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Co-creation of a transition pathway for a more resilient, sustainable and digital agri-food ecosystem

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CONTENTS

INTRODUCTION

1.1. The agri-food industrial ecosystem

The agri-food ecosystem is one of the fourteen industrial ecosystems identified in the updated New Industrial Strategy. ([1]) In this Strategy, the Commission proposed the co-creation of transition pathways with stakeholders, as an essential **collaborative tool for the green and digital transition of industrial ecosystems**. The pathways will contribute to forming a **shared vision for 2030** in collaboration with all relevant public and private stakeholders for the green and digital transition and enhanced resilience of the ecosystems.

The agri-food ecosystem covers all operators in the food supply chain - farmers, fishers, aquaculture producers, the food and drink industry, food retail and wholesale, and food service. It also encompasses suppliers of inputs and services (seeds, pesticides, fertilisers, machinery, packaging, repair, transport, finance, advice and logistics), the research community (Universities, Research Centres, Clusters) and public authorities. For the sake of completeness, the term 'agri-food ecosystem' in this document, refers to the EU food system as a whole (referring more broadly also to the consumer side and socio-cultural and institutional component of food systems).

The main activities considered as part of the ecosystem include the manufacturing of food products, including beverages, crop, production of food, feed destined for food-producing animals, as well as products of hunting and related services, forestry and logging as well as fishing and aquaculture, destined for human consumption. The value added produced by the activities of the agri-food ecosystem corresponded to €585 billion in 2021 (representing 4,84% of overall EU value added). The ecosystem provides employment for around 16.3 million people. ([2])

Small and Medium Enterprises (SMEs) are the backbone of the agri-food ecosystem: 99% of the 289 000 food and drink enterprises are SMEs. They provide around 48% of the turnover and employ over half of the workforce in food and drink manufacturing. ([3]) The remaining 1% large food and drink companies generate over 50% of the turnover of the sector. Farms are officially not classified as SMEs in business statistics, but most farms could be seen as SMEs, since only 1% of the EU farm holdings have a turnover of over €500,000 per year. ([4])

1.2. Main challenges

While trusted for providing high quality and safe products, and guaranteeing food security, the EU agri-food ecosystem is experiencing several structural issues and has recently been exposed to multiple shocks. The system is facing challenges, both at global and EU level of environmental, social and economic nature. Deforestation and biodiversity loss ([5]), soil degradation, water pollution and resource scarcity cause adverse environmental effects. ([6]) At global level, food systems still account for around 30% of global greenhouse gas emissions, even if this share has been going down, and despite farmers efforts. ([7]) Food and agriculture are responsible for 70% of freshwater withdrawals, ([8])

([1]) European Commission (2021), Updating the 2020 industrial strategy: towards a stronger single market for Europe's recovery
([2]) SWD (2021) 351 final, Annual Single Market Report 2021. The report uses data of NACE codes A, C10, C11 and C12 for analytical purposes. The forestry and logging sector is not the focus of this document. Tobacco products will not be analysed in this document.
([3]) Eurostat
([4]) SWD (2021) 351 final, Annual Single Market Report 2021
([5]) JRC (2022). Nature restoration as a solution to minimise biodiversity loss in EU
([6]) FAO, Energy
([7]) FAO (2022), Greenhouse gas emissions from agri-food systems, *Global, regional and country trends, 2000–2020*

28% solely linked to agriculture. ([9]) On the consumer end, globally, about 8% of the world's population is undernourished, while another 39% are overweight or obese. ([10])

Major challenges for the EU food system are linked to mitigating and adapting to the impact of climate change and the environmental pressure of the system, securing farmers and fishers' incomes and viable rural areas, ensuring sustainable and healthy diets and ensuring a skilled workforce. Farmers and fishers report on average lower incomes compared to other economic actors and often represent the weakest link in terms of power distribution upstream (inputs) and downstream (processors and retailers) in the food chain. This may limit their capacity to influence the market price. Primary producers also face uncertainty linked to climate change risks (severe droughts, floods, frosts or heat waves, increasing pressure from pests and diseases and rising sea temperatures), price, and income volatility, and the heavy dependency of food systems on fossil fuels. Another challenge of the farming and fishing sector is generational renewal, with less young people attracted by the food sector. Farmers have been faced with an increase in input costs, particularly of fertilisers, energy, and seeds. The low levels of public investment in some rural areas represent a specific challenge for maintaining farming activities, which in turn affects food processing.

Agri-food SMEs (including farmers) in the EU are in need of further investment, up-skilling and resources to undertake the green and digital transition. Large food companies are globally competitive but also face challenges in finding skilled workforce and achieving more innovation. Research and innovation in food is often considered dispersed and R&D investment are comparatively low with other sectors. ([11]) The uptake of digital solutions is picking up but remains below other sectors. The competitiveness of EU food companies has been impacted by the significant increase in input costs, especially energy costs. Food retail reports low margins (1-3%) and needs to restructure to adapt to new consumer trends to ensure a food environment that makes the healthy and sustainable choice the easy choice. Still, overall, the ecosystem can be considered as relatively robust and stable in the EU, with many small producers, processors and retailers alongside large companies with more capacity to invest in technological innovation. ([12])

The COVID-19 pandemic has shown the pivotal importance of well-functioning food supply chains, the heavy reliance of food supply on cross-border transportation and the need to further increase their resilience to emergencies and crises like pandemics, climate change and geopolitical forces. ([13]) Although food business operators were faced with serious challenges (changes in demand, cut-off of key outlets, trade disruption and shortage of workers), the EU agri-food supply chain demonstrated a high degree of resilience. ([14]) Food supply chain operators ensured food availability in the EU despite challenging conditions in terms of logistics, shortage of workers etc. The COVID-19 pandemic also revealed the opportunity for the right mix of local and global supply chains, to contribute to resilience, without disrupting the Single Market.

([8]) European Commission (2021), Report of the 5th SCAR Foresight Exercise Expert Group - Natural resources and food system: Transition towards a 'safe and just' operating space

([9]) European Environmental Agency (2022). Water abstraction by source and economic sector in Europe

([10]) FAO (2022). The State of Food Security and Nutrition in the World 2022

([11]) European Commission (2021). The 2021 EU industrial R&D investment scoreboard

([12]) SWD (2021) 351 final, Annual Single Market Report 2021

([13]) European Commission (2020), Food 2030 pathways for action, *Research and innovation policy as a driver for sustainable, healthy and inclusive food systems*

([14]) European Commission (2021). Preliminary impacts of the COVID-19 pandemic on European agriculture: a sector-based analysis of food systems and market resilience

The unprecedented increases of energy, gas, and commodity prices in 2022 have shed light on the dependency of the EU agri-food system on fossil fuels with serious consequences for all actors in the agri-food domain. Food producers have had to face higher costs ([15]) across the board as a result of the recent multiple crises (leading to higher prices of fertilisers, animal feed, energy, raw materials, transport, and packaging). In the EU, food availability is not at stake, though food affordability for low-income groups is. The risks for global food security have increased. ([16]) In addition, climate change and exceptionally hot and dry weather conditions in Europe substantially reduced yield. ([17]) The recent EU Communication on Drivers of Food Security ([18]) confirms the complex interrelation between all the different drivers and the need for holistic approaches towards food security.

1.3. The transition pathway

This Staff Working Document (SWD) is meant to set the scene and **guide the consultation and co-creation process for the transition pathway**.

It is based on a Blueprint developed by the EU Industrial Forum ([19]) which will orient the vision of the pathway. It covers the following areas:

1. Sustainable Competitiveness
2. Regulation and Public Governance
3. Social Dimension
4. R&I, Techniques and Technological Solutions
5. Infrastructure
6. Skills
7. Investments and Funding.

The objective of the current document is to present **an introduction to the key issues for the transition and launch discussions with stakeholders for the co-creation of the pathway.** Each section includes an introductory analysis of the issue and the existing policy landscape. It then outlines a list of **questions to guide stakeholders for their input and reflection**. Stakeholders are welcome to share any other ideas not covered by the questions.

This document and the up-coming pathway will build on the European Green Deal and its associated strategies especially those under the Farm to Fork ([20]), Bioeconomy ([21]) and Biodiversity Strategies ([22]) as well as the SME ([23]) and Industrial Strategies. ([24]) For the social dimension and skills, the European Pillar of Social Rights, the European Skills Agenda ([25]) and the Pact for Skills ([26]) will be considered.

