingly affect regions worldwide, such cooperation is essential to speed up innovation uptake, enhance knowledge exchange and develop solutions tailored to local needs with partner countries.

International cooperations, which resulted in 34% of Horizon 2020 and 19% of the current Horizon Europe projects in agriculture, forestry, rural areas having partners from third countries during the 2014-2025 period, have delivered results and opportunities to jointly address shared sustainability and resilience challenges in the sectors. Increasingly they have achieved this by fostering place-based innovation and frameworks for AKIS through shared experiences and lessons learned.

The Commission funds international projects of global relevance like the projects on African swine fever (ASF):

- ASFaVIP, aiming to understand performance characteristics of live attenuated vaccines for the prevention and control of African swine fever in wild boar and domestic pigs, exploring administration routes, immune responses, and risk-benefit profiles or;
- VAX4ASF, developing a next-generation vaccine platform designed to protect against diverse ASF virus variants while ensuring high safety and the ability to differentiate infected from vaccinated animals (DIVA strategy). The project seeks to innovate based on previous vaccination approaches and strategies with potential for success.

Through Horizon Europe 2021-2027 and long-standing initiatives such as the FNSSA partnership, the EU supports collaboration in areas including sustainable agriculture, agroecology, climate resilience, soil health, agroforestry and AKIS, while promoting multi-actor approaches and capacity building.

Flagship stories

EU-AU Food and Nutrition Security and Sustainable Agriculture (FNSSA) partnership

The EU-AU Food and Nutrition Security and Sustainable Agriculture (FNSSA) partnership is a long-term research and innovation partnership between the African Union (AU) and the European Union (EU) to support the achievement of sustainable food systems, improved nutrition, and resilient agriculture. The partnership promotes joint research, innovation, capacity building, and knowledge exchange between Africa and Europe. Its activities focus on sustainable agricultural intensification, nutrition-sensitive food systems, agricultural markets and trade, and cross-cutting issues such as climate resilience and innovation uptake.

Since its launch, the Commission has mobilised over EUR 125.5 million to support 20 collaborative projects addressing shared challenges in agriculture, food security, and rural development.

CEA-FIRST (Consortium Europe-Africa for Research and Innovation on Food Systems Transformation, 2023-2027, CSA) aims to bring together 21 partners from Africa and Europe in an alliance. It supports operationalisation of the International Research Consortium (IRC) that works towards implementation of the FNSSA roadmap.

The project focuses on reducing research fragmentation and provides public access to a large knowledge platform, and analyse R&I activities. It establishes thematic working groups in

line with the long-term IRC strategy aiming to provide inputs to high-level policy dialog. It also contributes towards the update of FNSSA roadmap (2027-2036).

CANALLS (Driving agroecological transitions in the humid tropics of Central and Eastern Africa through traNsdisciplinary Agroecology Living LabS, 2023-2026, RIA) is promoting agroecological transitions in Central and Eastern Africa through eight multi-actor agroecology living labs. It brings together researchers, farmers, advisory services, local communities and policymakers, and supports more than 20 000 farmers and value-chain actors in co-developing sustainable practices for key crops such as cocoa, coffee, cassava, rice and maize.

The project has already contributed to strengthening local innovation ecosystems, improving knowledge exchange and developing practical tools for assessing the environmental and socio-economic impacts of agroecological practices. It also supports inclusive business models and market access for agroecological products, demonstrating how EU-supported R&I cooperation can connect science, policy and practice to deliver tangible benefits for sustainable agriculture and rural communities.

PrAEctiCe (Potentials of Agroecological practices in east Africa with a focus on Circular water-energy-nutrient systems, 2022-2026, RIA) focuses on accelerating agroecological transitions by strengthening knowledge, practices and governance arrangements that support more sustainable and resilient farming systems. It promotes co-creation of solutions through multi-actor collaboration, involving researchers, farmers, advisory services and policymakers, and builds on participatory approaches such as living labs and on-farm experimentation. PrAEctiCe places particular emphasis on context-specific agroecological practices, capacity building and knowledge exchange between European and African partners, with the aim of improving the uptake of sustainable farming methods and supporting long-term transformation of the agri-food sector. Through these activities, the project contributes to bridging science, policy and practice and to reinforcing international cooperation on agroecology and sustainable agriculture

Partnership for Research and Innovation in the Mediterranean Area (PRIMA)

The PRIMA partnership is a ten-year initiative (2018-2028) partly funded by Horizon 2020 (EUR 220 million), Horizon Europe 2021-2027 (EUR 105 million) and the 20 participating countries (which include countries from the EU, Horizon Europe 2021-2027 associated countries and other Mediterranean partner countries, with combined funding of currently EUR 274 million).

The ambition of this public-public partnership, mainly implemented through competitive calls for proposals, is to mobilise the Euro-Mediterranean scientific communities, stakeholders and public and private entities on a common R&I strategy to identify solutions to improve water availability, sustainable agriculture and food production in a region heavily affected by climate change.

PRIMA forms a unique platform for strengthening cooperation between the EU and third countries on addressing common challenges to the Mediterranean region and beyond. It is exemplary in the implementation of the water, energy, food and ecosystems (WEFE) nexus approach. Between 2018 and 2025, PRIMA funded 2 900 beneficiaries in a total of 305 projects, including 69 on water, 129 on farming systems, 95 on agri-food value chains and 12 on the WEFE nexus. To date, PRIMA is the most ambitious joint programme to be undertaken in the framework of Euro-Mediterranean cooperation.

The 2016 strategic approach helped to fund the generation of new knowledge and innovation in key priority areas, and to support the innovation journey, from lab to fab. The achievements of the 2016 strategic approach in this regard have been observed through the analysis of key statistics on the investments made, and on the exploitation of the R&I results produced by the funded projects.

3.3. Analysis and key achievements on the innovation journey

The data supporting this quantitative analysis focus on the type of actions programmed for agriculture, forestry and rural areas during the period 2014-2024:

- Research and Innovation Actions (RIA),
- Innovation Actions (IA),
- Coordination and Support Actions (CSA),
- Actions funded with the COFUND instrument (COFUND)[69],
- European Joint Programmes (EJP)[70],
- ERA-NET[71].

General observations are drawn based on the distribution of the funding actions over time and within programmes, as well as on the oversubscription rate, proposals' average score and links with political priorities. Lastly, the analysis also focuses on data linked to the R&I journey from 'lab to fab' including SME engagement, results valorisation and co-investment rates.

While the 2016 strategic approach only applies after 2016, covering 2014 and 2015 in the analysis made it possible to capture more elements as regards R&I policy, implementation and development aspects through Horizon 2020 and the current Horizon Europe.

The final three years of Horizon Europe Framework Programme (2025-2027) are not considered in this analysis, so the data presented below is likely to change by the end of the Framework Programme. The data underpinning this analysis is publicly available as it was entirely sourced from the Horizon Dashboard.

Annex I describes the methodology in detail. The lists of projects considered for the purpose of the analysis in the scope of agriculture, forestry and rural areas on the one hand, and food systems on the other hand, can be accessed online as supplementary material to this staff working document.

3.3.1. Excellence of R&I project proposals: an analysis of oversubscription rates

The different types of actions programmed and funded during the period 2014-2024, attracted significant interest from applicants, as indicated by the ratio excellent/funded, which provides insights into the number of excellent proposals[72] evaluated per funded proposal.

To add value to this analysis, the average score per proposal was also assessed. This analysis focused on RIAs, IAs and CSAs. For coherence it considered single-stage and two-stage separately. The data related to two-stage topics refers exclusively to the second and final stage

[69] Horizon Europe COFUND includes AGROECOLOGY, EUPAHW and AgData.
[70] Horizon 2020 European Joint Programme Cofund (EJP Cofund) including One Health EJP and EJP Soil.
[71] Horizon 2020 ERA-net cofund, including ICRAD and ICT-AGRI-FOOD.
[72] Excellent proposals: proposals that in the last evaluation of the proposal status are classified as Main = selected to be funded; Reserve = selected to be funded, in case one of the 'main' does not succeed to sign the grant agreement; No Money = accepted as attain all the thresholds and scores in terms of excellence, impact and implementation, but cannot be funded due to lack of budget.

of evaluation, as it is only at that stage that proposals are complete and considered fully evaluated[73].

The data offers an overview of the number and quality of proposals received. The ratio of excellent to funded proposals was greater than one to one for all categories except CSA in Horizon 2020 (Figure 6). In other words, for each proposal that was funded, there was at least one excellent proposal that was not funded.

The average ratio, for **RIAs**, **IAs** and **CSAs** across **programmes**, **types of action** and **stages**, was **1:2**. This means that, for each proposal **funded**, two **excellent** proposals did **not** get funded.

When considered separately across programmes and stages, **RIAs** had a ratio of **1:2**, **IAs 1:3** and **CSAs 1:1**. The ratio and the average score were both **highest** for IAs. Detailed data are available in Figure 6.

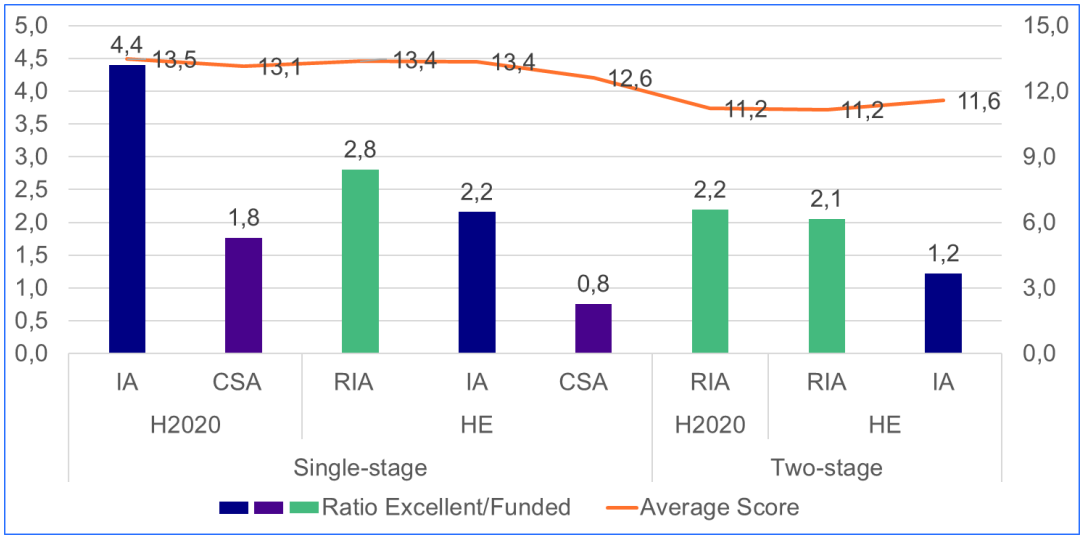

Figure 6. Ratio of excellent versus funded proposals and average score per programme, type of action and number of evaluation stages of topics in agriculture, forestry and rural areas[74].

In addition, an in-depth analysis focused on the top 20% RIAs and IAs topics with the highest ratio in four groups: H2020 single-stage, H2020 two-stage, Horizon Europe single-stage and Horizon Europe two-stage. The top 20% corresponded to 52 topics, which were categorised and grouped as regards the focus of the research themes they covered (Figure 7). A ratio greater than one was observed across all research themes and in particular for livestock, soil and plant protection.

[73] Horizon Dashboard. R&I Proposals: Scope and limitations.
[74] Note that for the two-stage calls, the data refers exclusively to the second stage which evaluates the proposals on their three dimensions: excellence, impact and implementation.

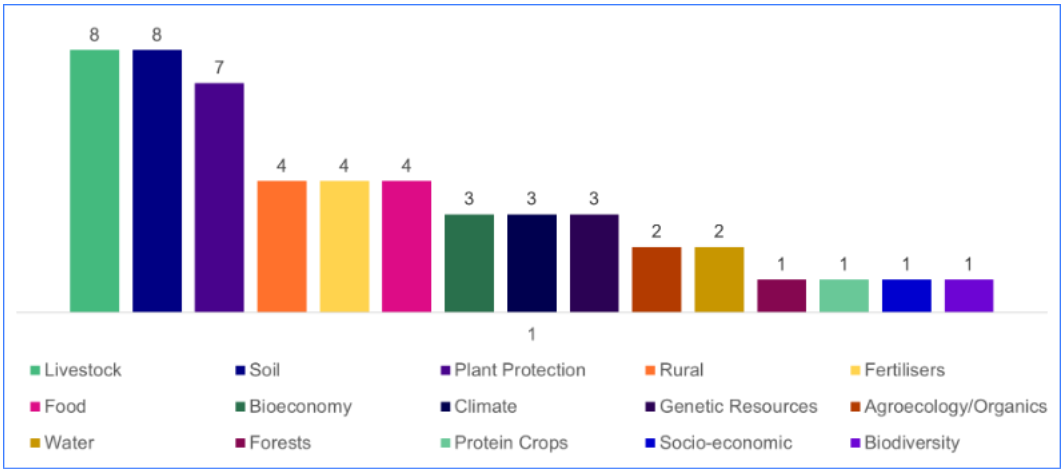

Figure 7. The distribution of the top 20% topics with highest ratio of excellent proposals versus funded proposals clustered per thematic area.

3.3.2. Type of actions: Research and Innovation Actions, Innovation Actions, Coordination and Support Actions, and investments in EU policy priorities

In four years, the current Horizon Europe has already funded Horizon 2020 for RIAs, IAs and CSAs projects (table 1). The number of projects also registered an increase for RIAs and IAs and a slight decrease for CSAs, although the Horizon Europe Work Programmes 2025 - 2027 will contribute further to these figures.

Table 1. The distribution of projects and EU funding for RIAs, IAs and CSAs in agriculture, forestry and rural areas per framework programme.

Type of Action	Number of projects H2020	Number of projects HE	EU funding H2020	EU funding HE
RIA	158	174	EUR 969 873 151.45	EUR 1 118 507 581.71
IA	37	55	EUR 258 692 593.22	EUR 318 610 182.81
CSA	69	65	EUR 167 748 586.52	EUR 254 944 676.64

Figure 8 shows the distribution of types of action over time by call deadline year, with a focus on RIAs, IAs and CSAs.

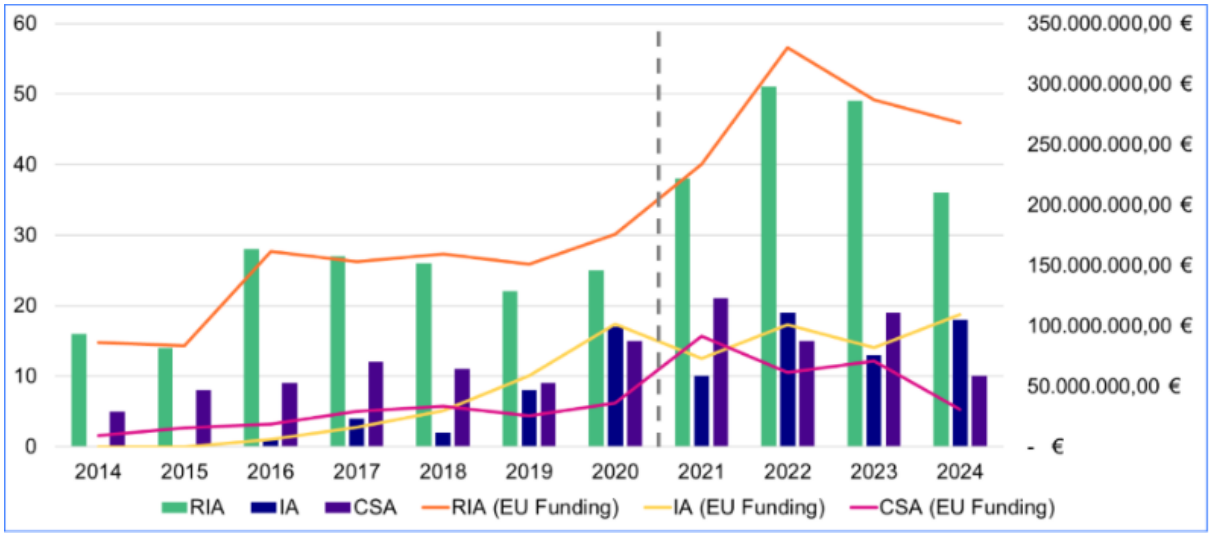

Figure 8. The distribution of collaborative projects in agriculture, forestry and rural areas and EU funding of RIAs, IAs and CSAs, per call deadline year, in the period 2014-2024. The dashed line separates H2020 and the current Horizon Europe years.