([15]) The Food and Agriculture Organization's (FAO) food price index, tracking international prices of the key food commodities, averaged 143.7 points in 2022, up 14.3% from 2021, and the highest since records started in 1990.
([16]) European Council (2023). Food security and affordability
([17]) JRC (2022), Summer drought keeps its grip on Europe
([18]) SWD (2023) 4 final, Drivers of food security

([19]) The Industrial Forum was set under the EU Industrial Strategy to support the Commission in in assessing the different risks and needs of industry for the twin transition
([20]) COM (2020) 381 final
([21]) COM (2018) 673 final
([22]) COM (2020) 380 final
([23]) COM (2020) 103 final
([24]) COM (2020) 102 final
([25]) European Commission, European Skills Agenda

The next steps for the co-creation process of the pathway include a **public consultation and targeted workshops with stakeholders**. Eventually, as part of the co-implementation process, stakeholders will be encouraged to share ideas for action. In relation to the sustainability transition, it is important to highlight that over 130 food stakeholders have already signed the **EU Code of Conduct for Responsible Food Business and Marketing Practices** and made concrete commitments to improve their sustainability performance. The Code is and will remain the key instrument for sustainability pledges for food operators in the EU. Sustainability commitments for action that come out of the reflection on this transition pathway can be submitted under the Code.

1.4. Scope and stakeholder involvement

In line with the EU Bioeconomy Strategy and its objective to contribute to all three dimensions of sustainability (environmental, social and economic), the transition pathway maintains a holistic approach but will complement and **not interfere with existing policy initiatives under development**. The EU Farm to Fork strategy of March 2020 is the main policy framework for the agri-food ecosystem. The Strategy and its actions are currently under implementation. Their corresponding consultation processes are hence separate from this co-creation process, which is not meant to reopen consultations already finalised or in course. ([27]) Aspects covered by ongoing policy streams, such as the development of the legislative Framework for sustainable food systems (FSFS), will not be the focus of discussion in the transition pathway process.

In addition, since primary producers are already subject to a range of policies and tools, this exercise will mainly focus on the **actors active in the middle part of the food chain**, while keeping in mind the inter-dependency with other operators in the system and the fact that the overall performance of the system depends on all actors within it.

Stakeholders are invited to describe how, in their view, the shift towards a resilient, sustainable, and digital agri-food industrial ecosystem can be realised (with a focus on the middle part of the food chain), and how this can contribute to the overall performance of the ecosystem, maintaining a holistic approach. They are asked to contribute to a bottom-up assessment of the required actions to accompany this transition. Stakeholders are invited to enrich and exceed the initial guidance for action presented in this SWD, indicating their own ideas. Finally, they are asked to provide their views on the costs and benefits of the twin transition, particularly as regards digitalisation aspects, and to suggest (where possible) targets for action and progress indicators to enable monitoring of progress.

This document proposes a comprehensive list of guiding questions for each section. Stakeholders are invited to reflect on these to the extent relevant to them. **The targeted public consultation and accompanying workshops will cover a set of priority questions for which a response is highly recommended**.

([26]) European Commission, Pact for Skills

([27]) Different webpages that describe the state of play of the different F2F initiatives are available on Farm to Fork Strategy (europa.eu), e.g., on sustainable food production (Sustainable food production (europa.eu)) or food loss and waste prevention (Food loss and waste prevention (europa.eu)).

2. SUSTAINABLE COMPETITIVENESS

2.1. Food systems thinking and economic sustainability

Food systems thinking

Food systems thinking relates to the integration of the complexity of transformation of the food system through acknowledging the diversity of actors and activities within the system – systemic approach. ([28]) The aim of food system thinking is to achieve a sustainable and resilient food system. ([29]) This is to be taken into account when analysing the agri-food industrial ecosystem.

Resilience is the dynamic ability of systems to persist in a functional way, despite shocks. It is defined as being able to not only withstand and cope with challenges, but also to undergo transitions, in a sustainable, fair, and democratic manner. ([30]) A system's resilience is dependent on its economic, environmental and social sustainability and is considered as a cross-cutting objective in this document. The resilience of the agri-food ecosystem is also related to the inter-linkages with other ecosystems (such as retail and tourism). There are strong synergies with bio-based industries. The interlocking of value chains is increasingly recognised by thinking of agri-food in terms of a system. It is important to keep this systemic thinking and the ways in which different actors in food systems can mutually reinforce each other. ([31])

Sustainable competitiveness of the agri-food system can broadly be defined as "the ability to generate and sustain inclusive wealth for all, without diminishing the future capability of sustaining or increasing current wealth levels." ([32])

Economic sustainability

Stable supply of agricultural commodities based on a resilient farming community is an indispensable prerequisite for the performance of the entire supply chain, including the economic sustainability of food business operators in the middle of the chain.

Disruptions on climate, ecosystems and natural resources have already led to direct and indirect economic shocks – e.g., availability of supply, price volatility. ([33]) In terms of productivity growth in the agri-food sector, research has shown that for major EU Member States, the growth has been relatively low. The downstream sector has been a beneficiary of productivity gains. Farmers have also benefited from a relatively low extent of productivity gains. ([34]) For fisheries, effort in terms of 'days at sea', deployed by EU fleets, declined by 1.0% in 2020 compared to 2019. Energy consumption decreased by 5.7%. ([35])

([28]) UN (2021). Food Systems Summit

([29]) World Economic Forum (2023). Four ways to make 2023 count in the pursuit of resilient and sustainable food systems

([30]) JRC, Resilience

([31]) FAO (2021), The State of Food and Agriculture 2021, *Making agrifood systems more resilient to shocks and stresses*

([32]) Hirvonen-Ere, S. (2023). Sustainable Competitiveness. In: Idowu, S., Schmidpeter, R., Capaldi, N., Zu, L., Del Baldo, M., Abreu, R. (eds) Encyclopedia of Sustainable Management. Springer, Cham

([20]) IPCC (2022), Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change

([34]) Boussemart, J. and Parvulescu, R. (2021), Agriculture Productivity Gains and their Distribution for the Main EU Members, *Revue d'économie politique*

([35]) JRC and Scientific, Technical and Economic Committee for Fisheries (STECF) (2022), Annual Economic Report on the EU Fishing Fleet

The EU food industry is a leading manufacturing sector for EU in terms of added value and an important contributor to the economy, processing the vast majority of EU agricultural produce (around 70%). It is generally considered competitive on global markets, as EU processed food and drinks are a major contributor to the EU positive trade balance in agri-food (even if differences are noted between sub-sectors and types of companies). Close to 40% of Member States' total food and drink exports were sold to non-EU markets. During the 2010-2020 period, extra-EU exports increased on average by 5% per year, compared to 4% per year for intra-EU exports. Both extra and intra-EU exports have been increasing over the last 10 years. ([36]) Yet, the industry is confronted with challenges. The EU food and drink industry has a lower R&D investment intensity when compared with several food and drink industries worldwide. Producers face difficulties in attracting talent and finding the right skills for the sector. With the 2022 crisis, food and drink companies have been confronted with shortages and rising costs of energy, raw materials, food ingredients and packaging materials. The Russian invasion of Ukraine impacted stocks of some critical raw materials for the industry such as vegetable oils (sunflower, flax, soy), mustard seeds and protein feeds leading to high-level prices. High energy costs, especially for energy-intensive and gas-dependent processors, including many SMEs, threaten the economic competitiveness of the industry. On the demand side, inflationary pressures and subdued private consumption have further intensified competition in the food chain. ([37])

Food retail is a sector with relatively low margins. During the COVID-19 pandemic, food retailers reported sales increases, then in 2022 sales volumes declined by 2.1% compared to 2021. Price sensitivity is expected to increase - especially among low-income groups. Consumers are expected to trade down, giving retailers with strong private label offerings at entry price level an advantage. On the other hand, retailers are expected to increase quality to meet consumer expectations. There is increased focus on sustainability and health (34% more consumers expected to focus on healthy eating and nutrition). Growth is expected in premium ranges for higher income consumers (i.e., higher quality, fresher products). ([38]) Food retail is expected to develop new revenue streams that can enable direct engagement on marketing opportunities. Online food sales are also expected to grow in the coming years. The high inflation and the energy crisis have influenced the competitiveness of the food retail sector as other parts of the supply chain. Food inflation has impacted all the different stages of the supply chain (including food processing and retail).

In 2022 prices of inputs increased ([39]), while consumer spending power dropped putting food producers under pressure to overcome short term challenges. Yet, as the different crises (climate, COVID-19, conflict and the recent energy crisis) exacerbated existing structural issues for all actors in the food chain, operators were also presented with an opportunity to explore ways for re-inventing the food system, to make it more sustainable and resilient. There has been an increased international attention to food production and the role of food producers for food security and global stability. Sustainable production methods are becoming more widespread, in particular organic production is on the rise. The 2020 official figures based on the common EU methodology also showed a certain drop in overall food loss and waste generation. New opportunities are opening with sustainable food packaging solutions, smart factories and food e-commerce.

([36]) FoodDrinkEurope (2022), Data & Trends of the European Food and Drink Industry 2022

([37]) FoodDrinkEurope (2022), Position Paper: *Recommendations for building resilience and sustainability for Europe's food and drink systems*

([38]) EuroCommerce and McKinsey (2022), The State of Grocery Retail 2022

([39]) In September 2022, EU food and drink producer prices increased by 20.9% compared to September 2021 (Source: FoodDrinkEurope)

In conclusion, EU producers have, until now, been able to guarantee the availability of safe, nutritious, and affordable food on the EU market, ensure the necessary workforce to produce (despite structural shortages of workers in agri-food), as well as to export part of their production. Yet, external shocks, including the war in Ukraine, the energy crisis and the new wave of weather extremes, have created an unprecedented situation for all actors in the ecosystem. They have exacerbated certain vulnerabilities, such as the EU dependency on imports of important inputs, namely fossil fuels, fertilisers and animal feed. Access to reliable energy sources at affordable prices is an important prerequisite for ensuring stable and competitive food production. Fertiliser prices have multiplied due to gas price increases and ban on imports from Russia and Belarus. Carbon-dioxide production for food industry uses has been affected. Moreover, most of agri-food processes involve heating and cooling which are highly energy intensive. Food operators have been calling for guaranteed prioritisation of agri-food as an essential sector of strategic importance at EU level and across all Member States in a uniform manner. They have made clear the need to move towards a more sustainable ecosystem as part of the bioeconomy, 'reducing the dependency on fossil fuels, fertilisers and other inputs, while proactively developing and stimulating a solutions toolbox for alternatives, keeping up productivity and yields' ([40]). Investment and innovation in all parts of the food chain need to be guaranteed as a prerequisite for the resilience and economic competitiveness of the ecosystem. In the long term, a way to reduce certain dependencies and ensure food security is to maintain the transition to a less energy intensive and sustainable food system, underpinned by fairness in the supply chains, as well as sharing of knowledge and good practices, research, innovation and the use of digital technologies.

2.2. International trade and food security

International trade plays a key role for the agri-food ecosystem and food security. The EU is the world's number one agri-food exporter and a major importer. In 2022, EU agri-food exports reached EUR 229.8 billion (+16% compared to 2021) ([41]). The top export destinations for EU food and drinks were the UK, US, China, Switzerland and Japan. The top imports of agri-food into the EU came from Brazil, the UK, Ukraine, the US and China. ([42])

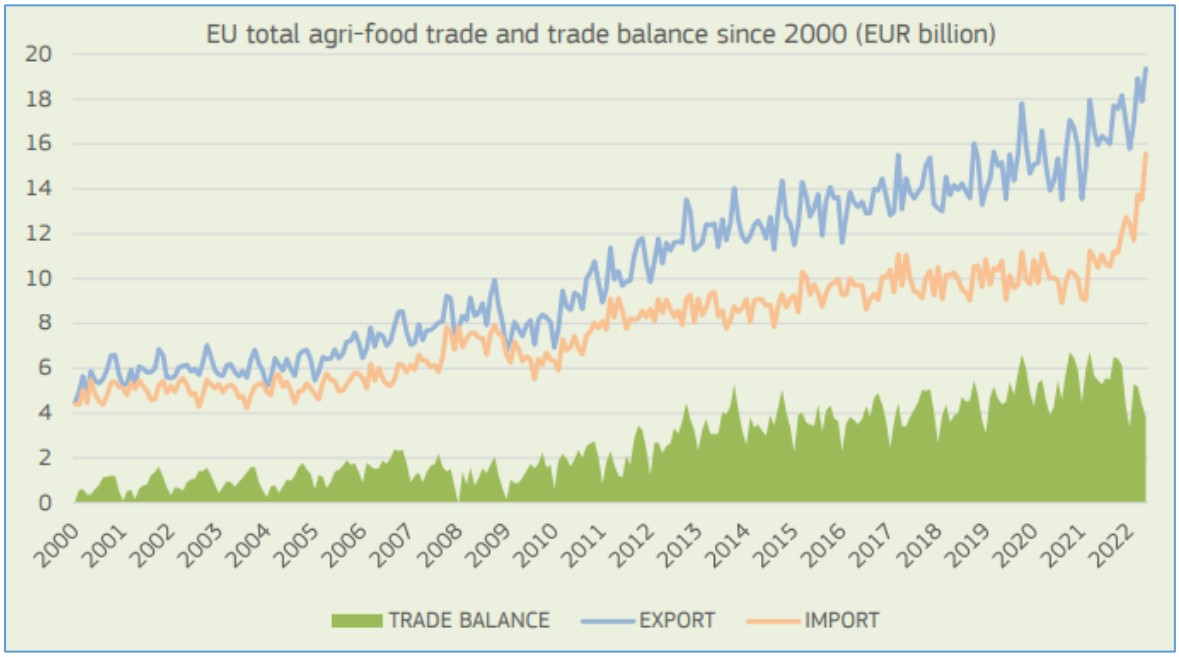
The EU is largely self-sufficient for key agricultural products, being a main wheat and barley exporter, and largely able to cover its consumption for other staple crops, such as sugar. The EU is also largely self-sufficient for animal products, including dairy and meat, with the notable exception of seafood. EU is 77% self-sufficient for protein in animal feed. ([43]) Yet, for high protein animal feed such as soy the EU is still dependent on imports. ([44]) The top three import product categories in agri-food in 2022 were oilseeds and protein crops, fruit and nuts, and the category of 'coffee, tea, cocoa and spices'.

For fishery and aquaculture products, the EU is a net importer. The seafood market has a high degree of import-dependency, the EU self-sufficiency being at 11% for the top five species consumed. ([45])

([40]) FoodDrinkEurope (2022). Recommendations for building resilience and sustainability for Europe's food and drink systems
([41]) This includes both basic and processed agricultural products.
([42]) European Commission (2023), Monitoring EU agri-food trade
([43]) EU feed protein balance sheet, European Commission DG AGRI: Oilseeds and protein crops

([44]) European Environment Agency (2020), EU animal feed imports and land dependency
([45]) European Market Observatory for Fisheries and Aquaculture Products, European Commission (2022), The EU Fish Market, 2022 edition

In terms of exports, EU remains competitive on the world market for a list of products. The EU's top food export categories include cereal prepartions, dairy products, wine, cereals and mixed food preparations and ingredients. Products of the food and drink industry such as spirits and beer, chocolate and confectionary also have an important place in EU's export basket for food.



Source: European Commission (2022). ([46])

The Russian invasion of Ukraine significantly impacted global markets, with reduced availability of exports from Ukraine for cereals (mainly wheat and maize) and vegetable oils (such as sunflower oil) in 2022. The EU Solidarity Lanes have since their inception facilitated 55% of food exports from Ukraine via land routes and EU ports. To ensure a truly resilient ecosystem ([47]), the preparedness and response to trade disruptions in times of crisis will have to be assured. ([48])

The EU is committed to ensuring the sustainability of its trade relations, including for food products. Modern EU trade agreements contain rules on trade and sustainable development, and the latest agreements also include a chapter on 'Sustainable Food Systems'. The EU Regulation on deforestation-free products, in force since June 2023, is to guarantee that imports into the EU of key agricultural and food products are deforestation-free. Food business operators will be expected to take further steps on due diligence and consider sustainability in their trading practices.