Table 2 offers a closer look at the data on the average growth rate of number of projects and EU funding based on a year-on-year analysis with more information on the evolution of these elements over time. The number of projects and EU funding for agriculture, forestry and rural areas under Horizon 2020 and the first phase of the current Horizon Europe increased on average 15% and 20% a year, respectively. IAs increased more than the other types of actions. The number of IAs increased mainly between 2016 and 2020, from one project funded in 2016 to 17 projects in 2020.

Table 2. The average annual growth of number of projects in agriculture, forestry and rural areas, and EU funding for type of action, based on a year-on-year analysis in the period 2014-2024. *Note that during the first two years (2014, 2015) there were no IAs programmed and therefore, the figures below for IAs address the period 2016-2024.

Type of action	Projects	EU funding
RIA	13%	15%
IA*	90%	56%
CSA	14%	26%
Total programme	15%	20%

In addition, the funding dedicated to these types of actions contributes to the different trackers monitored within Horizon Europe 2021-2027 to ensure investments in fields linked to legal commitments and strategic priorities. The R&I funding for agriculture, forestry and rural areas had essential contributions for the climate and biodiversity trackers, while also integrating digital and AI, as showcased in Figure 9.

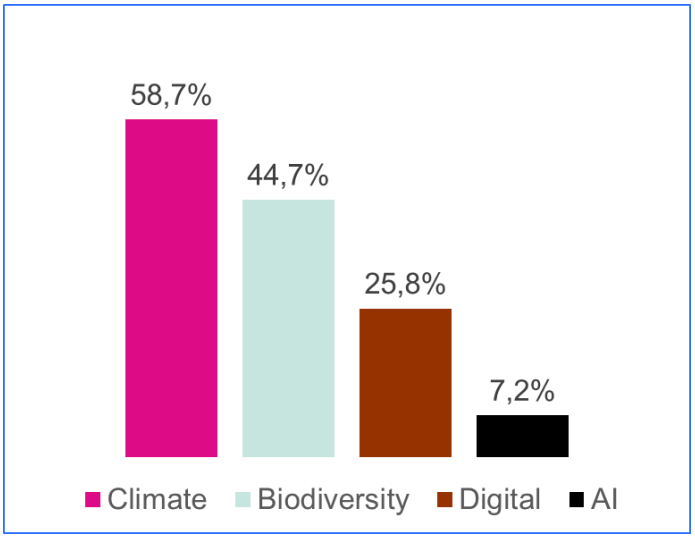

Figure 9. The share of total funding dedicated to the climate, biodiversity, digital and AI trackers during Horizon Europe (2021-2024), considering RIAs, IAs, CSAs, and COFUND

3.3.3. From lab to fab: co-investment, SME engagement and valorisation of results

This section explores Horizon data that provides information on the projects' innovation journey. The analysis explores co-investment rates and the **ability of projects to attract additional funding sources at proposal stage, the projects' results and their exploitation into scientific and commercial outputs**.

Horizon programmes' ability to mobilise additional sources of funding can be measured through the co-funding by participants in R&I projects, referred to as the 'leverage factor'. This indicator is the ratio between the total costs borne by partners with their own funding (other than the EU budget) and the EU budget contribution (i.e. the ratio of other funding to EU funding).

This analysis includes a comparison between Horizon 2020 Societal Challenge 2 and the current Horizon Europe Cluster 6 and between Horizon 2020 Pillar III and the current Horizon Europe Pillar II. It focuses exclusively on projects under the types of action: RIA, IA, CSA, EJP, ERA-NET and co-funded partnerships. It therefore excludes any actions linked to Pre-Commercial Procurement (PCP), Public Procurement of Innovative Solutions (PPI), SME instrument and Joint Undertakings (JU).

The capacity to leverage additional funding is closely linked to the types of actions programmed, as funding actions like COFUND actions or IAs require by default funding resources external to the EU budget funding. For example, IAs require a co-investment of 30% from organisations that are not non-profit legal entities. The same does not apply, for example, to RIAs which can have an EU funding rate of 100% and, therefore, the leverage factor equals zero. On this basis, a comparison of shares of types of actions across agriculture, forestry and rural areas, Cluster 6 and Pillar II programmed in the period 2014-2024 can provide valuable input.

The data shows that the leverage factor for agriculture, forestry and rural areas is lower than the average for Societal Challenge 2 of H2020 and Cluster 6 of the current Horizon Europe, and lower than it is overall for Horizon 2020 Pillar III and the current Horizon Europe Pillar II (Figure 10).

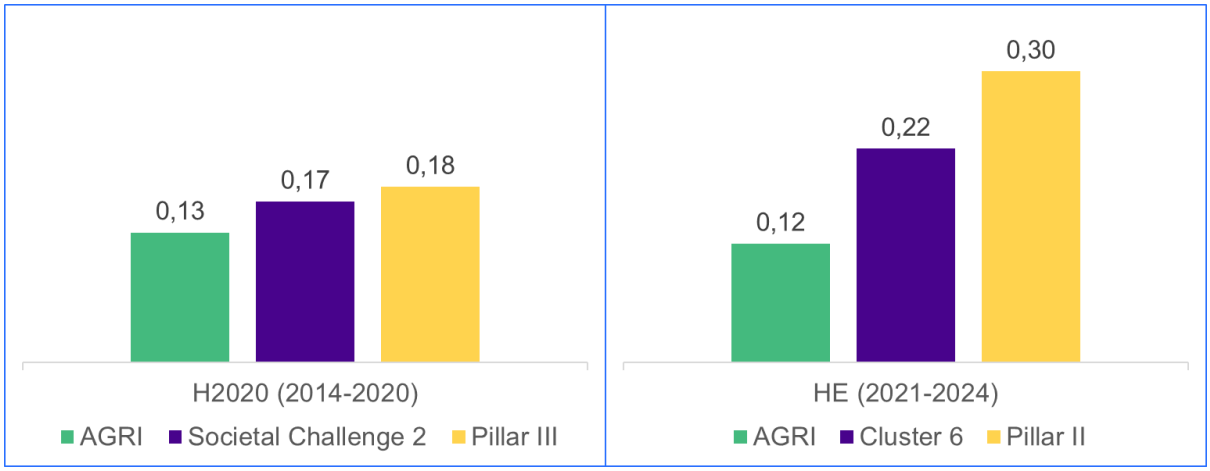

Figure 10. The leverage factor for the agriculture, forestry and rural projects (AGRI) of this analysis, overall for Societal Challenges 2 and Pillar III in Horizon 2020 (left) and overall for AGRI, Cluster 6 and Pillar II in the current Horizon Europe (right), considering RIAs, IAs, CSAs, EJP, ERA-NET and COFUND.

EU funding per type of actions shows that a higher share of planned R&I projects in agriculture, forestry and rural areas is dedicated to RIAs and CSAs than the average shares under Horizon 2020 and the current Horizon Europe (Figure 11). Conversely, the share of EU funding dedicated to IAs is much lower, 17% compared to 29% under Horizon 2020 Societal Challenge 2 and the current Horizon Europe Cluster 6 and 33% under the current Horizon Europe Pillar III and Pillar II. For EJP combined with ERA-NET in agriculture, forestry and rural areas, the share represents 7% compared to 6% and 3%, and COFUND of 8% compared to 9% and 6%, in Societal Challenge 2 / Cluster 6 and Pillar III / Pillar II, respectively.

Considering this information, **the lower leverage factor and therefore, co-investment within projects on agriculture, forestry and rural areas seems to result from the lower use of IAs, which require a co-investment of 30% from organisations that are not 'non-profit legal entities'.**

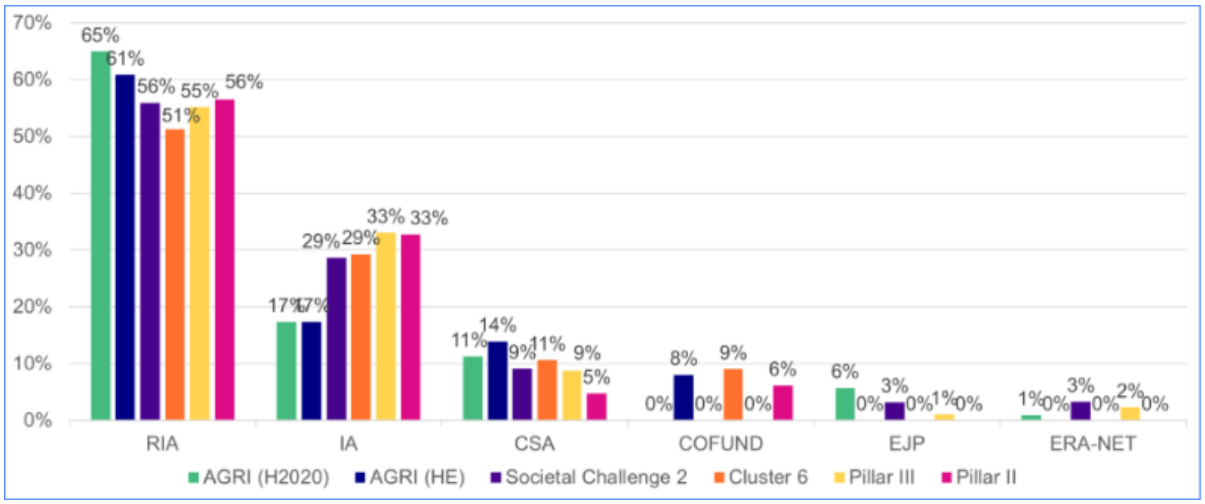

Figure 11. The share of EU funding per type of action and programme, for agriculture, forestry and rural projects (AGRI), Societal Challenge 2, Cluster 6, Pillar III of H2020 and Pillar II of Horizon Europe in the period 2014-2024.

The analysis examines in particular the involvement of SMEs within the R&I-funded projects, and the share of EU funding directed to SMEs. An observed trend is the lower share of funding

to SMEs in comparison to the share of SMEs' participation, which indicates that SMEs are funded below the average beneficiary. This trend is noted in all programmes (Figures 12 and 13).

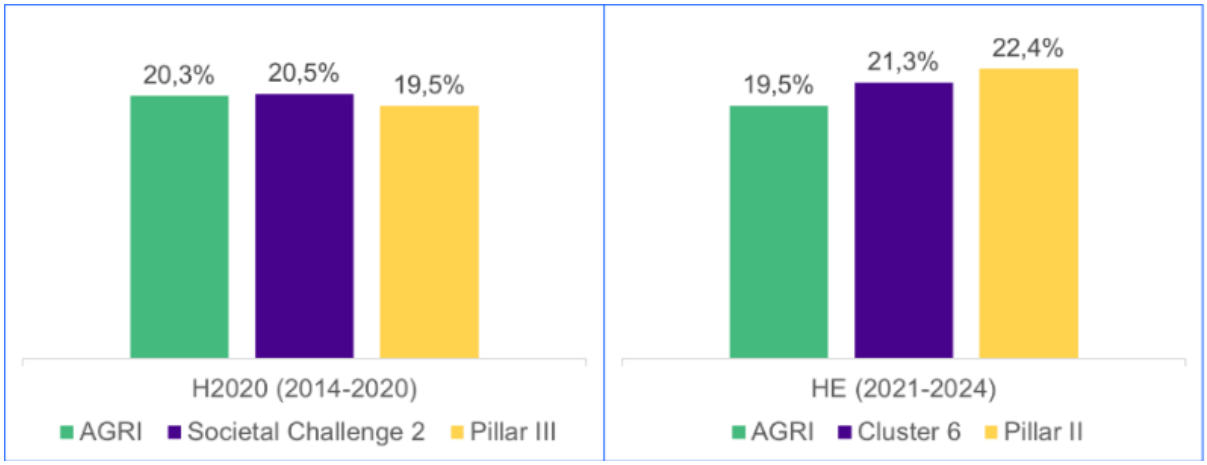

Figure 12. The share of SME participation for agriculture, forestry and rural areas (AGRI), Societal Challenge 2 and Pillar III in Horizon 2020 (left) and for AGRI, Cluster 6 and Pillar II in the current Horizon Europe (right), considering RIAs, IAs, CSAs, EJP, ERA-NET and COFUND

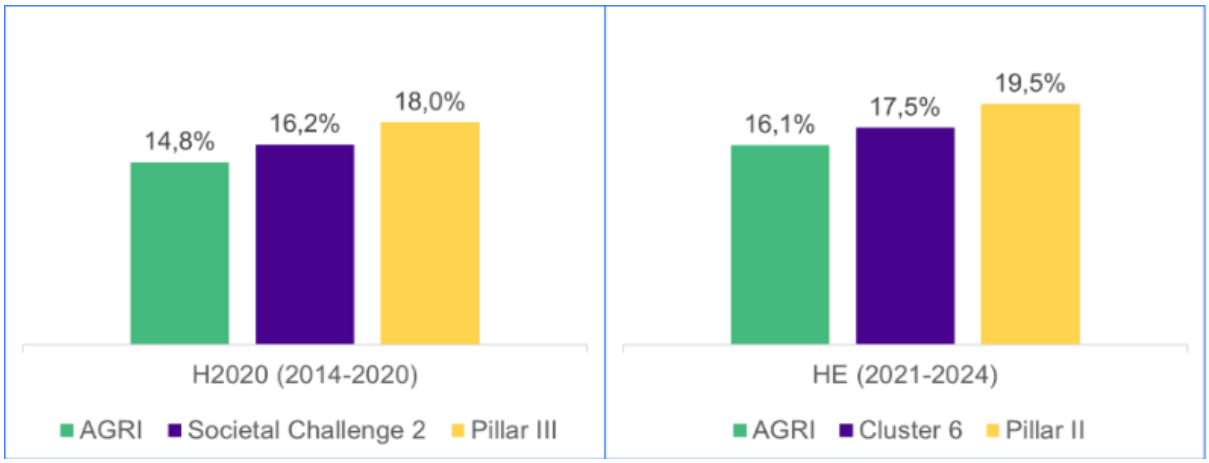

Figure 13. The share of EU funding provided to SMEs for agriculture, forestry and rural areas (AGRI), Societal Challenge 2 and Pillar III in Horizon 2020 (left) and for AGRI, Cluster 6 and Pillar II in the current Horizon Europe (right), considering RIAs, IAs, CSAs, EJP, ERA-NET and COFUND.

Nonetheless, the data provides a limited overview of SMEs. It overlooks the participation and funding of SMEs through tools like sub-contracting or financial support to third parties which is used to engage and involve small actors (like farmers and landowners) in R&I projects. Furthermore, the SME definition does not consider the SME activity, which may differ significantly within R&I projects, from a farm or technology-oriented startup to a communication service provider, which limits the interpretation of the results. Additionally, this analysis does not include types of actions which are designed to involve the private sector such as joint undertakings.

The exploitation and valorisation of R&I results of Horizon projects can be assessed through the analysis of indicators such as the number of projects that published peer-reviewed scientific articles and registered intellectual property rights (IPR) applications.

A data analysis across programmes shows limitations considering the different stage of both programmes, as not all H2020 projects are already concluded, and the current Horizon Europe calls are still ongoing. Furthermore, peer-reviewed publications and IPR applications are typically produced towards the end of the projects and thus require time to be reviewed and reported.

Nonetheless, within programmes, and in comparison, with Societal Challenge 2/Cluster 6 and Pillar III of Horizon 2020/Pillar II of the current Horizon Europe, agriculture, forestry and rural areas related R&I activities presented a higher share of projects reporting peer-reviewed publications in H2020 compared to overall Horizon 2020 Societal Challenge 2 and Pillar III (Figure 14). That trend is reversed in the current Horizon Europe context, which is still ongoing: for this reason, final conclusions cannot be drawn.