2.3. Environmental sustainability

Food production is embedded in the natural environment and is dependent on it. Its impact on the environment is manifold, ranging from greenhouse gas emissions to water usage, soil health, eutrophication, biodiversity loss, land use changes and several types of pollution as well as carbon

([46]) Monitoring EU agri-food trade, *Developments in May 2022*
([47]) COM(2022) 133 final
([48]) Other dimensions of resilience of the agri-food ecosystem, such as transport (green lanes, solidarity lanes), storage (energy costs) are discussed in other sections of this document.

sequestration and maintenance of agricultural landscapes. The sustainability transition of the agri-food system is fundamental for reaching the EU Green Deal objectives. Notably thanks to the Common Agricultural Policy (CAP), EU agriculture is the only major system in the world that reduced greenhouse gas (GHG) emissions (by 20% since 1990) while increasing EU production. ([49]) However, within the EU, this path has been neither linear nor homogenous across Member States. For fisheries, fuel use intensity overall decreased by 15% in the last decade due to 1) the good state of some stocks, 2) changes in fishing behaviour by some fishing vessels intended to reduce consumption and 3) more fuel-efficient technology and fishing gears. With an annual fuel consumption of almost 2 billion litres, there is room for substantial improvement in energy efficiency. ([50])

Primary production is hence confronted with an important sustainability mission – to adopt green production methods and reach ambitious targets. In that context, the balance (and complementarity) between the need to produce food and the need to reduce the environmental footprint has to be found.

The manufacturing, processing, retailing, packaging and transportation of food also make a major contribution to air (including GHG emissions), soil and water pollution and has a profound impact on biodiversity. ([51]) They can also positively influence the sustainability performance of their suppliers. While all stages and actors involved are essential to ensure a sustainable transformation and these inter-dependencies will be clearly recognised, the main focus in this document will remain the 'middle of the chain'. This includes food retail which plays a key role in nudging consumers to healthy and sustainable choices, for instance by changing the way products are presented in their stores. ([52])

The sustainability transition means opportunities, but also a clear responsibility for business operators, whose decisions also influence other actors in the chain. Food processors have the option to support their suppliers in the transition through supplier innovation partnerships, providing policies and principles for the cooperation and offering guidance, tools and resources. They have an indirect influence on the allocation of resources as well as on the final purchasing decisions. Food processors (especially larger players) are increasingly setting sustainability strategies and making ambitious commitments in various areas of food sustainability (including under the EU Code of Conduct for responsible Food Business and Marketing Practices). Yet, small and more traditional food producers often find it challenging to undertake the sustainability shift. Such difficulties have been exacerbated by the COVID-19 crisis and recent increases of energy and raw material prices. One of the main issues to be addressed remains efficient energy use. Food processing is energy intensive, highly dependent on gas and fuel. Heating and cooling operations also require significant energy supply. Transport and logistics also have scope for optimisation, to deliver food in a climate-friendly way. In order to move towards a clean and affordable energy transition actors of the same geographical area can form energy communities. Through a participatory and collective approach, energy communities can contribute to increasing public acceptance of renewable energy projects, make it easier to attract private investments in the clean energy transition and at the same time have the potential to provide direct benefits by increasing energy efficiency, lowering electricity bills and creating local job opportunities. ([53])

([49]) European Commission (2021), Evaluation of CAP's impact on climate change and greenhouse gas emissions

([50]) JRC and Scientific, Technical and Economic Committee for Fisheries (STECF) (2022). Annual Economic Report on the EU Fishing Fleet

([51]) COM (2020) 381 final, A Farm to Fork Strategy

([52]) Marketing campaigns often focus on less healthy foods, which is especially worrisome when it comes to advertisements targeting children.

([53]) European Commission, Energy Communities

The circular and sustainable bioeconomy, with food-systems as its biggest sector, offers numerous opportunities. Organic resources, such as those from food by-products, are free from contaminants and can safely be returned to the soil in the form of organic fertiliser. Some of these by-products can provide additional value before this happens by creating new food products, fabrics for the textiles and fashion industry, or as sources of bioenergy. These cycles regenerate living systems, such as soil, which provide renewable resources, and support biodiversity. Some businesses are already operating in a way that helps regenerate natural systems. Creating such a systemic shift will require investments of both time and funding. ([54])

Food packaging plays an important role in preserving, protecting, transporting and consuming food and, as well as guaranteeing food hygiene and longer shelf-life. Yet single use food packaging is one of the main contributors to consumer packaging waste. Over-packaging, littering or unsustainable disposal and the current mode of food consumption, influenced by society's culture and structure, add to the environmental footprint of the food system, ([55]) including the plastic litter into the oceans. ([56])

Consumer choices have an important impact on the sustainability of food systems. Overconsumption of certain foods is linked to environmental and health issues. Consumer habits depend on affordability, culture, upbringing, availability and accessibility of diverse types of food, but are also impacted by the overall food environment, advertising and promotion campaigns of the food industry and retail. Consumer demand also shapes the rest of the food system (production and post-production activities). Changes in consumption patterns can therefore clearly increase sustainability.

Food waste is a major issue to be addressed, especially at household level. ([57]) This comes in addition to food loss issues experienced by the farming sector, with interlinks between the farmers and other parts of the food chain (e.g., products not harvested because of low prices). Reducing food waste brings savings for consumers and operators, and the recovery and redistribution of surplus food that would otherwise be wasted has an important social dimension. It also ties in with policies on the recovery of nutrients and secondary raw materials, the production of feed, food safety, biodiversity, bioeconomy, waste management and renewable energy. ([58]) About 8-10% of the world's greenhouse gas emissions originate from food waste. ([59]) Food producers and food service can play their part in helping consumers and restaurants to limit food waste by supporting them with predictive analytics or portion control offerings/portion size labelling and other measures to better estimate the amount of food needed.

The EU is committed to reducing the environmental and climate footprint of the EU food system, by remaining sustainably competitive. Despite the difficulties that the ecosystem is currently facing, long term plans to reduce requirements and energy dependency by investing in renewable energy resources

([54]) EllenMcArthurFoundation

([55]) COM(2022) 677, of 30.11.2022 Regulation on packaging and packaging waste

([56]) United Nations Environment Programme (2023). Turning off the Tap: How the world can end plastic pollution and create a circular economy

([57]) According to Eurostat (2022), in 2020 around 127 kilogrammes (kg) of food waste per inhabitant were generated in the EU. Households generated 55 % of food waste, accounting for 70 kg per inhabitant. The remaining 45 % was waste generated upwards in the food supply chain. Household food waste is nearly twice the amount of food waste arising from the sectors of primary production and manufacture of food products and beverages (14 kg and 23 kg per inhabitant; 11 % and 18 %, respectively), sectors in which strategies exist for reducing food waste, for instance with the use of discarded parts as by-products. Restaurants and food service accounted for 12 kg of food waste per person (9 %), while retail and other distribution of food was the sector with the least amount of food waste (9 kg; 7 %); however, the impact of the COVID-19 lockdowns on these two sectors is still being analysed.

([58]) COM (2020) 381 final, A Farm to Fork Strategy

([59]) United Nations Environment Programme (2021), Food Waste Index Report 2021

and applying sustainability solutions (including for inputs such as fertilisers) remain crucial. ([60])Environmental sustainability hence requires collaborative action by all actors in the chain.

2.4. The role of digitalisation for sustainable competitiveness

Advanced technologies are essential in enabling the agri-food ecosystem to increase efficiency in production, while limiting the global impact of food production on the environment. ([61]) They are also essential for its resilience, as data-driven insights can improve decision-making and practices and can help making the job more attractive to younger generations. Advanced technologies such as Artificial Intelligence, robotics, block chain, high performance computing or the Internet of Things (IoT) have the potential to make farming, food processing, retail and food service more efficient and sustainable. Technology shifts in agri-food are occurring in the direction of the Industry 4.0. As industrial processes are becoming increasingly digital, automated and connected, an agri-food 4.0 is coming into place. ([62])

Farmers are increasingly using digital technologies such as smartphones, tablets, in-field sensors, drones and satellites. These technologies provide a range of farming solutions such as remote monitoring of soil conditions, better water management, and livestock and crop monitoring. They are also supported by digital farm management systems and tools to manage and oversee activities at farm and production level. Precision farming helps increase crop yields and animal performance, reduce costs, including labour costs, and optimise process inputs, reducing the environmental and carbon footprint. Analysis of data generated throughout these processes and access to real-time data allow farmers to gain further insights for the management of their farms and make well-informed decisions. At the same time, farmers can directly connect with actors of the supply chain via digital tools. Open digital platforms that deliver data sharing and precision farming services, when well designed, allow fair collaboration between actors in the value chain.

Food processors are increasingly using smart solutions, moving to Industry 4.0. Companies that adopt digital technologies see increases in productivity gains and their employee numbers. ([63]) Processors, in collaboration with producers and public health organisations, could also use technologies to increase the diversity and healthfulness of what consumers choose to eat. ([64]) Companies in the food and drink industry are in the process of adapting to this 'fourth industrial revolution'. To exploit the benefits of the 'smart factory', flexible systems that communicate openly with one another are required. Flexible production with small batch sizes allows processors in the food and drink industry to adapt quickly to a market in which the requirements change constantly and decrease food waste.

Digital tools offer opportunities to renew business models in value chains by connecting producers and consumers in innovative ways. ([65]) They can improve collaboration and coordination over the entire agri-food value chain. An example of this would be the digitalisation of traceability information, which could be a relevant tool when it comes to addressing some of the risks present in the agri-food ecosystem. Digital traceability could, for instance, streamline remedies against food

([60]) COM (2022) 590 Commission Communication on availability and affordability of fertilisers

([61]) European Commission (2020), Technological trends in the agri-food industry

([62]) European Commission (2020), Technological trends in the agri-food industry

([63]) The 2018 Digital Transformation Scoreboard of FoodDrinkEurope showed that 48% respondents in the food sector that adopted digital technologies experienced up to 20% increases in productivity gains, while 24% of food companies reported an increase in their employee numbers. FoodDrinkEurope (2020), Data & Trends of the European Food and Drink Industry 2020

([64]) European Commission (2021), Report of the 5th SCAR Foresight exercise expert group - natural resources and food systems: transitions towards a 'safe and just' operating space

([65]) European Commission (2019), AgriResearch Factsheet, *Digital Transformation in Agriculture and Rural Areas*

fraud or food safety incidences, as it makes it possible to trace back in an efficient manner where an issue in the chain started. Moreover, it could improve cost efficiency and resource efficiency in the chain. ([66]) Digitalisation is reshaping relationships in the food supply chain and has impacted the market structure of the value chain, allowing sellers to optimise the use of market related tools that facilitate the sales and provide alternatives to usual selling paths. While facilitating and speeding the flow of information within actors, digitalisation has the potential to create more efficient B2B relations within the food supply chain. ([67])

The use of digital technologies hence plays a role in communicating to consumers (via digital labelling, QR codes, apps). Digital technologies have the potential to offer consumers greater transparency as to how their food is produced.

E-commerce creates new opportunities for market entrance as digital technology advances allow for a more direct communication with customers. This digital revolution implies greater choice and customised offers to consumers, provided that digital solutions can be user-friendly and consumer education and openness to technology are taken into account. This trend towards the individualisation of offers has developed through the increasing use of social media and availability of customers' data. In addition to higher consumer fulfilment, digitalisation offers opportunities to respond to societal expectations: reduction of food waste with automatic discount on expiring products, better traceability and nutritional information, improved communication between producers and consumers and many more. ([68])

In combination with well-identified new technologies such as robotics, automation, satellite and positioning systems, big data is also a major opportunity for the agri-food sector. Data can support food stakeholders to optimise the management and planning of production (e.g., technical data from automatic system), ensure price transparency or risk management, strengthen relations along the chain, improve use of resources, increase traceability, foster entrepreneurship, or adapt to shifts in climate path. In addition, data infrastructures help scientific organisations and public authorities to manage, share and combine food data. Big data and blockchains, which store blocks of information distributed across the network, can fundamentally change business processes, allowing chain participants to have the same information, with secure transactions and lower costs. ([69]) Overall, digital product passports, or blockchain applications can help increase supply chain transparency, increasing customer confidence.

However, the digital transformation of the agri-food ecosystem needs to be further accelerated. Problems range from low awareness of the potential of data-driven innovation and of sharing data (and related burden to SMEs), lack of infrastructure, unclear data access and use rights, applied technologies that might not be adapted to the needs of the sector, and cybersecurity to low skills and limited investment capacity. ([70]) In addition, other considerations such as the availability of raw materials (rare minerals), electronic waste, or the reskilling of the workforce must be taken into consideration. Data sharing presents major opportunities for primary producers, but also for processors, distributors, and retailers, to reflect a holistic and product life cycle-based approach. There is also a growing call to give farmers and small businesses the tools and means to decide what is done

([66]) EIT Food (2021), How can digital traceability increase trust in the agrifood industry?
([67]) High Level Forum for a Better Functioning Food Supply Chain (2019), final report
([68]) High Level Forum for a Better Functioning Food Supply Chain (2019), final report
([69]) High Level Forum for a Better Functioning Food Supply Chain (2019), final report
([70]) European Commission (2020), Food 2030 pathways for action, *Research and innovation policy as a driver for sustainable, healthy and inclusive food systems*

with their data, to address the oligopolistic characteristics of today's data economy and to improve its governance. ([71])

Questions to stakeholders (Sustainable Competitiveness)

To kick-start the consultation on the transition pathway, stakeholders are invited to reflect on the below list of questions. These are initial guiding questions, and further input beyond these matters will be welcome during the co-creation process.

GUIDING QUESTIONS
How does the ecosystem compare to similar ecosystems outside of the EU when it comes to sustainability and digitalisation? What would be the best practices to foster a more resilient agri-food ecosystem to external shocks?
How could sustainability and digitalisation contribute to improving the global competitiveness of the ecosystem, especially of its SMEs, and what challenges could this potentially create?
How could enhanced sustainability and digitalisation in the middle part of the food chain help to improve the environmental and socio-economic performance of the entire chain (including of farmers and fishers)? Which actions tackling the middle part of the chain should be envisaged?
What are the enablers needed to achieve the digital and sustainability transition of the eco-system (particularly for SMEs)?
Are there dynamic SME (Small and Medium sized Enterprises) and start-up communities in the ecosystem contributing to sustainability and digitalisation? How can such communities be supportedincluding at local/regional level?
Are there enough collaborative networks or industrial clusters in the ecosystem contributing to sustainability and digitalisation? How could those networks be reinforced?
What synergies between the agri-food ecosystem and other ecosystems can contribute to improving resilience and increasing open strategic autonomy? What actions could exploit these synergies?
Are there strategic dependencies that could reduce the resilience of the ecosystem inside and outside the EU? If there are potential "chokepoints" (dependencies on critical inputs) - are there contingency plans in place to make sure those are addressed?
How can the ecosystem benefit better from integration in the global economy from the perspectives of supply diversification? What solutions are available for the diversification of supplies (including energy)? How can the agri-food ecosystem improve its overall sustainability and competitiveness

([71]) European Commission (2020), Food 2030 pathways for action, *Research and innovation policy as a driver for sustainable, healthy and inclusive food systems*

performance in international trade (including for food SMEs)?
What are ways to reduce energy consumption, increase energy efficiency and the share of renewable energy (e.g., used for transport, heating and cooling) and promote the collaboration with partners along the system on overall defossilisation?
How can the circular food economy be boosted? What measures and (new) business models could be adopted to quickly integrate innovative solutions enhancing circularity of materials and resource efficiency? What synergies between the agri-food ecosystem and other ecosystems can contribute to the deployment of a sustainable and circular bioeconomy?

3. PUBLIC GOVERNANCE

3.1. An enabling policy framework for the agri-food ecosystem

The EU is determined to be a frontrunner when it comes to the transition to a sustainable agri-food system and make EU food a global standard for sustainability. The **EU Farm to Fork Strategy**, launched in May 2020 as part of the **European Green Deal**, includes 27 actions for a more sustainable, and thus resilient, EU food system across the value chain. ([72]) The Farm to Fork Strategy therefore remains the main EU policy framework for the transition to sustainable food systems. The **EU Common Agricultural and Common Fisheries Policies** (CAP and CFP) also play an indispensable role in achieving sustainable food production, based on their crucial impact on the overall sustainability performance of the food chain. To complement existing initiatives, this document will mostly focus on the policy streams particularly relevant for the actors 'between the farm and the fork'.

One of the cornerstones of the Farm to Fork Strategy is the up-coming **Legislative Framework for Sustainable Food Systems (FSFS)**. Similarly, to the **General Food Law** it will become the horizontal framework setting the foundations for the systemic changes that are needed by all actors of the food system to accelerate the transition to a sustainable EU food system. Its main objective will be to improve the functioning of the internal market, in a manner that enables the systemic changes needed by all actors for the transition to a resilient and sustainable EU food system, enhancing consumer and environmental protection.