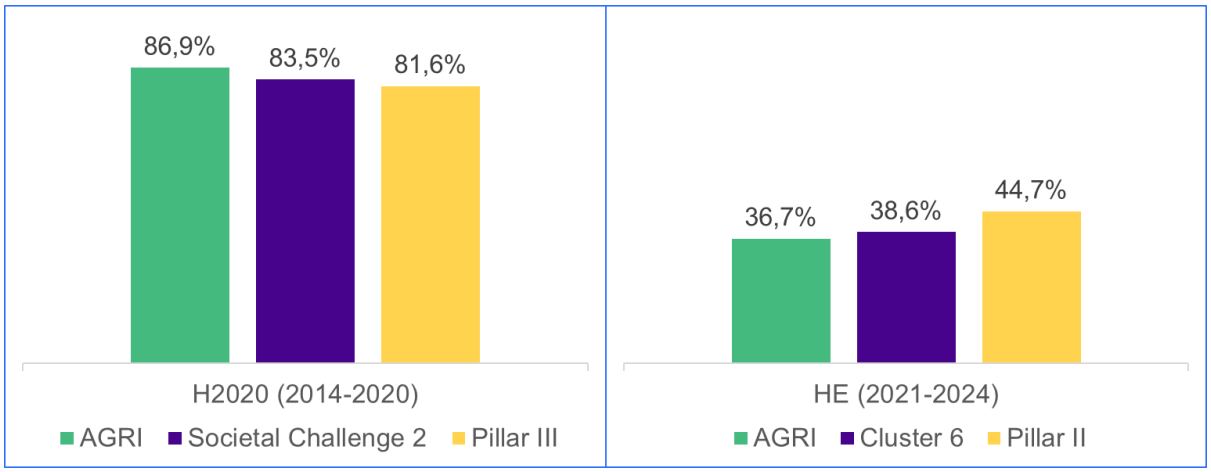

Figure 14. The share of projects that reported peer-reviewed publications for agriculture, forestry and rural areas (AGRI), Societal Challenges 2 and Pillar III in Horizon 2020 (left) and for AGRI, Cluster 6 and Pillar II in the current Horizon Europe (right), considering RIAs, IAs, CSAs, EJP, ERA-NET and COFUND.

The data for IPR applications is very limited, because how advanced both programmes were. In H2020, 4.5% of R&I projects on agriculture, forestry and rural areas led to an IPR application, while R&I projects under Societal Challenge 2 performed better than H2020 Pillar III overall, with 7.3% of funded projects reporting IPR applications (Figure 15).

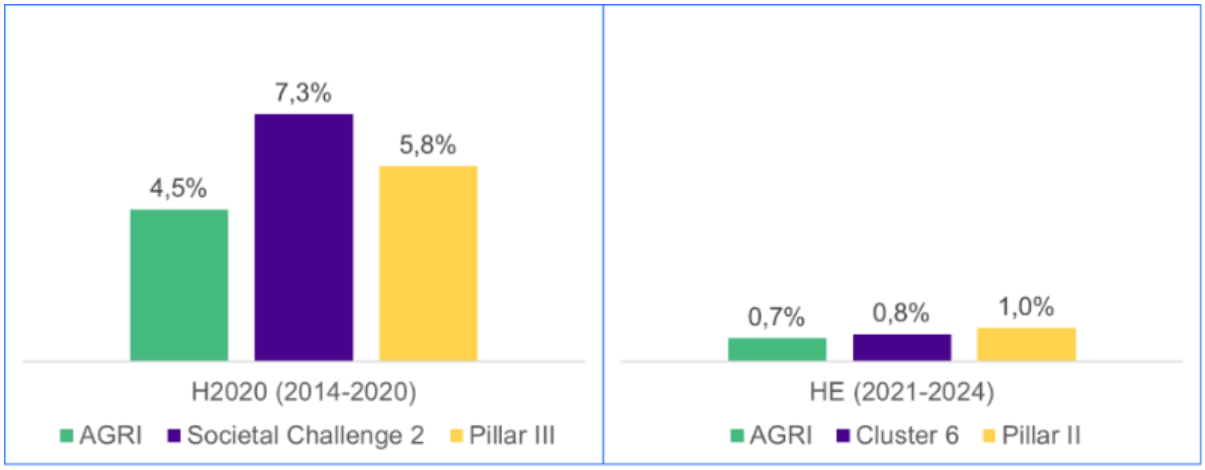

Figure 15. The share of projects that reported IPR applications for agriculture, forestry and rural areas (AGRI), Societal Challenges 2 and Pillar III in Horizon 2020 (left) and for AGRI, Cluster 6 and Pillar II in the current Horizon Europe (right), considering RIAs, IAs, CSAs, EJP, ERA-NET and COFUND.

Between 2014 and 2024, a total of 32 intellectual property rights applications valorising innovations from R&I projects in agriculture, forestry and rural areas were registered, including 13 trademarks and 10 patents. The research areas with the highest number of intellectual property rights applications are agricultural waste, co-products and by-products, plant protection and genetic resources, with five in each of those areas (Table 3).

Table 3. The distribution of the IPR applications resulting from R&I projects for agriculture, forestry and rural areas. N = Number.

IPR Type	Research Topic	N	Programme
Patent	Ensuring sustainable use of agricultural waste, co-products and by-products	5	H2020
Trademark	Innovations in plant protection	5	H2020
Other	Genetic resources and pre-breeding communities	5	H2020
Patent	Increase overall transparency of processed agri-food products	3	H2020
Trademark	EU-China cooperation on IPM in agriculture	3	H2020
Trademark	Traditional resources for agricultural diversity and the food chain	2	H2020
Other	Citizen science for soil health	2	Horizon Europe 2021-2027
Other	New and emerging risks to plant health	1	H2020
Patent	Genetics and nutrition and alternative feed sources for terrestrial livestock production	1	H2020
Patent	Validation of diagnostic tools for animal and plant health	1	H2020
Trademark	Legumes - transition paths to sustainable legume-based farming systems and agri-feed and food chains	1	H2020
Trademark	New and emerging risks to plant health	1	H2020
Trademark	Organic breeding – Increasing the competitiveness of the organic breeding and farming sectors	1	H2020
Registered Design	EU-China international cooperation on nature-based solutions for nutrient management in agriculture	1	Horizon Europe 2021-2027

An indicator that can provide further insights into the R&I projects' results exploitation potential, and more particularly on the development maturity of the solutions, tools or technology developed is the technology readiness level achieved by the end of a project. Data on projects' technological readiness levels is only available for the current Horizon Europe, and partially, as reporting this information is not a mandatory requirement.

Fewer projects related to agriculture, forestry and rural areas report their technology readiness levels than projects under the current Horizon Europe Cluster 6 and Horizon Europe Pillar II (Figure 16). The low level of reporting technological readiness levels hampers a robust analysis of how EU-funded R&I in those sectors has been facilitating the innovation journey. Nonetheless, the reporting took place mostly in projects from 2023 and 2024, 31 out of 42 projects in agriculture, forestry and rural, which shows a positive trend. Furthermore, the share of projects reporting technology readiness levels may significantly vary and increase as the programme progresses, and several projects reach their final reporting period.

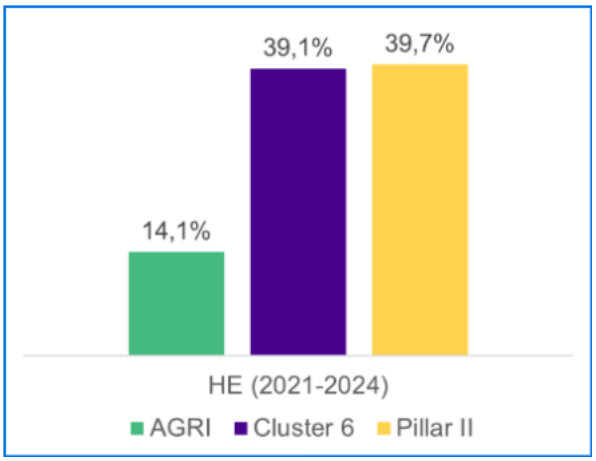

Figure 16. The share of projects reporting technology readiness levels for agriculture, forestry and rural areas (AGRI), Cluster 6 and Pillar II in the current Horizon Europe. No data available for H2020.

4. DELIVERING ON THE FOOD 2030 RESEARCH AND INNOVATION FRAMEWORK

4.1. Relevance of food systems and Food 2030 legacy

4.1.1. *Relevance of Food systems*

The European Union has a world-leading food system driven by advances in life sciences and supported through all European framework programmes for research and innovation including Horizon 2020 and Horizon Europe 2021-2027 , private sector-led research and innovation and excellence in entrepreneurship. It provides safe, nutritious and sustainable food to its citizens.

However, in the context of intensifying global competition, climate pressures and geopolitical uncertainty, Europe's ability to deliver safe, healthy, nutritious and sustainable **food is no longer just a policy objective, it is a matter of strategic autonomy and economic security.** Safe, healthy, nutritious and sustainable food systems are essential for the EU and its policy priorities, in particular for 'sustainable competitiveness and prosperity' and 'sustaining our quality of life'.

The food and drink industry is the largest manufacturing industry in the EU in terms of turnover, value added and employment. It is also a critical source of innovation, prosperity and territorial cohesion. In 2023, it had a **turnover of EUR 1 523 billion** and generated **EUR 296 billion of added value**, nearly **10% higher than that of the agriculture sector**. It employed **4.8 million people**, making it a leading employer in the EU, in **309 000 enterprises**, accounting for 14% of all manufacturing enterprises.

An important characteristic of the food and drink industry is the **large share of small and medium-sized enterprises (SMEs)**. In 2023, 80% of the EU's food and drink manufacturers alone were micro-enterprises, with fewer than 10 employees. SMEs make up 99% of food and drink industries, contribute 39% of the industry turnover and provide 57% of its employment[75]. In 2023, there were 2.7 million enterprises wholesaling, retailing and serving food and beverages in the EU; they employed 17.1 million people and added EUR 549 billion of value.

[75] FoodDrinkEurope-Data-Trends-2026-report-digital.pdf.

On average, people in the EU each spent EUR 4 290 on food, beverages and services serving food and beverages in 2023; this was 8.8% more than in 2022[76].

A competitive and future-proof food system depends on research and innovation and especially cutting- edge technologies: from biotechnology (including plants, microorganisms, fungi etc.) to AI and digitalisation (e.g. smarter data collection and digital solutions), and from sustainable processing and packaging to promotion of circularity and the development of new business models. By closing the 'innovation gap', Europe can take a leading role, not just keep pace, in the global transformation of food systems. At the same time, these innovations will strengthen Europe's resilience and preparedness, ensuring food systems are better equipped to handle future challenges.

Food systems shape livelihoods, drive economic development, affect **public health**, and determine how communities experience and adapt to climate change. At the same time, the global food system accounts for **almost 30% of total global greenhouse gas emissions**[77], the largest contribution coming from agriculture and the land use/land-use change sector (71%), with distribution, processing, consumption and end-of-life disposal accounting for the remaining 29%. Food systems alone are responsible for the transgression of 5 of the 9 planetary boundaries, the Earth's limits beyond which human activity threatens the planet's stability and survival, and are a major contributor to the pressure on the others[78]. For these reasons, it is imperative that food systems become more sustainable in all three dimensions of sustainability.

To act on climate and biodiversity in a meaningful and lasting way, we must address food systems transformation with the same urgency, visibility, and political momentum as energy transitions and nature protection, in ways that strengthen food security and nutrition, climate resilience, and equitable development. This has been outlined in the thematic assessment report on the interlinkages among biodiversity, water, food and health of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)[79].

Food 2030 **is the Research and Innovation (R&I) framework of Horizon 2020 and Horizon Europe 2021-2027 for food systems transformation,** dating back to 2016. It was designed to tackle complex challenges that cannot be solved by any Member State alone or are complementary to Member States initiatives and that require overcoming disciplinary, sectoral, institutional and regulatory silos, as well as to exploit potential.

Food 2030 is part of a wider and evolving **EU and global policy agenda**, in which public research and innovation underpin the transition to competitive, sustainable and resilient food systems and a stronger bioeconomy. This aligns with the **Draghi** and **Letta** reports[80]' focus on competitiveness, innovation, decarbonisation, security, a stronger Single Market (including the 'fifth freedom' for research, innovation and education), and is complemented by the **EU startup and scaleup strategy**[81]. Recent initiatives further support food-systems transformation, notably the **life sciences strategy**[82], the **vision for agriculture and food**[83], the

[76] Key figures on the European food chain – 2025 edition - Key figures - Eurostat.
[77] Crippa, M., Solazzo, E., Guizzardi, D. *et al.* Food systems are responsible for a third of global anthropogenic emissions. *Nat Food* **2**, 198–209 (2021). https://doi.org/10.1038/s43016-021-00225-9.
[78] Rockström J, Thilsted S, Willett W et al. The EAT–Lancet Commission on healthy, sustainable, and just food systems.The Lancet, 2025; 406, 1625-1700, the 5 boundaries transgressed are: land, biodiversity, climate, blue water flows, and biogeochemical flows.
[79] Thematic Assessment Report on the Interlinkages among Biodiversity, Water, Food and Health | IPBES secretariat.
[80] The Draghi report on EU competitiveness and Enrico Letta - Much more than a market (April 2024).
[81] EU Startup and Scaleup Strategy.
[82] Life Sciences Strategy.
[83] Vision for Agriculture and Food.

strategy for a competitive and sustainable EU bioeconomy[84], the **Biotech Act I**[85] and the 2025 **Food and Feed Safety Simplification Omnibus**[86], as well as the **safe hearts plan**[87] promoting healthier diets.

Through a systemic, cross-sectoral R&I approach, Food 2030 operates through **11 thematic pathways for action,** while delivering co-benefits across **four** cross-cutting **priorities**: 1) Nutrition and health; 2) Climate and sustainability; 3) Circularity and resource efficiency; 4) Innovation and communities.

Food 2030 priorities

Nutrition and health

• Promoting healthier and more sustainable diets that prevent diet-related non-communicable diseases.

• Diversifying the offer of proteins sourced from existing and new ingredients.

• Meeting diverse, cultural and specific needs through a place-based dietary shift.

Climate and sustainability

• Reducing greenhouse gas emissions and biodiversity loss.

• Improving air and water quality.

• Reducing dependence on imports (leading to less deforestation) and external inputs (e.g. less use of chemical fertilisers), for positive impacts on the climate.

Circularity and resource efficiency

• Decreasing the resource footprint across all sectors.

• Reducing food waste through the potential reintroduction of by-products into the food chain as alternative protein sources (e.g. use of microorganisms or fungi on food waste).

Innovation and communities

• Triggering innovation, new jobs, business models, value-added products and services.

• Meeting the needs, values and expectations of society, especially vulnerable groups, in a responsible and ethical way.

• Improving the resilience and performance of food systems.

Food 2030 11 Pathways for Action

1. Governance for food systems change
2. Urban food systems transformations
3. Food from the ocean and freshwater resources
4. Alternative proteins for dietary shifts
5. Food waste and resource-efficient food systems
6. The microbiome world
7. Nutrition and sustainable healthy diets

[84] Strategy for a Competitive and Resilient EU Bioeconomy.
[85] EU Biotech Act 1.
[86] Simplification of legislation - Food Safety - European Commission.
[87] https://health.ec.europa.eu/non-communicable-diseases/cardiovascular-health_en#eu-cardiovascular-health-plan-the-safe-hearts-plan.

8. Food safety systems of the future

9. Food systems Africa

10. Data and digital transformation

11. Zero-pollution food systems

4.1.2. *Legacy of Food 2030 and synergies with other Union programmes and activities*

According to the independent experts' evaluation of Food 2030[88], carried out in 2025 and further confirmed by an EU Survey conducted in 2026 targeting food systems stakeholders (see Stakeholders' outreach chapter), the **intervention logic of Food 2030 has been pioneering**, aligning with EU strategic priorities and working across multiple topics, including urban food policy, food safety, alternative proteins for diversified diets or the microbiome world.

Food 2030 has achieved significant milestones by adopting a **holistic approach to food systems**, addressing intricate interactions between ecological, economic, and social objectives. It has allocated approximately **EUR 770 million in funding[89]** under Horizon 2020 and Horizon Europe for research and innovation projects, resulting in valuable scientific contributions and bringing new scientific knowledge in the form of publications, living labs[90], robust policy support[91], innovative business models[92], ICT tools[93], and innovative foods[94].

Additionally, Food 2030 has excelled in **stakeholder engagement** and **community building** by employing the multi-actor approach, participatory methods and place-based solutions, enabling support from local stakeholders and enhancing behavioural change. **Social sciences and humanities**, **Living Labs[95]** and the **multi-actor approach** ensured a broad engagement of diverse stakeholders. This approach has also extended to the creation of a vibrant community, bolstering food systems science and education. One example is the Food 2030 stakeholders mailing list, with nearly 2 000 subscriptions. It has also facilitated cross-European cooperation through the Horizon Europe 2021-2027 **FutureFoodS[96] co-funded partnership**, uniting 83 partners across 29 countries and a 30% EU contribution of around EUR 95 million mobilising another EUR 200 million in Member States' funding. Launched in June 2024, it

[88] European Commission: Directorate-General for Research and Innovation, *Shaping the future of food research and innovation – Insights and recommendations from Food 2030 experts*, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2777/8711448.