The **EU Code of Conduct on Responsible Food Business and Marketing Practices** is an industry-led initiative under the Farm to Fork Strategy, aimed at business actors in the 'middle part' of the chain. Launched in July 2021, it currently has more than 130 signatories. It sets out the actions that food chain actors, mainly 'between the farm and the fork', such as food processors, food service operators and retailers, can voluntarily commit to undertake to tangibly improve and disseminate their sustainability performance. Together with the Signatories of the Code, the Commission is active in maintaining an exchange between the community of signatories and attract more SMEs, by providing supportive tools. The Code has 7 key aspirational objectives covering all sustainability aspects of the agri-food ecosystem, under which the Code's signatories have made to date over 500 commitments.

([72]) COM (2020) 381 final, A Farm to Fork Strategy

Reducing food loss and waste is a key policy objective. The EU is committed to halving per capita food waste levels by 2030. Within the **EU Platform on Food Losses and Food Waste**, stakeholders are discussing on recommendations on how to act on this commitment. As part of the 'Sustainable Use of Natural Resources Package' the European Commission has proposed specific targets for food waste reduction at Member States' level ([73]). The recent crises have underlined the importance of the **European Food Security Crisis preparedness and response Mechanism (EFSCM)** created as part of the Farm to Fork Action plan. After its first meeting in March 2022, the EFSCM stakeholder group ([74]) met several times to exchange views on risks and vulnerabilities of the supply chain. It is playing an important role particularly for the exchange of information on the effects of the Russian invasion to Ukraine on the food sector.

As a response to the impact of the war in Ukraine, the Commission issued a **Communication on Safeguarding food security and reinforcing the resilience of food systems** in March 2022. ([75]) The Communication put forward overall response measures for global food security (with a focus on food security in Ukraine) and short- and long-term food security measures for the EU. ([76]) Other actions to support the ecosystem included a proposal for the temporary suspension of import duties for certain nitrogen fertiliser inputs ([77]) and measures to increase the EU's arable crops production, allowing farmers to increase their sowing area for sunflower and protein crops.

The EU has adopted several policy measures in relation to the current energy crisis, which is heavily impacting the agri-food ecosystem. With the **RePowerEU Plan**, the Commission outlined steps to reduce energy dependency through energy savings, diversification of energy supplies, and accelerated roll-out of renewable energy. A **Bio-methane Action Plan** sets out tools, including a new bio-methane industrial partnership and financial incentives, to increase production, including through the **Common Agriculture Policy (CAP)**. Under the **'Save Gas for a Safe Winter Plan'** the Commission, following consultations with industry, issued guidance on the prioritisation criteria of non-protected customers, in particular of industry. It recognised that agri-food should be prioritised as a societally critical sector. The nexus and possible trade-offs between safeguarding food security and overcoming the energy crisis has also been addressed in the **EU Bioeconomy Strategy Progress Report** of June 2022. ([78])

In 2021 the European Commission adopted a new approach for a **Sustainable Blue Economy in the EU**. This detailed agenda for the blue economy aims to achieve the European Green Deal's objectives, and complement other recent Commission initiatives on biodiversity, food, mobility, security, data, and more. Smart specialisation strategies are a key enabler of the implementation of the sustainable blue economy. In the beginning of 2023, the Commission also adopted a 'fisheries package' made up of a Marine Action Plan and a Fisheries and Oceans Pact, and two reports – one on the Common Fisheries Policy, the other on the common organisation of fishery markets.

The Commission has also published a proposal for a revision of the **Packaging and Packaging Waste Directive (PPWD)**, which will have an impact also on food packaging ([79]). The proposal aims to reinforce the mandatory essential requirements for packaging to be allowed on the EU market and

([73]) The package also covers the EU
([74]) The group gathers European and national administrations and food stakeholders all along the supply chain.
([75]) COM (2022) 133 final
([76]) European Commission (2023). Analysis of main drivers in food security
([77]) European Commission (2022). Ensuring availability and affordability of fertilisers
([78]) COM (2022) 283 final
([79]) COM(2022) 677, of 30.11.2022

focus on reducing (over-)packaging and packaging waste, driving design for re-use and recyclability of packaging and considering reducing the complexity of packaging materials.

The Commission is also in the process of revising the **EU Food Contact Materials (FCM) legislation** (under the framework Regulation (EC) 1935/2004) to address several issues such as insufficient prioritisation of most hazardous substances in food contact materials and the need for a future-proof framework supporting innovation and sustainable development. The revision will consider rules to support the use of innovative and sustainable packaging solutions using environmentally friendly, re-usable and recyclable materials, and contribute to food waste reduction.

In relation to food consumption, the Commission is currently gathering evidence to define possible policy actions to facilitate consumers to make informed and healthier choices. This is included in the revision of the **Food Information to Consumers legislation (FIC)**. ([80]) A sustainability labelling framework should furthermore be proposed as part of the upcoming legislative Framework for Sustainable Food Systems. In a broader context, the **Green Claims Directive** covers sustainability labelling. ([81])

The EU is also active in preventing, detecting and deterring food fraud. Fraud affects businesses and consumers. Infringements of the EU agri-food legislation may also hinder the functioning of the EU Single Market. The Commission published guidance on fighting fraudulent and deceptive practices in the agri-food chain ([82]); coordinated enforcement activities of the **EU Agri-Food Fraud Network** which links the Commission, liaison bodies designated by Member States, Switzerland, Norway and Iceland; and streamlined information exchanges on food fraud suspicions through tools such as the **Information Management System for Official Controls (IMSOC)** ([83]).

In addition to agri-food specific initiatives, several horizontal policy initiatives have particular relevance for the agri-food ecosystem. For instance, the **EU Regulation on deforestation-free products** sets mandatory due diligence rules for operators which place specific commodities on the EU market or export from it associated with deforestation and forest degradation ([84]). The Commission proposal for a Directive on corporate sustainability due diligence will contribute to more sustainable and responsible value chains, including for food. The Commission also adopted a proposal to tackle the use of forced labour in value chains of products circulating within the Single Market.

From an international perspective, the EU's updated trade strategy **'Trade Policy review – An open, sustainable and assertive trade policy'** sets the scene for promoting sustainable trade, including the food domain. ([85]) In June 2022, the Commission presented the Communication 'The power of trade partnerships: together for green and just economic growth' with a new plan to strengthen the sustainability impact of Free Trade Agreements (FTAs). ([86]) Recent FTAs negotiated by the EU systematically include provisions on trade and sustainable development and the latest one's specific chapters on sustainable food systems. ([87]) The aim of such provisions is to maximise the leverage of

([80]) Regulation (EU) No 1169/2011
([81]) COM(2023)166
([82]) Fighting fraudulent and deceptive practices in the agri-food chain (technical report)
([83]) Commission Implementing Regulation (EU) 2019/1715 of 30 September 2019 laying down rules for the functioning of the information management system for official controls and its system components (the IMSOC Regulation)
([84]) Regulation (EU) 2023/1115 of the European Parliament and of the Council of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010 (OJ L 150, 9.6.2023, p. 206–247).
([85]) COM (2021) 66 final
([86]) COM (2022) 409 final
([87]) For example, the EU-Chile FTA negotiated text includes a chapter on sustainable food systems.

EU trade and investment policy on issues such as decent work, environmental protection, sustainable fisheries and aquaculture or the fight against climate change, to achieve effective and sustainable policy change, to cooperate on issues related to sustainable food systems. ([88]) Furthermore, at the request of Parliament and Council, the Commission published a report on the application of health and environmental standards to agri-food imports. ([89])

While often of voluntary nature and developed by independent certification bodies, certification schemes for agricultural products and foodstuffs provide assurance that certain attributes of the product or its production method have been observed. Many are related to environmental sustainability. Such schemes can play a role in facilitating the shift towards more sustainable farming and fishing. ([90])

An important initiative to support the ecosystem in its resilience and sustainability journey is the **European Cluster Collaboration Platform (ECCP)**, an online community which helps cluster organisations across Europe and beyond to connect and collaborate. It provides a one-stop shop for opportunities and collaboration for EU industrial clusters. To help the industrial ecosystems (as agri-food) to decarbonise, the **European Resource Efficiency Knowledge Centre (EREK)** hosted by the ECCP, provides tools, information and business opportunities. It showcases resource-efficient and circular business models which turn waste into an asset. ([91])

Another initiative supports the agri-food ecosystem through fostering at EU level collaboration among regional authorities. The platform on agri-food brings together regions focussing on agriculture and food in their **Smart Specialisation Strategies** ([92]) with the objective to support their efforts in developing a pipeline of investment projects on agri-food. The platform ensures an active participation and commitment of industry and related business organisations and clusters as well as research institutions, academia and civil society.