[89] Until Horizon Europe Work Programme 2023/2024, excluding the funding allocated to the co-funded FutureFoodS partnership.

[90] The project HealthyFoodAfrica improved the sustainability and resilience of food systems and innovated practices and governance arrangements in ten localized, context-specific Food System Labs across ten African cities. The LIKE-A-PRO project has established Living Labs in 11 European countries to engage with consumers and explore barriers and opportunities related to the uptake of alternative proteins.

[91] The REFRESH project contributed to policymaking by integrating its group of experts into the EU Platform on Food Losses and Food Waste, which informed the process of updating the Waste Framework Directive to include food waste reduction targets.

[92] The project IFISHIENCI produced business models showcasing the potential of valorisation of waste from Recirculating Aquaculture Systems in bio-based industries.

[93] The project FUSILLI produced an ICT tool for behavioural change in the form of a social game, developed through a mobile app, to encourage citizens to adopt a healthy diet.

[94] The project REALM produced novel sensors to monitor the growth and physiological state of microalgae in real-time.

[95] Search the TRANSIT resource hub - Transformative Social Innovation Theory.

[96] FutureFoodS.

resulted from the preparatory work carried out under the CSA FoodPathS[97] (funded under Horizon Europe) with the support of the Standing Committee on Agricultural Research (SCAR).

Most Food 2030 projects were supported through thematic Societal Challenge (H2020) and through Cluster 6 (Horizon Europe 2021- 2027), but it has also benefited from synergies with the broader EU R&I and innovation ecosystem, particularly in relation to market uptake, evidence generation, monitoring and science-for-policy support. This includes the support from the European Innovation Council and the European Food Safety Authority described in Section 2.1.

In addition, the JRC's **EU Food System Monitoring Dashboard[98]** monitors the sustainability of the EU food system from an environmental, economic and social perspective, based on a set of indicators and operates in close connection with **FutureFoodS' Food systems Observatory** for forward-looking analysis and KPI development aligned with Food 2030's objectives. To complement this monitoring for advancing competitive sustainable food systems, Food 2030 has also been working with the well-established EC Knowledge Centre for Global Food and Nutrition Security[99] and the Knowledge Centre for Bioeconomy[100].

EIT Food[101] (the knowledge and innovation community mentioned in Section 2.1) accelerates market uptake by supporting startups and innovation programmes aligned with Food 2030 (e.g. food waste reduction, protein diversification, circularity) developing activities on educational aspects e.g. related to healthy diets which were linked to the Food 2030 priorities. Food 2030 also contributed to the New European Innovation Agenda (which the European Commission adopted in 2022) through the development of the **'Regional Innovation Valleys for Bioeconomy and Food Systems' concept note[102].**

Food 2030 also aligns thematically with the **Smart Specialisation Strategy (S3) thematic platform** on agri-food[103]. The thematic platform and its partnerships bring together regions sharing R&I priorities, all within the framework of the Smart Specialisation Strategy under cohesion policy. In those regions, the European Regional Development Fund (ERDF) plays a key role in supporting R&I capacities and strengthening their R&I ecosystems Also, the Interregional Innovation Investment (I3) instrument[104] is supporting innovation across the agriculture and food sector, helping regions turn Smart Specialisation priorities into concrete market solutions. Among more than 70 projects, the I3 Instrument already supports a growing portfolio that contributes to Europe's bioeconomy and agri-food transition; this includes the AquaLoops4Med, Biotech4Food, and VALUE4PACK projects.

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[97] Co-creating the prototype 'Sustainable FOOD Systems PArTnersHip' | FOODPathS | Project | Fact Sheet | HORIZON | CORDIS | European Commission.
[98] EU Food System Monitoring Dashboard.
[99] Global Food and Nutrition Security.
[100] Bioeconomy Knowledge Centre.
[101] EIT Food | Accelerating Food Innovation for a Future-Fit Food System - EIT Food.
[102] European Commission: Directorate-General for Research and Innovation, *Regional innovation valleys for bioeconomy and food systems*, Publications Office of the European Union, 2023, https://data.europa.eu/doi/10.2777/93434.
[103] Inforegio - S3 Smart Specialisation: Agri-food.
[104] Interregional Innovation Investments (I3) Instrument.

4.1.3. Analytical evidence on Food 2030 delivery and impact proxies

Assessing the **long-term systemic impact of Food 2030** requires structured time-series data, which are not yet fully available. In their absence, this analysis uses a set of **proxy indicators** based on observable project outputs that can reasonably be linked to delivery, uptake and potential impact. These include the *number of projects with living labs*, *coordination and support actions* (CSAs, such as networks and alliances), and *innovation actions* (IAs), based on Horizon 2020 and Horizon Europe 2021-2027 projects under Food 2030 until Work Programme 2023-2024.

Another source of information is a survey conducted in collaboration with the European Research Executive Agency (REA) in 2024-2025. Over 100 coordinators of projects (most of which resulted directly from Food 2030 programming) funded under the societal challenges part of Horizon 2020 and Pillar II of Horizon Europe 2021 – 2027 responded to a questionnaire on *market uptake* and *social innovation* emerging from the projects.

Food 2030 focused on post-farmgate food system actors post farm gate. As explained above, the food and drink industry includes a large share of small and medium-sized enterprises (SMEs). As such, Food 2030 sought to engage SMEs in its funded projects.

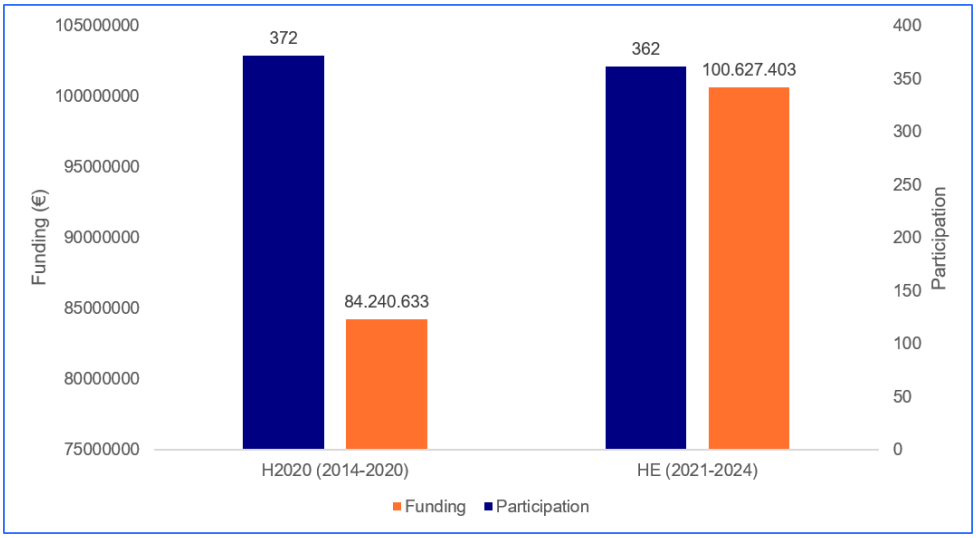

Figure 17: SMEs participation and funding among the Food 2030 projects

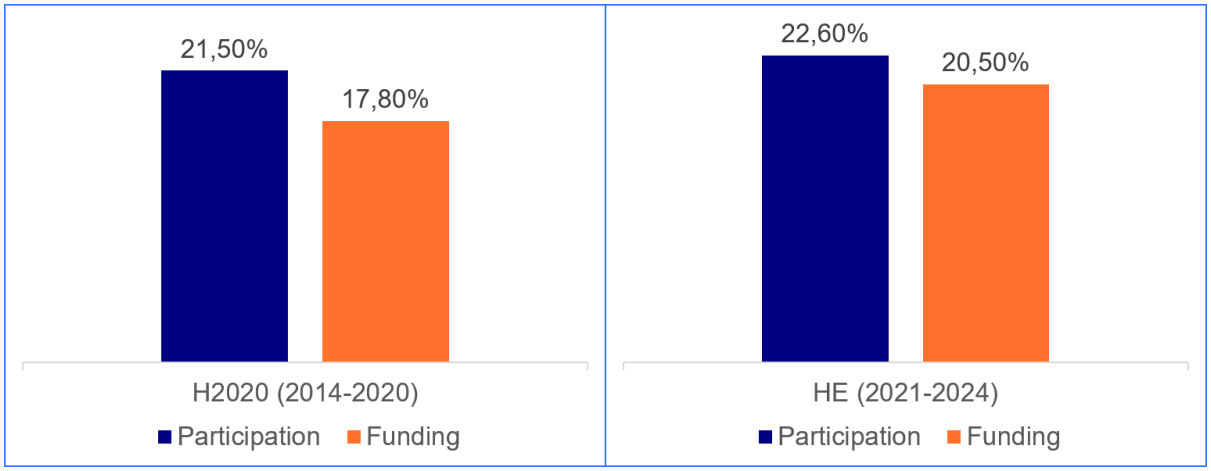

Figure 18: Shares of SMEs participation and funding among the Food 2030 projects

Figures 17 and 18 show a growing involvement of SMEs in Food 2030 projects, alongside a corresponding increase in funding allocated to them. Under Horizon 2020, SMEs accounted for 21.5% of participants (372 SMEs), compared with 22.6% in Horizon Europe 2021-2027 (362 SMEs). Financially, this represents a rise from EUR 84.2 million (17.8% of the total net EU contribution) to EUR 100.6 million (20.5%).

No Food 2030 related projects under Horizon 2020 reported their technology readiness levels, but 24 Food 2030 projects under Horizon Europe 2021-2027 did (14 RIAs and 10 IAs).

Impacts of Food 2030 can also be observed through the number of projects that have produced peer-reviewed scientific articles and registered intellectual property rights (IPR) applications at the end of the projects.

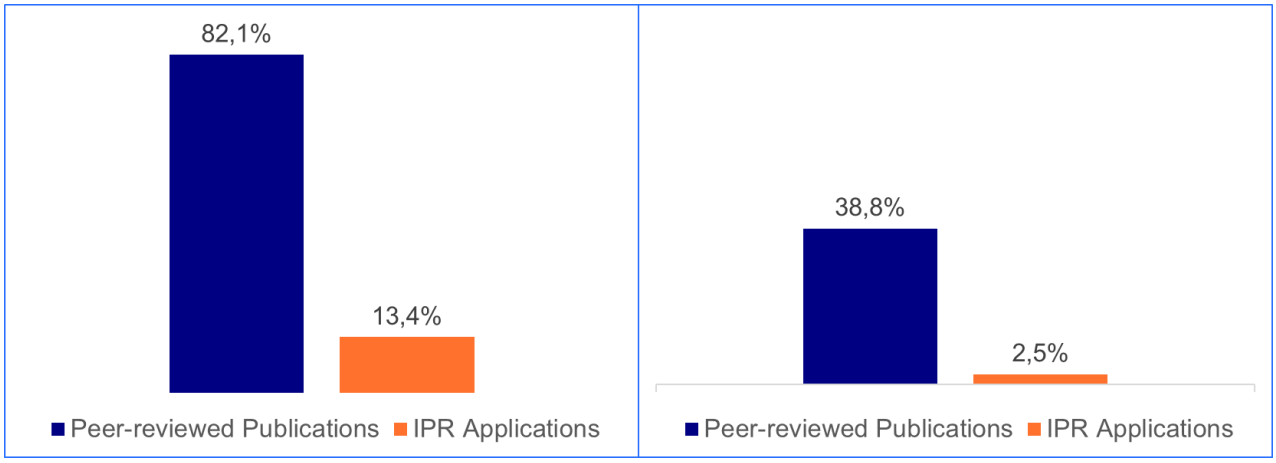

Figure 19: Share of Food 2030 projects that produced peer-reviewed publications and registered IPR

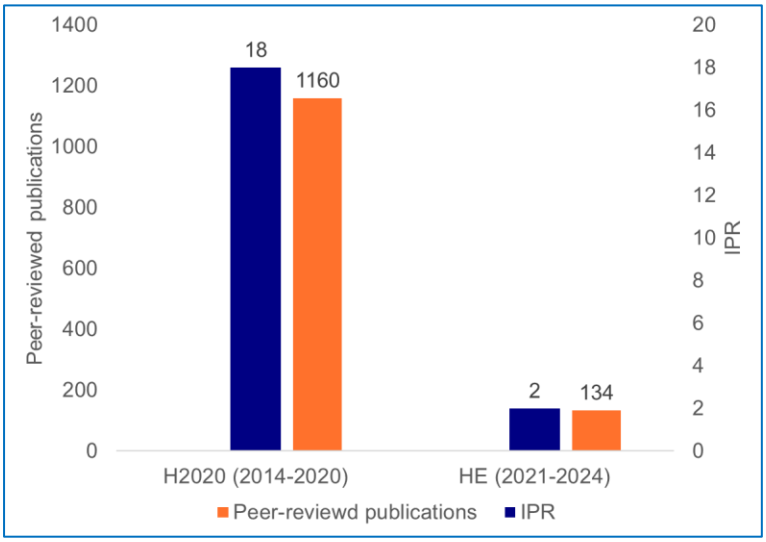

Figure 20: Number of IPR and peer-reviewed publications coming from Food 2030

Figures 19 and 20 show the number of peer-reviewed publications and IPR reported by Food 2030 projects, as well as the share of Food 2030 projects that produced peer-reviewed publications and registered IPR. While Horizon Europe 2021-2027 related projects appear to have significantly fewer IPR applications and peer-reviews exist outputs, this can be attributed to the fact that these deliverables usually come towards the end of a project, and many Horizon Europe projects are still ongoing. As such, a meaningful comparison between Horizon 2020 and Horizon Europe on this indicator is not yet possible.

That said, Food 2030 related projects have generated 18 IPR applications and 1 160 peer-reviewed publications under Horizon 2020, and 2 IPR applications and 134 peer-reviewed publications under Horizon Europe 2021- 2027. About 82% of the Food 2030 projects under Horizon 2020 produced peer-reviewed publications and about 13% of them registered IPR. Under Horizon Europe 2021-2027 so far, about 39% produced peer-reviewed publications and 2.5% registered IPR. By 2024, there were about 8.8 peer-reviewed publications per Food 2030 project.

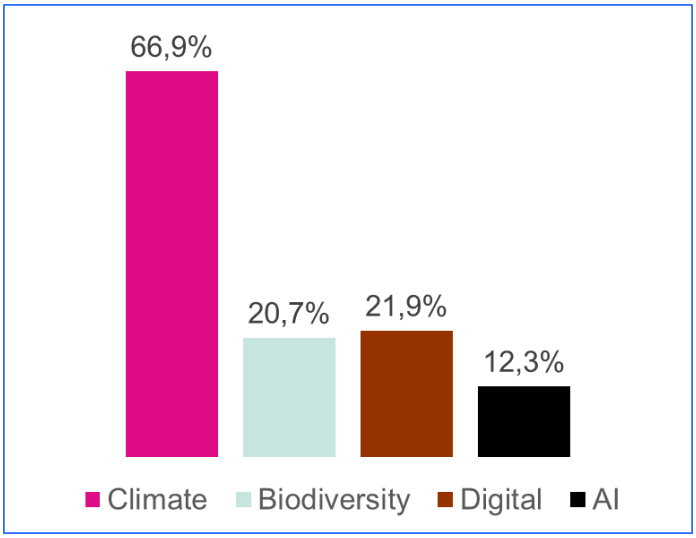

Figure 21: The share of total funding dedicated to the climate, biodiversity, digital and AI trackers during Horizon Europe (2021-2024), considering RIAs, IAs, CSAs, and COFUND

Figure 21 shows that about 66.9%, 20.7%, 21.9% and 12.3% of the Food 2030 funding in Horizon Europe (2021-2024) was at least indirectly dedicated to climate, biodiversity, digital and AI issues respectively.

4.2. Analysis and key achievements

The impact of Food 2030 will be showcased along the four Food 2030 priorities and exemplified by successful EU-funded projects and their concrete outcomes.

Figure 22 shows to which **degree each pathway addressed its own ambitions for the four Food 2030 priorities**[105]. **Communities and nutrition** are covered most by different pathways, while the pathway on food systems in Africa appears to be the most cross-cutting.