In all policy initiatives, special attention should be given to the sustainability journey of SMEs, which make up the majority of the ecosystem. The Sector Group Agri-Food of the **Enterprise Europe Network (EEN)** already provides support to agri-food SMEs and will step up its work on sustainability. The Network is active in more than 60 countries worldwide and brings together 3,000 experts from more than 600 member organisations. The EU SME Strategy introduced the role of sustainability advisers for SMEs. EREK also supports national, regional and local organisations across Europe that work with SMEs to improve their environmental performance, helping them to become more resource efficient.

3.2. The EU's digital strategy and agri-food

The EU's digital strategy aims to make the digital transition work for people and businesses, while helping to achieve its target of a climate-neutral Europe by 2050. ([93]) With the **2030 Digital Compass** targets, the Commission works towards the digitalisation of all sectors, and provides concrete targets for updating the skills and innovating data-enabled business models for SMEs. The European strategy for data aims at creating a Single Market for data. Common European data spaces in strategic

([88]) Commission Services (2018), Feedback and way forward on improving the implementation and enforcement of Trade and Sustainable Development chapters in EU Free Trade Agreements
([89]) COM (2022) 226 final
([90]) European Parliament (2022), Farm certification schemes for sustainable agriculture
([91]) European Cluster Collaboration Platform, European Resource Efficiency Knowledge Centre (EREK)
([92]) Inforegio - S3 Smart Specialisation (europa.eu)
([93]) European Commission, A Europe fit for the digital age

economic sectors and domains of public interest will ensure that more data becomes available for use, while keeping the companies and individuals who generate the data in control of their data. ([94])

The setting up of the **Common European Data Spaces** is supported by policy, legislative and funding measures. **The Data Governance Act (DGA)**, the first Regulation following the European strategy for data, creates new rules on the neutrality of data intermediaries and lays down a horizontal governance framework for data that will apply to data exchanges in the Common European Data Spaces. The European Data Innovation Board will contribute to enhancing interoperability and ensure a coherent development of all the common European data spaces. The **Common European Agriculture Data Space (CEADS)** aims to create an agriculture ecosystem where private and publicly held data is shared in a fair, sustainable and transparent manner, where all stakeholders, including farmers and SMEs, can benefit from the value of the data they generated and shared. The Common European Data Spaces, the European Green Deal data space and more will complement initiatives as the EU's Earth observation programme Copernicus, the European Marine Observation and Data Network (EMODnet) and other data services.

Building on the Commission's work on data and chips, the **Coordinated Plan on AI** makes concrete proposals for further action and identifies key areas with high impact, notably agriculture, as well as the Green Deal more broadly. To bridge the gap between AI research and deployment, the Commission is co-funding together with Member States, new AI Testing and Experimentation Facilities focused on the agri-food sector, where companies will be able to test their latest AI-based technologies in real-world environments. Furthermore, the Commission has set up the 'AI on Demand platform, a European marketplace for trustworthy AI solutions, which includes a specific section focusing on agriculture.

Questions to stakeholders (Regulations and public governance)

GUIDING QUESTIONS
How can governance at all levels improve the situation of food SMEs and facilitate their green and digital transition?
Are there unmet needs for business operators in relation to the green transition in the ecosystem? What standardisation actions could accommodate these needs?
Are there existing public-private partnerships or other public and/or private initiatives that can support the green transition in the ecosystem by means of digitalisation?
What synergies could be achieved by better coordination between the different partnerships and initiatives to realise the green transition in the ecosystem by means of digitalisation?
Have exercises similar to the transition pathway exercise taken place for this ecosystem at a national or regional level (also cross- border) with a focus on the green and digital transition? What could be learned from these exercises to the benefit of this transition pathway?
Which tools can be fast-tracked (particularly at Member State and local levels) to accelerate the green and digital transition (e.g., permits), particularly when fast responses are needed in critical situations?

([94]) European Commission (2022). A European Strategy for data

4. THE SOCIAL DIMENSION

4.1. A just transition

Ensuring a sustainable livelihood for all actors, especially primary producers, who still lag behind in terms of income ([95]), is essential for the success of the recovery and the transition and will lead to a more resilient ecosystem. ([96]) The agri-food sector is highly dependent on the availability and quality of the workforce. Such workforce is often insufficient and socially vulnerable because of the working conditions: low salaries, difficult working conditions, and short term or seasonal contracts. All citizens, operators and other stakeholders across value chains, in the EU and elsewhere, should benefit from a just transition, especially in the aftermath of the COVID-19 pandemic, the Russian invasion of Ukraine and the subsequent economic and social downturn, which has intensified competition in the food chain. In June 2022, a Council Recommendation on ensuring a fair transition towards climate neutrality was adopted, which invites Member States to adopt and implement comprehensive and coherent policy packages, addressing the employment and social aspects to promote a fair transition across all policies, as well as to make optimal use of public and private funding. ([97]) In April 2023, the Council has adopted conclusions, stressing the importance of the circular and sustainable bioeconomy to modernise our food systems and contributing to rural development. ([98])

The entire food chain has potential to meaningfully contribute to a just transition. Food processors have an impact on ensuring a fair income for those working within their extended supply chains. Companies active in the food and drinks industry also have the responsibility to unlock opportunities for women in supply chains, workplaces and marketplaces. Women produce the majority of the world's food but earn only 10% of the world's income. ([99]) Companies can further make **Corporate Social Responsibility (CSR)** programs a core part of their business, including actions on more transparency, a child-labour free chain, fair wages, and eliminating the exploitation of water, land and labour, as well as being involved in responsible purchasing, ensuring fair prices to farmers and fishers. Disclosing CSR activities could also lead to positive outcomes from a business perspective: employee motivations and higher commitment to work and an improved image.

Food service and food retail sectors are closest to the final consumer and part of the communities in which food products are consumed. They play a crucial role, generating jobs and providing valuable skills. Restaurants and shops could also support the local economy by buying directly from farmers in the region and donating leftover food to food banks. Even if some work in food service is often regarded as a temporary job, it provides young people with the opportunity to gain transferable skills. Strategies for retention of trained employees can highly contribute to the sustainability of the sector.

Food retailers are a major employer in the EU (5.6 million people). They face high demand for new skills and roles and high attrition rates for existing employees. ([100]) The sector is labour-intensive,

([95]) For example, the average EU farmer currently earns around half of the average worker in the economy as a whole, see: CAP Context indicator C.26 on Agricultural entrepreneurial income (see European Commission, Jobs and growth in rural areas - Infopage, *GDP, incomes, employment in agriculture and poverty rates in rural areas*)

([96]) COM (2020) 381 final, A Farm to Fork Strategy

([97]) European Commission (2021), Commission presents guide for a fair transition towards climate neutrality
See also: European Commission, European Pillar of Social Rights

([98]) Council conclusions 8194/23

([99]) Oxfam Aotearoa, Women's rights

([100]) EuroCommerce and McKinsey (2022), The State of Grocery Retail 2022

leading to challenges for employers in recruiting, retaining and engaging its employees. A focus on fair working conditions, career advancement and diversity is of major importance. ([101])

The social partners of the agri-food ecosystem are promoting a just transition in agri-food in the context of the **European Sector Social Dialogue Committee (ESSDC)**. Their Work Programmes focus on political developments and the regulatory environment affecting the ecosystem, addressing sustainable employment challenges, particularly the qualifications and training needs of the sector. The social partners have developed 'Good practices and tools from the food and drink industry in Europe' as a toolbox for their members. ([102])

A just transition also means ensuring the access to healthy and nutritious food for all EU consumers, including vulnerable groups. In 2020, 8.6% of the EU population and more than one in five people at risk of poverty (21.7%) were unable to afford a meal with meat, fish or a vegetarian equivalent every second day. ([103]) In addition, recent crises, including the high energy prices and the Russian invasion of Ukraine, have resulted in double digit food inflation in 2022, and continuing at similar levels in 2023. In a context of rising food prices where food inflation in the EU reached double digits in 2022, social policy measures are important to both protect the most vulnerable citizens from food insecurity and to ensure everyone can afford sufficient amounts of healthy and nutritious food. These must be embedded in an integrated approach to target root causes of poverty and social exclusion. The European Child Guarantee for example provides guidance to Member States to guarantee effective access to sufficient and healthy nutrition for children in need, including at least one free healthy meal each school day. The EU school scheme supports the distribution of milk, fruit & vegetables to millions of children, from nursery to secondary school, across the EU. ([104])