[105] European Commission: Directorate-General for Research and Innovation, *Shaping the future of food research and innovation – Insights and recommendations from Food 2030 experts*, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2777/8711448, overview page 20. The assessment considers the degree to which each pathway addressed its own ambitions with regards to the four priorities covering Horizon 2020 and Horizon Europe. The dots represent the presumed level of attention with smaller dots representing lower attention, and larger ones representing higher attention. The figure is informed by an analysis of gaps and contributions as identified by the independent pathway experts.

Figure 22 Degree to which each pathway addressed Food 2030's four priorities

The 2023 **innovation investment gap study**[106] reports that, under FP7 and Horizon 2020, **around 36% of EU funding in food systems R&I activities aligned with the Food 2030 priority** on climate/environmental sustainability, while 27% of the EU funding in food systems R&I activities aligned with the Food 2030 priority on circularity/resource efficiency. By contrast, Figure 22 suggests that Horizon Europe gives relatively greater weight to nutrition and communities, indicating a **shift in emphasis between the two EU funding programmes**, while maintaining the systemic logic of Food 2030.

[106] European Commission: Directorate-General for Research and Innovation, SPI and IPSOS, *Food systems – Research and innovation investment gap study – Policy report*, Publications Office of the European Union, 2023, https://data.europa.eu/doi/10.2777/888905.

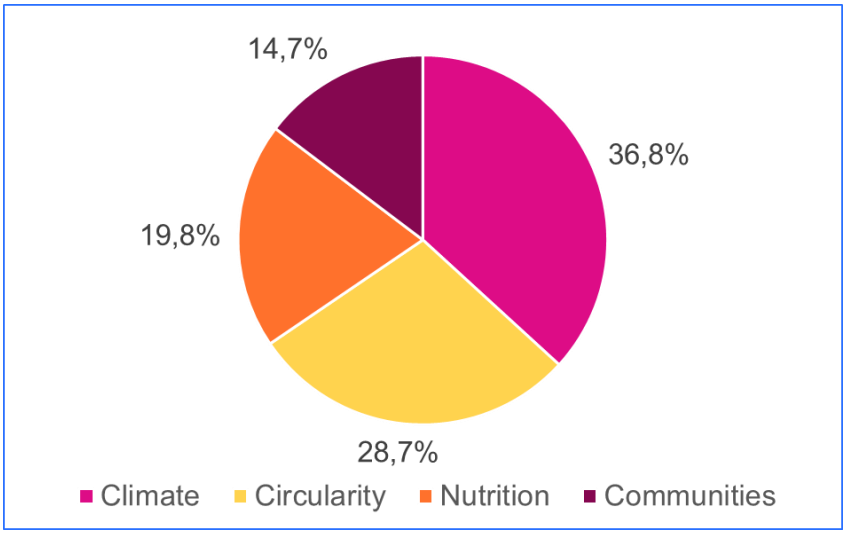

Figure 23 EU-public food-systems R&I funding per Food 2030 priority under Horizon 2020

4.2.1. Nutrition and sustainable healthy diets

Introduction

The target under this priority is to drive a dietary shift that ensures healthy diets and more optimal nutrition, while acknowledging that health and sustainability are intrinsically linked. Key issues under this priority include tackling all forms of malnutrition, from undernutrition to obesity, and improving diets for the general population and specific population groups (including children, older people, and people placed in vulnerable situations). Food affordability is key, given that in the EU over 42 million people cannot afford a quality meal every second day[107]. Access to adequate, safe, sustainable and nutritious food is fundamental for the whole population and particular attention must be given to groups at higher risk of food insecurity or exclusion. This is essential to support health promotion and disease prevention.

What Food 2030 enabled[108]

EU-funded projects supported healthy diets by advancing the state of the art in **personalised nutrition** and **diet-related disease prevention and health promotion**.

Several projects developed personalised nutrition interventions and associated products and technologies (NUTRISHIELD, STANCE4HEALTH, PREVENTOMICS, PROTEIN), including innovations linking diet to **individual health profiles** using omics (dataNUTRISHIELD, STANCE4HEALTH) and digital delivery such as AI-enabled apps and wearables and communication technologies (CoDiet, PROTEIN). The **microbiome** pathway was integrated by investigating how plant-based and fermented-derived food can modulate gut microbiome to **prevent metabolic diseases** (DOMINO) and by assessing the nutritional impact of **microbial fermentation on pulse-based diets** (HealthFerm).

Projects also targeted urgent public health challenges, such as **obesity** (STOP, SWEET) and tackling **malnutrition in older people** (PROMISS), while **promoting sustainable dietary**

[107] Eurostat, 2023.
[108] Based on assessment of external expert report: European Commission: Directorate-General for Research and Innovation, *Shaping the future of food research and innovation – Insights and recommendations from Food 2030 experts*, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2777/8711448.

patterns through different approaches including diet's true cost (FEAST, PLAN'EAT, SWITCH).

Food 2030 supported **food safety** by advancing the state of the art and final applications to benefit the EU food sector, consumers, industry, and to provide policy recommendations. In the field of food safety, knowledge consortia worked closely both with the EFSA on the development of **risk assessment platforms** (FoodSafety4EU) and with the industry and even filed **patents**, e.g. for new kitchen tools and appliances (SafeConsumE).

Projects under the Alternative Proteins pathway aimed to diversify our dietary habits with alternative protein sources[109] (plant-based, fungi, microbes, meat from cell cultures, insects, macroalgae and microalgae, etc.). These projects help tackle global challenges such as climate change, natural resource scarcity, food security and sustainability, and malnutrition[110]. Diversifying our protein sources can also help build food system resilience and can also reduce reliance on imported proteins. Lastly, as alternative protein products could also reduce the risk of zoonotic diseases and antimicrobial resistance, the R&I investment in this area, also helps boost the '**One Health**' approach.

Relevant projects fostered **healthy diets beyond Europe**, by analysing the food needs and choices of 10 000 urban and rural consumers to support more plant-based diets, developing 26 ingredients/products with improved authenticity and safety solutions (e.g. smart storage and bio-based packaging), and delivering tailored nutritional recommendations and consumer nutrition-awareness campaigns (FOODLAND).

In addition, the projects funded under Cluster 6 of Horizon Europe 2021- 2027, are also in complementarity with other **projects under Cluster 1 'Health',** the **ERA4Health[111] partnership**, as a proof of synergies to reinforce the link between healthy diets, nutrition and prevention of certain diseases such as obesity, diabetes, cardiovascular and mental health diseases and disorders.

Flagship stories

Pathway: Alternative proteins for dietary shifts

Giant Leaps (2022-2026, RIA) is a project with 30 partners that seeks to **accelerate the dietary shift from animal-based proteins to alternative dietary proteins** and to improve people's well-being and health, by providing strategic innovations, methodologies, and open-access datasets.

The project advances multidisciplinary work on alternative proteins, **spanning food processing, sustainability assessment, consumer research, data infrastructure, and health-related studies**. It analysed current food consumption in 28 European countries to evaluate nutritional adequacy and quality, and environmental sustainability. Several scientific articles published include Which are the most promising protein sources for meat alternatives? and A review of the toxicological effects and allergenic potential of emerging alternative protein sources. The work carried out so far covers a broad range of approaches,

[110] Bending the curve of land degradation to achieve global environmental goals | Nature.
[111] ERA4Health Partnership.

including **microbial fermentation, enzymatic processing, solid-state fermentation, extrusion, and high-pressure technologies**.

Six categories of food prototypes have been developed, supporting the dietary transition towards alternative protein sources. Prototypes of vegan burgers, meatball analogues, a cheese spread analogue, egg replacers for bakery products, and milk and yogurt alternatives have been developed. While the prototypes offer promising opportunities for food innovation, optimizing taste and texture remains a key area for further development to ensure consumer acceptance and satisfaction.

LIKE-A-PRO (2022-2026, IA) explores the production of new food products from alternative protein sources such as **rapeseed, mealworms, krill, microbes, mushrooms, fermented fungi and peas**. It also investigates the consumers' needs and ways to meet them with new products (Food system maps for 13 countries). The project involves **45 project partners**. Notable achievements have been reached so far including the upscaling and characterisation of several alternative protein ingredients, the development of an extensive portfolio of pilot-scale food products, and the large-scale implementation of **Food Environment Living Labs across 11 countries**. These activities produced robust evidence on consumer behaviour, food environments, nutritional quality, safety, regulatory feasibility, and socio-environmental impacts, thereby strengthening both the scientific and policy relevance of the project. In several cases, results went beyond the originally planned scale, such as the number of food prototypes developed and the breadth of outreach and engagement activities. A total of **63 pilot-scale food prototypes** were developed across **22 product types**, exceeding initial targets.

Both of these projects, and others, are also part of the Horizon4Proteins collaboration, and Horizon Magazine dedicated an article promoting the key findings in this area.

Pathway: Nutrition and sustainable healthy diets

CoDiet (2023-2026, RIA) created the **largest collection of biomedical data**, verified by both AI and human experts, including unique categories of information. This data has been used to **train specialized AI models** for reviewing medical literature, helping us understand the **connections between diet, disease risk factors, and biological mechanisms, particularly metabolic syndrome.**

A pilot study running in the UK, Greece, Ireland, and Spain has been conducted to test new technologies to **monitor diet and non-communicable diseases (NCD) risk** using (i) passive cameras and biomarkers from blood and urine for dietary assessment, and (ii) integrated genetic, metabolomics, and metagenomics data with non-invasive sensors for NCD risk monitoring.

This project is also part of the research multidisciplinary network, the European Cluster of Obesity Research Projects (OBEClust) aiming to increase the impact of obesity research in Europe, with a focus on prevention.

FEAST consortium (2022-2027, RIA) involves 15 countries, 35 partners and 13 living labs. It supports the EU's just transition to healthy diets produced by sustainable food systems. It seeks to make it easy for everyone in Europe to eat delicious, healthier and more sustainable food along the entire chain from the production systems to the final consumers.

It **maps and monitors dietary patterns** for the general population as well as for vulnerable groups and it identifies the **micro-level factors influencing individual food choices and behaviours**. It also analyses in detail the geographical, socio-economic, behavioural, and cultural drivers that shape dietary habits at both the individual and group levels.

It provides a **toolkit** with examples of strategies and interventions that can be used to address **drivers and barriers to healthier and more sustainable eating habits**. Key recommendations for food companies, governments and communities use the **Healthy Food Environment Policy Index (Food-EPI)**. it also provides a practical handbook containing the experiences gained from the living labs for the co-developed interventions focussing on food, health and sustainability.

4.2.2. Circularity and resource efficiency of food systems

Introduction

This priority focuses on achieving circularity and resource efficiency within food systems, emphasising the need for sustainable practices to reduce and valorise the staggering 58 million tonnes of food waste generated annually in the EU[112], with an associated market value estimated at EUR 132 billion[113]. This involves a commitment to minimising food loss and waste, enhancing recycling processes, and rethinking food packaging to adopt biodegradable options. It also responds to rising consumer demand for more transparent, sustainable and locally relevant food choices, while supporting shorter and more resource-efficient supply chains. An integral aspect of this priority is reducing water and energy consumption to boost resource efficiency across all sectors of the food systems. Climate change may aggravate food systems problems in countries with delicate food security balances and relatively high levels of vulnerability to climate change due to the large-scale use of scarce resources (water, land, etc.)[114].

What Food 2030 enabled[115]

Food 2030 projects supported circular and resource-efficient food systems and healthier food choice while **reducing pollution and waste**. They:

- promoted change to **cut spoilage** and encourage **healthier consumption habits** (SISTERS, CHORIZO);
- enabled **practical solutions** such as diet planning and food-bank optimisation to improve access (ZeroW);
- **strengthened food security** by increasing redistribution of edible food and reforming standards, combined with behaviour-driven interventions to reduce avoidable losses (REFRESH, ZeroW);

[112] Eurostat, 2025.
[113] SWD (2023)421.
[114] Ensuring Access to Safe and Nutritious Food for All Through the Transformation of Food Systems - Science and Innovations for Food Systems Transformation - NCBI Bookshelf.
[115] Based on assessment of external expert report: European Commission: Directorate-General for Research and Innovation, *Shaping the future of food research and innovation – Insights and recommendations from Food 2030 experts*, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2777/8711448.

- **quantified greenhouse-gas reductions** enabled by waste valorisation and reuse pathways (SCALIBUR, FOLOU).

Under this priority, the **microbiome** plays a specific role in tackling food waste, as the microbiome influences the rate of food breakdown, and contributes to the decomposition of organic matter. Projects like CIRCLES and SIMBA harness microbial 'circular actions' to optimise food production cycles, using beneficial microbes to break down organic side-streams and convert them into high-value nutrients, thereby reducing the environmental footprint of the food system. Microbes also have the potential to break down plastic waste and convert it into useful by-products such as biofuels or biodegradable materials. This approach has the potential to not only reduce plastic and chemical pollution but also create new sources of sustainable materials and energy.

Food 2030 also supported the development of sustainable fisheries and aquaculture in the **ocean and freshwater ecosystems.** This included advancing predictive capacity supporting ecosystem-based fisheries (EcoScope) following the maximum sustainable yield principle (SEAwise). Science-based feeding and breeding in aquaculture was also advanced (NewTechAqua, FutureEUAqua).

Flagship stories

Pathway: The microbiome world

DOMINO (2023-2028, RIA) is designed to **scale high-potential microbial innovations** into commercial applications. While earlier research focused on mapping microbial ecosystems, DOMINO applies those findings to build a **climate-neutral food chain**.

The project uses established tools such as the **CuratedFoodMetagenomic database** to harness **beneficial bacteria as natural preservatives for fermented foods**. One core aim is to develop **optimised, health-promoting products** that improve digestion and safety while offering chemical-free alternatives in line with the EU vision for agriculture and food. DOMINO also prioritises **waste valorisation**, using advanced technology to convert food side-streams and waste into high-value ingredients. By turning knowledge into scalable solutions, the project helps bring a decade of scientific breakthroughs closer to the consumer market and builds strategically on the results of MASTER.

Pathway: Food safety systems of the future

WATSON (2023-2026, RIA) takes a full-chain systems-based approach, from producer to consumer. Its main aim is to deliver a **transformative traceability framework** that integrates data-driven services, intelligence-based toolsets and risk-estimation approaches, enabling food safety authorities to identify and prevent fraudulent activities. The pilot demonstration and validation campaigns enabled the deployment of the Watson solutions in real operational environments across six important value chains (wine, honey, olive oil, meat, dairy, and fish).

Supporting policy with scientific evidence: in support of the Watson project, the **JRC has consolidated 2 445 food fraud incidents** reported since 2016 (as of January 2026) into a single, harmonised dataset and developed an interactive application to facilitate exploration and analysis. The platform enhances pattern detection and supports early identification of

emerging risks. The policy briefs have mapped **critical fraud vulnerabilities** across supply chains (including **other value chains at high fraud risk (i.e. mushrooms, coffee, cocoa and spices**) beyond the Watson framework). The project launched a communication campaign in Euronews series under the name of Food Detectives[116].

FoodSafety4EU (2021-2023, CSA) aimed to build a permanent, collaborative EU Research & Innovation platform connecting food safety stakeholders across Europe. The platform has 42 formal members, over 80 collaborating institutions and more than 10 EU projects, expanding its impact across nearly all Member States and associated countries. Through a dynamic, participatory approach, FS4EU succeeded in structuring, mobilizing, and engaging a wide network of actors spanning authorities, scientists, industry, and civil society.

A key achievement of the project is **the development of a dynamic Strategic Research and Innovation Agenda (SRIA)**, updated annually through the EU Food Safety Forum, which has become a central science–policy–society interface. Importantly, the SRIA evolved consistently with the European Commission's policy framework and its latest update specifically focuses on bridging the gap between research and innovation to strengthen EU competitiveness.

To ensure long-term sustainability, FoodSafety4EU established a non-profit legal entity (PIC 872618306) powered by the Consiglio Nazionale delle Ricerche in Italy to support a permanent structure. It continues to engage and proactively stimulate the participation of the EU Food Safety community through the organization of the annual EU Food Safety Forum.

Pathway: Food from the ocean and freshwater resources

AWARE (2022-2026, RIA), is developing **fish farming in recycled water** and is showing that producing fish for human consumption is feasible in any city, with no impact on natural habitats and no dependence on natural freshwater availability. Specifically, AWARE created the first European case study for reclaimed water aquaponics in the town of Castellana Grotte (Puglia, Italy) within a wastewater treatment plan using a multitrophic aquaponics recirculation system. To promote the public awareness that fishes and plants grown with properly treated wastewater can be safely consumed, good for the environment and for human health. It will publish a study on health safety of fishes and vegetables consumption. It will eventually add a new value chain for the farm-to-fork production of fish and vegetables to the local economy, providing new jobs and a cheaper food production pipeline.

IMPRESS (2023-2027, IA) focuses on **zero-waste, sustainable aquatic food value chains** using low trophic species and innovative circular solutions. To date it has conducted a pan-European survey to analyse consumer preferences, habits, barriers, and attitudes toward seafood, plant-based, and aquatic plant-based products across six countries. It also optimised extraction of chitin and chitosan from shrimp shell waste and fish protein isolates, hydrolysates, and lipids from haddock waste using eco-friendly technologies. High value polysaccharides and proteins were recovered from macroalgae via biorefinery approach. A combination of microalgal extract and microalgae-derived oil demonstrated liver-protective

Pathway: Food waste and resource-efficient food systems

[116] https://www.euronews.com/the-food-detectives.

ZeroW (2022-2025, IA) provided significant contributions to preventing and reducing food waste and enhancing the sustainability of food supply chains.

Specifically, it demonstrated innovative food loss and waste reduction solutions in nine living labs along real-life food chains to effectively address the multidimensional issue of food waste. These real-life Living Labs embedded systemic innovations with the potential to lead to fundamental changes in both social dimensions (values, regulations, attitudes) and technical dimensions (infrastructure, technology, tools, processes) and in the relations between them.

At the end of the project, seven of the nine living labs have chosen **commercialisation routes**, and five are anticipating revenue growth for the partners involved.

4.2.3. Climate-smart and environmentally sustainable food systems

Introduction

This priority emphasises the responsible use and management of natural resources - water, soil, land, and sea - in our entire food system while staying within the planetary boundaries, ensuring their availability for future generations. This priority aims to enhance research and innovation to support climate-smart food systems that adapt to climate change, conserve and restore natural resources and ecosystem functions, and reduce environmental degradation while contributing to climate change mitigation. By encouraging and developing sustainable and innovative practices, this priority helped to develop food systems that are resilient, environmentally sustainable and capable of contributing to climate mitigation and adaptation.

What Food 2030 enabled[117]

Projects supported climate-smart and environmentally sustainable food systems by supporting **greenhouse gas emission mitigation**, reducing ecosystem pressure, including greenhouse gas reduction quantifications from waste valorisation and reuse (SCALIBUR, FOLOU, ZeroW, CIRCLES). **I**mproved resource use (ToNoWaste, SIMBA) fostered **climate adaptation and mitigation**. The **environmental impact** of specific alternative proteins was also addressed (GIANT LEAPS).

Beyond Europe, projects supported **biodiversity goals** by valorising local varieties and species, as well as contributing to the implementation of agro-ecological practices, precision irrigation and protection systems, biodegradable mulching, food safety and integrated aquaculture (FOODLAND, HealthyFoodAfrica, HealthyDiets4Africa, InnoFoodAfrica, UPRISE, FS4AFRICA).

Flagship stories

Pathway: The microbiome world

MASTER (2019-2023, IA) pioneered the use of **microbiome-based DNA sequencing** to map microbial relationships across marine, plant, soil, rumen, and food systems. This Horizon 2020

[117] Based on assessment of external expert report: European Commission: Directorate-General for Research and Innovation, *Shaping the future of food research and innovation – Insights and recommendations from Food 2030 experts*, Publications Office of the European Union, 2025, **https://data.europa.eu/doi/10.2777/8711448**

initiative bridged the gap between frontier science and commercial use, yielding **over twenty innovations** to improve the quality and sustainability of agri-food chains.

Key outputs included a **high-efficiency DNA extraction kit** and the **CuratedFoodMetagenomic database**, a vital tool for detecting microorganisms in food processing environments. In the agricultural sector, researchers developed microbial strains to fight crop pathogens and biofertilisers to boost grass quality. The impact extended to aquaculture, where probiotic strains improved fish growth and animal husbandry, where microbiome modulation enhanced nutrient extraction while cutting methane emissions.

By exploring fermentation as a natural preservative, MASTER also laid the groundwork for safer, health-promoting food products. These achievements provided the blueprints now being scaled by successor projects like DOMINO or HoloRuminant.

Pathway: Zero-pollution food systems

MAGNO (2024-2027, RIA) is **supporting decision-making around food packaging**, contributing to the European Green Deal and EU 2030 Climate Target Plan objectives. It aims to improve the sustainability and efficiency of food packaging, promote directions for new policies and increase social innovation.

The project will examine plastic packaging value chains and create **an ecosystem digital twin** to provide innovative and circular business strategies drawing a map of different scenarios ahead. It will use a multi-actor approach by involving researchers, food business operators, packaging producers, developers, converters, recyclers, consumers and local authorities to prevent and reduce plastic packaging pollution in Europe and the Mediterranean Sea.

Pathway: Food waste and resource-efficient food systems

PRECIOUS (2024-2028, RIA) and **WASTEWISE** (2024-2028, RIA) are expected to deliver robust, harmonised data on the environmental footprint of food waste across the food supply chain, with a particular focus on greenhouse gas emissions.

They will apply the life cycle assessment methodologies to identify and assess effective prevention and reduction pathways, contributing to climate mitigation, biodiversity protection and resource efficiency. Their work will also support the integration of food waste reduction measures into key EU policy instruments, including national energy and climate plans, thereby advancing the Food 2030 priority on environment and helping to achieve the EU's 2030 climate targets.

4.2.4. Innovation and empowerment of communities

Introduction

Transforming food systems requires systemic change involving actors across the entire food system, including innovators, industry, researchers, public authorities, civil society, local and regional authorities, and citizens.

The food sector is moderately innovative overall, with strong pockets of innovation (alternative proteins, functional foods, fermentation, digital traceability, and sustainable packaging) but

slower diffusion than sectors like technologies or pharma. R&I intensity is generally low, especially among SMEs, because margins are tight, the sector is risk-averse and failure is costly. Large multinationals typically invest more in R&I than smaller firms, while SMEs and startups tend to be the carriers of niche or disruptive innovation. Nevertheless, uptake of innovations can be quick when innovations reduce cost, risk, waste, or labour.

Food retail and distribution, another part of the food system, shows faster change in customer-facing and digital areas (loyalty schemes, personalisation), than core logistics. E-commerce has driven significant experimentation. Automation is growing (self-checkouts, micro-fulfilment, warehouse robotics, vertical farming, etc.), but rollout is capital-intensive. Supply-chain visibility and traceability technology is expanding, yet hindered by interoperability and supplier readiness. Overall, uptake of innovation is shaped by legislations and compliance (food safety, labelling, etc.) and consumer trust.

This priority focuses on promoting a healthy, place-based innovation ecosystem that supports the creation of innovative and digital technologies, new business models and solutions with societal benefits and market potential. This approach aims to foster resilient and empowered local and regional communities, generate employment across the EU, and support vibrant urban, rural, and coastal economies. Research and innovation challenges under this priority include fostering food governance innovation at all levels, empowering local authorities, facilitating social innovation, combating food poverty, and ensuring sustainable, accessible food in marginalised communities. It also emphasises citizen science, education, skills and capacity development, including data-driven solutions.

What Food 2030 enabled[118]

EU Food 2030 projects helped translate R&I investments into **direct policy change**. EU funding enabled cities to make formal political commitments to food, adopt food policies and dedicated budgets, and set-up of food policy councils charters and municipal food commissions (CLEVERFOOD, FUSILLI).

Job creation was fostered by local activities; for example, FoodSHIFT2030 led to the creation of jobs based on continued Living Lab activities. There are examples of effective industry involvement, with several **patents** filed e.g. for new kitchen tools and appliances as a direct result of the project (SafeConsumE). **SMEs and business development** were supported by connecting food companies with technology and the IT community (S3FOOD, Data4Food2030).

A range of projects contributed with **digital and technology innovations**. ALLIANCE, and HOLIFOOD were early examples of **blockchain and AI technologies** within the food safety and quality domain. Other projects on microbiomes advanced **pan-European interoperability in data, standards and tools** for scalable solutions in food safety, sustainability and microbiome applications (e.g. SymbNET, Holofood, 3D-omics, HealthFerm). Digital innovations use **metadata from in-situ and/or remote sensors and omics technologies** to develop and demonstrate next-generation food safety and traceability systems (FoodSafety4EU, FoodSafeR SAFFI, DiTECT).

[118] Based on assessment in external expert report: European Commission: Directorate-General for Research and Innovation, *Shaping the future of food research and innovation – Insights and recommendations from Food 2030 experts*, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2777/8711448.

Community-driven innovations feature prominently under the pathway on urban food systems, deployed through **living labs** (e.g. Cities2030, FUSILLI, FOODCLIC), but also through **governmental and social innovations** such as installing food policy councils or drafting advisory plans for food systems governance (FOODSHIFT2030).

Community empowerment was enhanced through **networks** for knowledge sharing and enhanced collaboration (e.g. SWEET, CO-CREATE, FOSSnet**)** and **innovative citizen education** by bringing science and food choices into public spaces with accessible learning formats, combining experiential outreach, digital learning platforms and training for citizen science (e.g. SUMMER; AquaVitae, FOSTER*)*.

Food 2030 created policy impact beyond the project level, it **inspired local and regional food policies**, such as the Flemish Food Strategy, which based their four strategic pillars on the Food 2030 priorities.

In addition, on 20 March 2024, the Commission adopted the Communication Building the future with nature: Boosting Biotechnology and Biomanufacturing in the EU'[119]. Under Horizon Europe 2021-2027, the Commission introduced a biotechnology and biomanufacturing monitoring flag to monitor how Horizon Europe impacted the implementation of the Biotechnology and Biomanufacturing Communication. Under Pillar II, Pillar III (EIC) and CBE JU, the HE Work Programme 2025 provided funding of around EUR 100 million in the food area.

Flagship stories

Pathway: The microbiome world

MicrobiomeSupport (2018–2022, CSA) created a **harmonised framework for microbiome research** across 33 countries; today, it **continues to operate** as an autonomous association. The project acted as the 'architect' of the field, mapping global research to eliminate redundant funding and effort. A major milestone was the Strategic Research and Innovation Agenda (SRIA) publication, which aligns microbiome R&I efforts at the global level.

The project's scientific leadership is highlighted by high-impact publications, including a 'manifesto' for microbiome innovations in *Nature Microbiology* and a standardized 'microbiome definition' in the journal *Microbiome*. These contributions provided a unified language and vision for the bioeconomy. The project also laid the groundwork for an International Microbiome Consortium to serve as a permanent resource for policymakers.

Pathway: Urban food systems transformations

Cities2030 (2020-2024, IA) succeeded in empowering cities, regions, stakeholders and citizens to take ownership of their food systems and create a more equitable, sustainable, and food-secure future by creating local ecosystems. It established '**city-region food systems**' across **42 policy and living labs** in 18 countries forging 296 partnerships with very local-specific interactions, engaging **12 000 citizens** while drawing in **115 additional 'follower-cities'**.

The project generated **29 technological innovations** to assist policy makers and citizens. These included blockchain technology for improved food traceability, IT devices for urban agriculture monitoring and digital tools for optimized food supply chain management. A capacity-building programme supported broad uptake. Key was a **S2CP technological platform**, organised

[119] COM/2024/137 final.

around 13 adaptable components that can be tailored to local needs. The platform supports decision-making processes and communities' engagement, as well as economic actors (SMEs, producers) at local level. The S2CP platform submitted its product to the JRC's 'Innovation Radar (IR)', which identified two tools of the platform as having 'Business Ready' market maturity and 'Exploring' value creation opportunities.

FoodE (2020-2024, IA) created **citizen-led city region food systems** (CRFS) and has created **new job opportunities** in EU cities through the implementation of pilot projects (e.g. urban agriculture parks, vertical farms, aquaponic farms, small scale fishery in school canteen, circular economy restaurants, urban bee keeping), also involving fragile and disadvantaged social groups. It developed an **app to facilitate citizens' active engagement** in identifying, monitoring and assessing CRFS initiatives, to achieve involvement and an effective shift to local food consumption. A **citizen-science approach** raised citizens awareness on CRFS sustainability and on the environmental impact of dietary habits and enable them to become key actors in this respect.

An interesting example in community building across projects was the creation of a '**Family' of five projects funded under the urban pathway** (i.e. CITIES2030, FOODTRAILS, FUSILLI, FoodSHIFT2030 and FoodE), which led to the development of joint products (such as a video and a policy brief), with support by the Horizon Booster.

CULTIVATE (2023-2026, IA) supports **food security and resilience** by deploying an **online social innovation platform, the Food Sharing Compass**. Designed with and for food sharing initiatives (from seed sharing and social dining to surplus food redistribution and community composting), policymakers, food supply actors, researchers and citizens, the Food Sharing Compass will identify costs, benefits and impacts of FSIs; help actors navigate governance architectures and ensure appropriate policies and regulations of food sharing.

Pathway: Governance for food systems change

CLEVERFOOD (2023-2026) is driving a transformative shift towards a fairer, healthier, and more sustainable European food system by mobilising citizens, farmers, entrepreneurs, policymakers, and researchers across nine countries (Belgium, Denmark, Greece, Hungary, Italy, the Netherlands, Poland, Portugal, and Spain). The project is fostering regenerative, resilient, and plant-based food systems through an interlinked multi-level structure of policy labs and living labs, ensuring systemic change from production to consumption.

By **co-creating governance models**, advancing food policies, and accelerating social and technological innovations, CLEVERFOOD is breaking down barriers to sustainability. Its **policy labs** facilitate peer-learning programmes, multi-stakeholder dialogues, and cross-governance collaboration, while its **living labs** drive sustainable value chains, impact investment, and technology adoption, all measured through robust transition progress frameworks.

A key achievement is the **CLEVERFOOD online platform**, which has already united over **70 EU-funded initiatives** with a combined investment exceeding EUR 450 million, fostering synergies for large-scale impact. CLEVERFOOD also builds long-term capacity through education and public engagement activities. Wider mobilisation includes citizen science, influencer campaigns and an interactive exhibition, alongside competence centres.

FoodPathS (2022-2025) was the preparatory action for the Horizon Europe partnership on food systems transformation, **FutureFoodS**. It has developed a **virtual Knowledge Hub of**

food system labs and an **interactive funders map** to connect diverse funders including regional actors and foundations. It has produced guidance on how to implement a systems approach in transnational calls and align funding strategies on food systems. These insights were transferred to the FutureFoodS Partnership, which launched its first call for proposals in 2024.

The project has also delivered a strategic research and innovation agenda for FutureFoodS providing guidelines for science to policy interfaces, food system observatories and R&I, policy and education collaboration (RIPE concept). It has delivered a **handbook on guidelines and lessons learned for building a partnership** in the food domain.

Pathway: Data and digital transformation

FOODITY (2023-2025) supported **12 projects that participated in their funding programme** in demonstrating alternative paths to overcoming existing tools and platform's limitations to citizens' rights to personal data sovereignty:

For example, *MyNutri* empowers healthier, sustainable food choices through **personalised AI-driven insights**. The android application uses Open Food Facts for product data and includes a carbon foodprint scoring. The app solution was co-developed and tested with 150 consumers to ensure matching user needs and expectations.

Another example is *SEBP*, a **digital platform** that connects sustainable producers with socially responsible companies through employee benefit programs. It has a producer portal for managing product listings, a company portal with basic impact reporting, and an employee portal with an online shop offering sustainable products. The platform integrates real-time ecological, economic and social ethics, empowering informed choices and enhancing corporate sustainability reporting.

DRG4Food (2022-2025, RIA), empowers a fair and responsible **European Food Register**, fostering citizen sovereignty and creating a data-driven food system. For the consortium technology acts as an empowering enabler, providing the means to achieve a wide variety of innovative and valuable use cases. These **use cases** range from customised food provision, food waste reduction, and improved transparency.

For example, the *SAfeNutriKids* use case has developed a **responsible, AI-powered nutrition education platform** for children aged 6-12 years. The solution integrates a gamified-based frontend and an AI-based personalisation chat function to deliver age-appropriate, culturally adaptive content.

A second use case is *NutriSight*, an open model to extract **nutrition information from images** by automating the process using a machine learning model. The application '**Open Food Facts**' is available in the app store.

Pathway: Food systems Africa

HealthyFoodAfrica (2020-2025, RIA) aimed at building **more sustainable, equitable and resilient food systems in 10 African cities**. This project was part of the African Union – European Union High-Level Policy Dialogue on Science Technology and Innovation under the Partnership on Food and Nutrition Security and Sustainable Agriculture.

It developed food system labs in Benin, Ethiopia, Ghana, Kenya, Uganda and Zambia on: nutrition and consumption, sustainable production, postharvest, food safety, value chain governance, novel products and processes. It worked with smallholders, aquafarmers, SMEs, women, youth, street vendors, consumers, NGOs, scientists and policymakers to **enhance the capacity of producers and food chain actors to deliver diverse, nutritious, high quality, affordable foodstuffs.**

4.2.5. Cross-cutting achievements

Beyond the four priorities, Food 2030 has made significant contributions to horizontal objectives of Horizon Europe 2021- 2027, in particular Cluster 6: '**Food, Bioeconomy, Natural Resources, Agriculture, and Environment**', by shaping not only what food-systems R&I addresses, but also how it is performed.

Social sciences and humanities are vital for understanding societal needs and delivering public benefit are widely integrated across Horizon Europe 2021-2027 Cluster 6. In the European Commission's monitoring report on the integration of social sciences and humanities for 2021-2023 Horizon Europe 2021-2027 projects[120], Cluster 6 was one of the two clusters with the highest number of social sciences and humanities participants (21%). In the Horizon Europe Work Programme 2026/2027, 38% of topics are expected to include a social sciences and humanities dimension, with topics under Food 2030 in line with this average. As consumers shape demand and trends, they are central to food systems transformation. Accordingly, social sciences and humanities have been integrated into topics engaging citizens and consumers, including those on dietary shifts, local and regional food systems transformation and the deployment of enabling technologies.

The **multi-actor approach** is inherent to the application of a systemic approach, and ensures all stakeholders are included. The concept refers to a transdisciplinary R&I approach that actively involves a wide diversity of sectors (from primary production to food waste management) and stakeholders (including researchers, policymakers, representatives from the public and private sectors, NGOs and civil society)[121]. Nearly all Food 2030 projects under Horizon Europe demanded the multi-actor approach and encouraged applicants to apply it. An external expert evaluation concluded that multi-actor collaborations are critical to the ongoing success and impact of the Food 2030 research and innovation framework. However, more structural support and guidance is required to fully exploit its impact[122]. This is also consistent with the broader strategic approach to R&I in agriculture, forestry and rural areas, where the multi-actor approach is recognised as an important mode of knowledge creation, uptake and implementation.

One application of the multi-actor approach is **Living Labs**[123], defined as practice-driven, place-based organisations that facilitate and foster open, collaborative research and innovation and real-life environments where both open innovation and user innovation processes can occur

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[121] European Commission: Directorate-General for Research and Innovation, *Shaping the future of food research and innovation – Insights and recommendations from Food 2030 experts,* Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2777/8711448.

[122] European Commission: Directorate-General for Research and Innovation, *Shaping the future of food research and innovation – Insights and recommendations from Food 2030 experts,* Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2777/8711448.

[123] Search the TRANSIT resource hub - Transformative Social Innovation Theory.

and where bottom-up driven R&I can be designed and implemented. The external expert evaluation[32] highlights that Living Labs have played an important role in facilitating meaningful, and, at times, sustained multi-actor activities. However, it also notes concerns regarding the proliferation and fragmentation of networks and the related risk of stakeholder fatigue.

The EU-funded project CLEVERFOOD has established a Food 2030 **Connected Lab Network** for living labs, communities of practice and other co-creation initiatives working on transforming the food system at the local, regional and national level. The Horizon Europe co-funded Partnership on food systems FutureFoodS establishes a **Knowledge Hub of Living Labs**, incorporating the CLEVERFOOD network and ensuring consistency. Living labs are inherent to several projects under different pathways such as Africa (HealthyFoodAfrica), healthy diet and nutrition (PLAN'EAT).

International cooperation is a fundamental aspect of Food 2030. An analysis of urban food system projects[124] in 2023 showed that 25 Member States were represented by city initiatives involved in food transformation with **partnering cities in Africa, South America and China**. Still, initiatives lacked Eastern European participation that should be further focussed on in the future.

The dedicated pathway on Africa reflects the long-standing **AU–EU cooperation** on food and nutrition security and sustainable agriculture and recognises that food systems transformation requires joint work on shared challenges such as nutrition, sustainable production, resilience, trade and innovation uptake. This pathway enhanced international cooperation between the European Union (EU) and the African Union (AU) through the partnership on **Food and Nutrition Security and Sustainable Agriculture** **(FNSSA)** as part of the AU-EU High-Level Policy Dialogue on Science, Technology and Innovation.

Since its launch in 2017, the FNSSA partnership has channelled investments in areas such as: sustainable intensification of agriculture; agriculture and food systems for nutrition; expansion and improvement of agricultural trade and markets. The establishment of the International Research Consortium (IRC-FNSSA) -a hosted, networked institution governed by the IRC Statutes (2025)- has transformed the FNSSA from a coordination platform into a long-term, inclusive mechanism for joint AU-EU research governance. Together with the forthcoming FNSSA Roadmap for 2027-2036, the FNSSA partnership serves as a cornerstone of the AU-EU STI cooperation, driving innovation, policy alignment, and sustainable development across both continents. On the urban side, AfriFOODlinks and INCiTiS Food exemplify how AU-EU cooperation advances locally-driven approaches to food system transformation anchoring global ambitions in concrete, city-level change.

Under the Food 2030 framework, the **governance pathway** aimed to strengthen the coherence, coordination and effectiveness of actions across policy domains, governance levels and stakeholder groups, recognising that food systems are shaped by a complex interplay of regulatory frameworks, market incentives and societal behaviours. Through support to multi-level governance structures, participatory approaches and policy innovation, this pathway facilitates collaboration between public authorities, research actors, private sector stakeholders and civil society (e.g. RefreSCAR, FOSTER, CLEVERFOOD). It also promotes the alignment of research and innovation outcomes with policy development and implementation, thereby addressing the persistent gap between knowledge generation and systemic uptake. This

[124] European Commission: Directorate-General for Research and Innovation, *Urban food system transformation in the context of Food 2030 – Current practice & outlook towards 2030*, Fabbri, K.(editor) and Vandrich, J.(editor), Publications Office of the European Union, 2023, https://data.europa.eu/doi/10.2777/507125.

contributed to food systems transformation across **local, regional and other territorial contexts**, including through place-based approaches, city and regional initiatives, and governance models adapted to different institutional and socio-economic settings.

Innovative governance mechanisms at various levels have been deployed in different projects beyond the dedicated pathway for action. Often, these projects are linked to Living Labs which serve as a collaborative place for co-creation, for encouraging regional innovation governance and for helping stakeholders to align their education and R&I agendas to better address the barriers and opportunities of food systems transformation. This suggests that governance innovation should be treated as a **transversal enabler** across Food 2030 and future Food 2040 activities, supporting thematic objectives wherever coordination, uptake, scaling or policy alignment are required. The main R&I needs identified under nearly 20 EU-funded projects working on urban food systems transformation was innovation on governance[125].

A range of **technologies** support Food 2030 objectives, including the application of data, AI, digital and other instrumental technologies. The 2024 Communication '**Boosting Biotechnology and Biomanufacturing in the EU**'[126] aimed to unlock the full benefits of biotechnologies and biomanufacturing for industrial competitiveness.

Food 2030 has anticipated some of those challenges through specific topics under the Horizon Europe Work Programme 2025 - one dedicated on consumer education on food biotech[127] and another on the application of precision fermentation through microorganisms[128]. In addition, in 2025 the EIC Accelerator challenge launched a topic on food from precision fermentation and algae[129] with a budget of EUR 50 million. The public and private partnership CBE JU invested in biotechnologies projects such as the PLENITUDE flagship project[130] which aimed to produce affordable plant-based proteins for human consumption by integrating an aerobic fermentation plant with a conventional first-generation biorefinery.

However, despite growing interest, **commercial development and market uptake of fermentation-based proteins remain limited**, and only a few microbial protein products have been authorised in the EU. The results hint towards an untapped market opportunity and potential for more R&I investment and valorisation support.

CBE JU has also contributed to the broader innovation landscape relevant to Food 2030 by supporting bio-based solutions for food and feed ingredients, including alternative proteins and ingredients derived from low-cost sustainable feedstocks, microalgae and macroalgae. While CBE JU does not cover direct food production, its portfolio includes projects that support biotechnology, circularity, industrial scale-up and the development of new food and feed ingredient value chains. Based on the CBE JU portfolio, **food and feed ingredients represent 21% of both EU contributions and projects funded**, covering 48 projects and EUR 291.4 million in EU contributions. These activities complement Food 2030 objectives by supporting

[125] EU funded projects un urban food systems under Food 2030 - cluster workshop, 10 March 2026.
[126]European Commission, Building the future with nature: Boosting Biotechnology and Biomanufacturing in the EU, COM(2024) 137 final, Brussels, 20 March 2024.
[127] HORIZON-CL6-2025-02-FARM2FORK-13 "Raising citizen awareness on alternative proteins derived from biotechnology".
128 HORIZON-CL6-2025-02-FARM2FORK-14: Nutrients produced by microorganisms utilising primarily CO2 from the air, with the support of biotechnology.
[129] Food from precision fermentation and algae | Programme | HORIZON | CORDIS | European Commission.
[130] PLENITUDE | Circular Bio-based Europe Joint Undertaking (CBE JU).

resource efficiency, protein diversification, circularity, industrial deployment and the valorisation of R&I results[131].

The following table provides detailed information on the number of projects funded in this area as well as the EU contribution.

Table 4. CBE JU projects on food and feed ingredients by action type and technology readiness level (TRL).

CBE JU projects in food and feed ingredients	FLAG TRL 8 flagship biorefineries	IA-DEMO TRL 6-7 Demonstration pilots	RIA TRL 5 In lab testing	Total
EU contribution	EUR 74 473 166	EUR 144 304 635	EUR 72 657 484	EUR 291 435 285
Number of projects	5	24	19	48

5. STAKEHOLDER OUTREACH

Stakeholder engagement has been a core feature of both the 2016 strategic approach to agricultural R&I and Food 2030. Across both processes, engagement with Member States, associated countries, researchers, farmers, foresters, rural actors, food-system stakeholders, industry, SMEs, civil society, public authorities and citizens has helped identify priorities, strengthen ownership, support co-creation and improve the relevance of EU-funded research and innovation.

Stakeholder engagement and feedback played an important role for the **preparation of the new EU strategic approach to R&I** for competitive, resilient and sustainable agriculture, forestry, rural areas, and food systems. This section summarises the main stakeholder engagement activities conducted to support the new R&I strategic approach.

5.1. Updating the 2016 strategic approach to agricultural R&I: stakeholder outreach

5.1.1. Open consultation

On 15 December 2025, during the session on the 'future of EU agri-food: data & innovation for food security' of the EU Agri-Food Days 2025, the Commission launched an open consultation through an online survey to support the preparation of a new strategic approach to agricultural R&I. Stakeholders were invited to share their perspectives on five main areas by 25 January 2026:

1. R&I as an enabler of the vision for agriculture and food
2. Strengthening the EU R&I ecosystem
3. Accelerating the uptake of new knowledge and innovation
4. Stronger cooperation in Europe and beyond
5. Future thematic priorities and approaches for R&I

701 contributions from farmers, foresters, rural organisations and actors, researchers, businesses, non-governmental organisations, citizens and public authorities were collected. A report presenting an analysis of the results was prepared and published in April

[131] Note that CBE JU does not support R&I on direct food production, as per its Strategic Research and Innovation Agenda (SRIA).

2026[132]. **The results show strong support for a broader and more forward-looking agenda, with up to 94% of respondents backing this approach.** There is also clear support for better assistance to startups, scaleups, and SMEs, with up to 82% in favour, as well as strong demand for faster and more practical uptake of innovation by farmers on the ground, reaching up to 88%.

At the same time, the findings send a clear signal that research results need to be translated more effectively into market-ready innovations. The feedback received helped inform the new R&I strategic approach on key challenges, opportunities and priority areas for future R&I to support competitive, resilient and sustainable agriculture, forestry and rural areas.

5.1.2. EU AgRI 2040 Conference

Building on the previous editions of the AgriResearch conference in 2016, 2018 and 2023, the European Commission is preparing the fourth edition, **EU AgRI 2040: Future-proofing EU Agri-Food through research and innovation,** to be held on 24 and 25 September 2026 in Brussels, Belgium.

On this occasion, the new strategic approach to R&I in agriculture, forestry, rural areas, and food systems will be presented. The conference will kick-off a process of working with stakeholders to identify priorities for future R&I on agriculture, forestry and rural areas to be addressed under the next EU Research and Innovation Programme Horizon Europe 2028-2033 and the new European Competitiveness Fund, in support of the ambition of the vision for agriculture and food.

5.2. Food 2030 stakeholder outreach

Stakeholder outreach has been an important **building block and a key success factor of Food 2030**, combining targeted dialogue with EU-funded project communities, Member State expert bodies, and broad multi-stakeholder consultations. Additionally, stakeholder outreach has been intensified in view of preparing the next-generation R&I strategic approach for food systems, 'Food 2040'.

Cluster workshops

A range of **cluster workshops** of EU-funded Food 2030 projects served to obtain a state-of-play of activities under dedicated action pathways, and an overview to further define R&I needs.

A Food 2030 clustering workshop (on 10 September 2025) on **food safety and food fraud** projects aimed to exchange knowledge about project achievements and possible new research and innovation needs. The cluster event also helped to increase the collaboration and synergies among the project coordinators and scientific community in areas such as **food safety, food fraud, food safety in Africa, regulatory aspects on food safety and novel technologies** applied to specific food sectors.

A Food 2030 cluster workshop (24 October 2025) gathered Horizon 2020 and Horizon Europe projects to exchange results and strengthen synergies on **food waste and resource-efficient food systems**. Projects showcased **innovations across the supply chain**, including digital tools, smart packaging, behavioural approaches and microbiome solutions. New projects are linking food waste reduction with environmental footprint analysis and climate impacts. Key challenges include **industry engagement**, **consumer involvement** and **fragmented policy**

[132] Strategic approach - Agriculture and rural development.

frameworks. The discussions highlighted the importance of collaborative, multi-actor research and innovation to accelerate systemic change, improve resource efficiency and support evidence-based policymaking towards sustainable, circular and climate-resilient food systems.

A Food 2030 **cluster workshop on urban food systems** (10 March 2026) representing nearly 20 projects under Food 2030 showcased a range of **impacts** on **community empowerment**, relevant local and regional **food policies**, development of **innovative tools** to support citizens in their positive decision-making, better and more impactful **communication** and **positive food environments**. Key **R&I needs** identified include **strengthened multi-level and cross-sectoral food system governance** with clear political commitment, stronger links between local innovation and national/EU policy, improved monitoring, and trustworthy **citizen-centred digitalisation**, including reliable and transparent AI tools that support public engagement and better decision-making in food systems.

The cluster workshop on **food from the ocean and freshwater resources** (16 March 2026) represented 17 projects and showcased impacts like **reduced pressure on aquatic ecosystems**, more **realistic fish stock assessments**, new **algae-based food products**, **consumer awareness** and **connection of all actors** along the aquatic food value chain. Involving **companies** and all relevant **stakeholders** from the very beginning of projects was highlighted as crucial for the successful **uptake and valorisation** of the project's outputs. Key R&I needs identified include **traceability** systems and fully **digitalised catch** documentation that will enhance **transparency and consumers' trust.** More research is needed, among other things, on **climate-related and other natural risks** affecting aquatic food value chains.

Cluster workshops were also organised on **healthy diet and nutrition**, on **alternative proteins** and on **microbiome**. Their discussions focused on the R&I gaps and challenges, as well as the potential impact of the recommendations on legislative revisions and next steps. Some project coordinators highlighted the development of new technologies for producing innovative products based on alternative proteins. When developing such products tough, several aspects need to be taken into account (e.g. safety aspects, consumers perception and acceptance).

5.2.1. EU survey

Further stakeholders' input was collected through an EU-wide survey to complement evidence from the workshops and to help validate emerging priorities and action pathways. A report presenting an analysis of the results was published in July 2026[133]. The consultation gathered **more than 600 responses**, alongside **63 detailed written contributions** from across the agri-food landscape, including research institutes and academia, food manufacturing and processing, NGOs, government and policy actors, farming organisations, consumer and advocacy groups, and civil society.

The respondent profile showed very high participation from research and academia (52%), with more limited responses from SMEs and startups. Awareness of Food 2030 was also uneven across respondent groups. Overall, 57.6% of respondents reported being unaware of Food 2030, while lack of awareness remained substantial among individual citizens (44.1%).

Taken together, the survey and written contributions suggest **continued support for the food-systems approach introduced by Food 2030, while pointing to the need for a more focused and operational update**. Across sectors, stakeholders called for better alignment with real-

[133] European Commission: Directorate-General for Research and Innovation, Gallina, A. and Pelissier, P.-M. (eds), *Building FOOD 2040 stakeholder input for the new EU R&I strategic agenda for food systems – Analysis and synthesis of the results from the open consultation survey*, Publications Office of the European Union, 2026, https://data.europa.eu/doi/10.2777/2306913.

world food systems, clearer objectives and impacts, stronger links to scale-up, deployment and competitiveness, and improved monitoring of progress. There was also **broad support for simplifying and streamlining the current pathway architecture**.

The feedback indicates that future priorities should focus more on **post-farmgate environmental impacts, healthier diets, resilience and preparedness, circularity, protein diversification, and the uptake of innovation, including digital solutions**. Open responses and written submissions also highlighted issues seen as insufficiently covered in the current framework, notably governance, territorial approaches, fairness, strategic autonomy, and the conditions needed for deployment. Notably, 59 of the 63 written submissions identified new or insufficiently covered areas beyond the existing Food 2030 pathways.

Overall, the feedback suggests that Food 2040 should retain the systemic logic of Food 2030 while providing a clearer, more implementation-oriented framework **with stronger attention to competitiveness, health, resilience and public value**.

5.2.2. Food 2040 workshop

A Food 2040 stakeholder workshop took place on 25 March 2026 in Brussels and brought together 80 representatives from academia and RTOs, public institutions, interest groups (European Technology Platforms, agri-food associations, etc.) and the private sector (particularly SMEs and startups). Two dedicated panels on policy and innovation and new technologies set the scene ahead of two consecutive breakout sessions to provide input for shaping the Food 2040 priorities and its related action pathways.

In the first breakout session participants agreed that while the **Food 2030 approach remains essential**, it is **no longer sufficient** alone. The **systems-based perspective** was praised as a key achievement, but concerns were raised about **lagging implementation,** with calls for future work to be more operational, measurable, and aligned with current risks. Moderators noted broad support for retaining the systemic logic in Food 2040 priorities, while strengthening the framework - particularly around **competitiveness, resilience, risk management, justice, and governance**. Governance emerged as a dominant theme, with some advocating it as a standalone priority and others as a foundational layer shaping the entire framework. Debates also arose over **digitalisation and AI**: while many viewed them as critical cross-cutting enablers, others warned against treating them as vague solutions without clear mechanisms to ensure trustworthy, impactful outcomes.

The second breakout session focused on **updating the pathways for action** while maintaining a food systems approach. Participants agreed on **retaining the strongest Food 2030 building blocks** but suggested **merging, broadening, or reframing certain pathways** to better address current challenges and opportunities. Governance, technology, and digitalisation were widely seen as cross-cutting enablers that should be integrated across all pathways rather than treated as standalone themes. There was also strong support for reinforcing the **territorial perspective**, ensuring greater emphasis on rural, regional, and local food systems alongside urban priorities.

Participants also called for a stronger focus on **implementation, scale-up and competitiveness**. The workshop highlighted the need to go from generating research to accelerating uptake through demonstration infrastructures, public-private cooperation, innovation-friendly regulation, investment conditions and skills development. In that context, stakeholders emphasised that Food 2040 should better address food manufacturing and processing, market uptake, and the conditions needed to translate innovation into broader societal and economic value.

A third major conclusion concerned the scope of future priorities. Many participants called for stronger integration of **health, sustainable diets, food environments** and **protein diversification**, as well as greater attention to **circularity, zero pollution, strategic autonomy, resilience** and Europe's role in global food systems. At the same time, several discussions underlined the need to address **social innovation, behavioural change, fairness and governance capacity** more explicitly.

Overall, the breakout sessions suggest that Food 2040 should have a more **operational and future-oriented architecture**: fewer silos, stronger cross-cutting enablers, and clearer pathways for delivery, competitiveness and public impact.

5.3. Consultation of the Standing Committee on Agricultural Research

The Standing Committee on Agricultural Research (SCAR) is an important **source of strategic R&I policy advice** from the Member States and associated countries to the European Commission on European agriculture, fisheries, food, forestry and wider bioeconomy. It is a **catalyst for the coordination of national R&I programmes** and contributes to strengthening the **integrated European Research Area**. The committee played an important role in implementing the 2016 strategic approach to agricultural R&I and Food 2030.

The SCAR plenary, organised twice a year, brings together delegates from more than 35 countries represented in the SCAR to discuss R&I policy development and SCAR working groups activities, and take strategic decisions. The working groups are the backbone of the SCAR. **Focusing on specific priority areas**[134], they bring together nominated national experts from across Europe. Together, they co-create R&I agendas, develop inspiring studies, provide recommendations on R&I policy, highlight priority R&I needs and gaps and exchange on experiences and best practices.

For example, the SCAR Sustainable Animal Production working group developed the ERA-NET on Sustainable Animal Production Systems (SusAn)[135], with an EU contribution of EUR 5 million and an overall budget of around EUR 16 million. The SCAR Agroecology, SCAR Animal Health and Welfare, SCAR Food Systems and SCAR Forest working groups have been **key platforms for co-creating the strategic R&I agendas of four Horizon Europe 2021-2027 partnerships**: **agroecology living labs and research infrastructures; animal health and welfare; FutureFoodS;** and **FOREST**. Since its creation in 2010, SCAR AKIS has been a key working group for the Commission, Member States and associated countries to discuss and exchange best practices on the functioning of EU AKIS, the integration of the multi-actor approach, and synergies between Horizon programmes and the CAP[136].

The SCAR foresight reports are **important sources of advice** to the Commission in designing its R&I actions under the different R&I framework programmes. The latest report, the **5th SCAR Foresight Report** focused on '**Resilience and Transformation**'[137].

[134] During the 2016-2026 period, the working groups of SCAR were the following: SCAR Agroecology, SCAR AKIS, SCAR Agricultural Research towards greater impact on global challenges (ARCH), SCAR Bioeconomy, SCAR FISH, SCAR Food Systems, SCAR Forest, SCAR Sustainable Animal Production, SCAR Animal Health and Welfare, SCAR Task Force on Proteins, SCAR Task Force on Foresight, SCAR Task Force on Startup and Scaleup.

[135] European Research Area on Sustainable Animal Production Systems | SusAn | Project | Fact Sheet | H2020 | CORDIS | European Commission.

[136] Strengthening EU AKISs: 5th mandate report of the SWG- AKIS (2019-2022) Documents.

[137] Report of the 5th SCAR Foresight Exercise Expert Group.

Another achievement was the SCAR Protein Task Force's report on protein diversification, which provided actionable recommendations and strategic directions to guide future R&I agendas toward a more autonomous, sustainable and resilient European protein system.

5.3.1. 2026 SCAR consultation workshop to support the preparation of the new R&I strategic approach

A SCAR consultation workshop on 27 February 2026 focused on supporting the development of the EU's new R&I strategic approach on agriculture, forestry, rural areas, and food systems. The workshop included **four breakout sessions on future thematic priorities for agriculture, forestry and rural R&I**, on boosting the uptake of R&I results by farmers, foresters and rural actors, Food 2040 priorities and pathways, and the valorisation of agricultural and food-systems R&I results into business creation, startups and scaleups. Detailed **outcomes and recommendations are available in the dedicated workshop report**[138].

5.3.2. Establishment of a new SCAR task force on startup and scaleup

In January 2026, SCAR established a dedicated task force on startup and scaleup, representing 15 Member States and associated countries, in support of the development of the new R&I strategic approach. The focus was on providing advice on **improving the valorisation of R&I results into business creation, startups and scaleups** in the agri-food sector. The task force collected case studies from relevant startups and scaleups across Europe and identified sector-specific challenges and opportunities and delivered targeted R&I recommendations[139].

6. CONCLUSION

The evidence presented in this Staff Working Document shows that the 2016 strategic approach to EU agricultural R&I and Food 2030 have both played important roles in shaping EU-funded research and innovation under Horizon 2020 and Horizon Europe 2021-2027 in support of agriculture, food systems, forestry, and rural areas. In line with the strategic planning of Horizon programmes and ensuring transparent prioritisation with Member States through Programme Committees, the 2016 strategic approach to EU agricultural R&I and Food 2030 have helped **structure investments, mobilise research communities, support co-creation with stakeholders, and valorise the knowledge, tools, methods and innovations** emerging from Horizon-funded activities.

The 2016 strategic approach to agricultural R&I has contributed to strengthening the knowledge and innovation base for **competitive, resilient and sustainable agriculture, forestry and rural areas**. More than EUR 3 billion were invested in 565 R&I projects in the period 2014-2024 to support these strategic sectors. By mobilising and reinforcing tools supporting inclusive and impactful research and innovation activities and strengthening synergies between Horizon Europe 2021-2027 and the common agricultural policy, it helped **place farmers, foresters and rural actors more centrally in the R&I process** and supported the uptake of knowledge, practices, technologies and services in real-life settings.

European farmers, foresters, and rural actors are inherently innovative and continually adapting to the changing context. However, **the adoption of innovation remains a challenge**[140] for

[138] Summary of the SCAR consultation workshop on European Commission's R&I strategic approaches related to the agri-food system.
[139] Startup & Scaleup Task force.
[140] OECD (2023), Policies for the Future of Farming and Food in the European Union.

these sectors. Barriers to uptake of innovation at farm level include economic risks, uncertainty, compatibility with existing practices, trust in knowledge sources and reluctance to change, all of which are and largely influenced by the region's diverse agricultural structure[141]. Socio-economic factors - such as the diversity of farming systems, the prevalence of small actors, ageing and gender imbalance, limited investment capacities and weaker broadband connectivity in rural areas as compared to urban ones further hinder effective uptake of knowledge and innovations[142]. This calls for more support for the uptake of R&I results.

Food 2030 has provided a pioneering food-systems R&I framework, helping to **connect nutrition and health, climate and sustainability, circularity and resource efficiency, and innovation and communities**. It has supported systemic, cross-sectoral approaches, stakeholder engagement, living labs, coordination and support actions, innovation actions, and synergies with other EU initiatives. It has also created a strong basis for the development of Food 2040, supporting a more integrated approach to food-systems R&I, including processing, distribution, retail, consumption, food waste, healthy and sustainable diets, circularity and innovation uptake.

This analytical work supports the preparation of the new Communication on the strategic approach to R&I in agriculture, forestry, rural areas and food systems. It takes stock of achievements, implementation experience and stakeholder input from both R&I strands. It highlights opportunities to **strengthen the innovation ecosystem, improve the uptake and valorisation of R&I results,** and better connect agricultural, forestry, rural and food-systems R&I along the innovation and investment journey, from knowledge generation to deployment and scale-up.

The 2016 strategic approach to agricultural R&I and Food 2030 address different parts of the agri-food sector. However, **recent stakeholder consultation activities point to several common needs for the future**: more operational frameworks, stronger links between research and deployment, better alignment with users, stronger monitoring, stronger governance capacity, and greater attention to competitiveness, resilience and territorial realities.

Across both areas, several shared lessons emerge. The EU R&I strategic approach supported by this SWD should **maintain a systemic and multi-actor perspective while strengthening implementation, uptake, scale-up and valorisation**. It should better connect research with deployment, market and policy uptake, and support the enabling conditions needed for innovation to generate public value. This includes stronger attention to skills, investment, demonstration, regulatory interfaces, monitoring, digital tools, governance capacity and territorial innovation ecosystems.

Stakeholder engagement also shows that future frameworks need to respond to a changed strategic context. In the areas of the agri-food sector, **competitiveness, resilience, sustainability, strategic autonomy, health, circularity, fairness and public trust are increasingly interconnected**. Addressing the challenges faced by those areas requires continued cooperation and close engagement with Member States and associated countries, and sustained dialogue with all actors, including the private sector.

Building on the achievements and implementation experience of the 2016 strategic approach to EU agricultural research and innovation and Food 2030, the new strategic approach to EU research and innovation for competitive, resilient and sustainable agriculture, food systems, forestry and rural areas should provide an **updated and more integrated framework for**

[141] WIPO (2026) https://doi.org/10.1007/s13165-023-00440-7https://doi.org/10.1787/32810cf6-en.
[142] OECD (2023), Policies for the Future of Farming and Food in the European Union.

future R&I investments. It should help strengthen Europe's innovation and investment journey, boost the uptake of new knowledge and solutions, and support competitive, resilient, sustainable and inclusive agriculture and food systems in Europe and beyond.

7. ANNEXES

Annex I-Data Analysis Methodology

2016 strategic approach to agricultural research and innovation

The data used to conduct this analysis was sourced from the Horizon Dashboard, a publicly available data platform managed by the European Commission. The period covered is 2014–2024. The chosen timeframe allows the analysis to fully include the Horizon 2020 programme (2014-2020), and a period with robust data on Horizon Europe (2021-2024). The year 2025 was excluded as several administrative procedures and two-stage calls are still ongoing, and the information is constantly being updated.

The dataset '**AGRI**' was obtained by applying the filters described below.

- Call deadline year: 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024.
- Programme: Horizon 2020 or Horizon Europe 2021-2027.
- Thematic priority description: Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy; or Food, Bioeconomy, Natural Resources, Agriculture and Environment.
- Simplified types of action: RIA, IA, CSA, COFUND-EJP, ERA-NET-Cofund; or HORIZON - COFUND, HORIZON-CSA, HORIZON-IA, HORIZON-RIA.

The output was then filtered by the projects that relate to the context of the 2016 strategic approach to EU agricultural R&I. For transparency and replicability reasons, a full list can be accessed online as supplementary material to this staff working document.

To enable a coherent comparison between programming and funding with Societal Challenge 2, Pillar III, Cluster 6 and Pillar II, the filter 'type of actions' was used and only the following types of action were used: RIAs, IAs, CSAs, EJP, ERA-NET and COFUND.

The dataset '**Societal Challenge 2**' was obtained by applying the filters described below.

- Call deadline year: 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021.
- Programme: Horizon 2020.
- Thematic priority description: Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy
- Simplified types of action: RIA, IA, CSA, COFUND-EJP, ERA-NET-Cofund.

The dataset '**Cluster 6**' was obtained by applying the filters described below.

- Call deadline Year: 2021, 2022, 2023, 2024.
- Programme: Horizon Europe 2021-2027.
- Thematic priority description: Food, Bioeconomy, Natural Resources, Agriculture and Environment.
- Simplified types of action: HORIZON-COFUND, HORIZON-CSA, HORIZON-IA, HORIZON - RIA.

The dataset '**Pillar III**' was obtained by applying the filters described below.

- Call deadline year: 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021.
- Programme: Horizon 2020.
- Pillar description: Societal Challenges.
- Simplified types of action: RIA, IA, CSA, COFUND-EJP, ERA-NET-Cofund.

The dataset '**Pillar II**' was obtained by applying the filters described below.

- Call deadline year: 2021, 2022, 2023, 2024.
- Programme: Horizon Europe 2021-2027.
- Pillar description: Global Challenges and European Industrial Competitiveness.
- Simplified types of action: HORIZON-COFUND, HORIZON-CSA, HORIZON-IA, HORIZON-RIA.

Food 2030

The data used to conduct this analysis was sourced from the same Horizon Dashboard, a publicly available data platform managed by the European Commission. The period covered is 2014-2024; the chosen timeframe allows the analysis to fully include Horizon 2020 programme (2014-2020), as well as a period with robust data on Horizon Europe (2021-2024).

It should be noted that Food 2030 was created in 2016, with the first calls launched in 2017. Yet, food systems related projects existed and were launched with the same objectives as those laid down in Food 2030 prior to the creation of Food 2030 (2014-2016). It is important to also capture the outcomes and data of these projects to get a complete analysis.

The dataset used for the analysis was obtained by filtering, in the dashboard, the projects that relate to the context of the Food 2030 framework since 2014.