The Commission has proposed and encouraged Member States to ensure a regular follow-up and analysis of food prices and food insecurity. To alleviate the impact of high food prices on the most vulnerable, Member States can implement measures such as reduced rates of Value Added Tax and support for economic operators to reduce the price for consumers. In December 2021, the EU Council agreed on a reform of VAT rates at EU level, which enables Member States to further reduce their rates, down to 0%, on certain goods and services which address basic needs, notably food. Member States may already make use of this possibility, as well as making lump-sum transfers to households as an efficient and effective solution to address affordability. ([105])

Access to affordable, nutritious food is a human right. Ensuring healthy and sustainable diets is an essential element of a just and sustainable food system. Qualitative stunting is a major and growing concern throughout Europe: One in every two people in Europe is either overweight or obese. ([106]) Creating a favourable food environment will benefit consumers health and quality of life and reduce health-related costs for society. ([107]) Business actors in the agri-food ecosystem have a responsibility to promote food environments that make the healthy and sustainable choice the easy choice. Governments also have a major role, for example through public procurement choices and taxation

([101]) European Commission (2021), Commission proposals to improve the working conditions of people working through digital labour platforms

([102]) European Federation of Food, Agriculture and Tourism Trade Unions (2019), Toolbox: Good practices and tools from the food and drink industry in Europe

([103]) Eurostat (2022), 8.6% of people in the EU unable to afford proper meal

([104]) European Commission (2021). School scheme.

([105]) COM (2022) 133 final, Safeguarding food security and reinforcing the resilience of food systems

([106]) European Commission, Modern-day malnutrition

([107]) COM (2020) 381 final, A Farm to Fork Strategy

policies, where relevant. Stakeholders could support vulnerable groups by safeguarding their access tofood.

Rural areas are of foremost importance to the food sector. ([108]) Strengthening the sustainability of rural areas can increase the ecosystem's resilience, but they often face social challenges, such as weak social services. ([109]) Making rural areas more socially resilient is part of a fair, green and digital transition.

Cities also play a leading role in transforming food systems. It is estimated that by 2050 over 70% of the global population will be living in cities. ([110]). Therefore, future proofing the food system will require a rethinking of the role of cities as agents of positive change. Cities have the potential to become ecosystems of innovation, facilitating experimentation and multi-stakeholder engagement, to establish long-term evidence-based strategies that will ultimately ensure safe, healthy, sustainable and nutritious food to their inhabitants and surrounding communities. ([111]) Providing food to large cities sets forth broad sustainability challenges. Urban agriculture, including controlled environment agriculture, urban gardening and agriculture in peripheral areas present complementing solutions to traditional food production. Urban agriculture can address some sustainability challenges such as food accessibility, transparency and proximity (yet solutions such as controlled environment farming still require important amounts of energy). The increasing interest in urban agriculture is also linked to the growing need of urban consumers to reconnect with food production. Studies have highlighted the need to reconnect cities with their peripheral areas to increase food autonomy. ([112]) The role of cities for the food system is evidenced by initiatives such as the **Milan Urban Food Policy Pact**. ([113])

4.2. The role of digital tools for a just transition

Digitalisation of food production and consumption can have broad societal benefits. It can allow organisations to communicate information beyond conventional industry boundaries to create new synergies and opportunities. ([114]) Multiple examples from industry already show how digital solutions can help to improve the lives of workers. Regarding occupational safety and health at work, the EU social partners from the EU Sectoral Social Dialogue Committee (EUSSDC) for Agriculture, for example, formally launched the **Online interactive Risk Assessment (OiRA)** tool in the agriculture sector in the beginning of 2022.

Digital tools can help improve transparency in the supply chains, offering important social benefits. At the same time, the automation of work processes impacts employment needs, making re-qualification and re-skilling a prerequisite for the social sustainability of the ecosystem. Consumer apps that are scientifically based are important tools for consumer information on nutritional aspects and the environmental and social footprint of food. Those also allow for a direct link with producers and direct orders supporting locally produced food. ([115])

([108]) European Commission, Rural Vision
([109]) FAO (2015), Technical Workshop, *The Implications of Social Farming for Rural Poverty Reduction*, final report
([110]) World Economic Forum (2020). Sustainable development in cities
([111]) CORDIS, European Commission (2022), FOOD 2030 - Empowering cities as agents of food system transformation
([112]) Utopies (2017), Autonomie alimentaire des villes, *note de position*
([113]) Milan Urban Food Policy Pact
([114]) Project Breakthrough, UN Global Compact, Digital Agriculture, *feeding the future*
([115]) It is important to note that local food does not in all case mean more sustainable food.

GUIDING QUESTIONS
What actions can ensure a long-term positive effect on the social factors of the ecosystem (such as gender balance, precarious employment, access for young people to the labour market etc.) and thereby increase the resilience of the ecosystem?
Is the workforce adequately supported and equipped enough to ensure the resilience of the ecosystem? What actions could support the workforce to be better equipped to improve the resilience of the ecosystem?
What actions could increase the attractiveness of the ecosystem for young talent?
How can social dialogue and collective bargaining further improve the situation of agri-food workers (including in times of crisis)?
What are the social implications (including for workers and citizens/consumers) inside and outside of the EU of the transition towards sustainability and digitalisation in the ecosystem? Are there specific SME-related social implications? What actions could accommodate the identified implications?
How can social partners be involved in the implementation of sustainability and digitalisation to ensure a successful twin transition?
What are the social and labour market consequences of the current economic and geopolitical challenges (including SMEs)?
How can the Transition Pathway take into account a possible future change in consumer patterns and behaviours (including in times of crisis)?
Are there sociocultural barriers hindering the transition of workforce and its re-/up-skilling in the industrial ecosystem, if yes – which are they and what solutions could be found?

5. R&I AND TECHNOLOGICAL SOLUTIONS

5.1. Key R&I initiatives for sustainability and digitalisation

Research and Innovation (R&I) plays a key role for the sustainability and digital transition of the EU's food system and can make it more resilient to shocks. ([116]) EU R&I also plays a key role in the global transition to reach the Sustainable Development Goals (SDGs). Cooperation, knowledge sharing with third countries is key to ensure food security globally.

During the period 2021-2027 the EU invests more than 9 billion euros in R&I in agriculture, bioeconomy, food and environment. It is important to note that innovation is not only about technologies: it is also about innovative processes and systems including operational, organisational and governance aspects. Social and institutional innovation are also of key relevance, particularly in agri-food ecological systems. R&I is not only about scientific aspects, but they must also fit within the broader legal framework. Marketability and regulatory compliance should also be considered.

([116]) Although this section mainly focuses on R&I at EU level, it should be noted that international cooperation in research and innovation is also a strategic priority for the EU.

Focusing on where R&I investments stand now, it can be discerned that investment in food has grown in recent years. Yet, the EU food and drink industry has a lower R&I investment intensity when compared with several food and drink industries world-wide. ([117]) The EU R&I Investment Scoreboard shows that the food and drink industry belongs to the group of medium-low R&I intensity sectors. Stakeholders have signalled in the past that food innovation research is often dispersed, R&I investment is considered comparatively low, while innovation culture needs to be improved, especially to accelerate the sustainability transition. Yet, in recent years, the EU food industry (including innovative food SMEs) has introduced numerous innovative products and processes. The EIT Food Rising Food Starts is one of the examples of a network of innovative agri-food scale-ups. ([118])

A combination of factors, including the framework conditions, industry dynamics and access to high-skilled labour need to be examined to provide a boost to innovation and act as a lever for increased competitiveness and sustainability of the food industrial ecosystem into the future. The opportunities for R&I along the food ecosystem are leveraged by the EU in a major way via the **Horizon Europe programme**. ([119]) Horizon Europe's Cluster 6, 'Food, Bioeconomy, Natural Resources, Agriculture & Environment' aims at reducing environmental degradation, halting and reversing the decline of biodiversity on land, inland waters and sea and better managing natural resources through transformative changes of the economy and society in both urban and rural areas. ([120]) Horizon Europe includes key areas of research for innovation on food systems, contributing to the objectives of the European Green Deal related to the Biodiversity Strategy to 2030, the Farm to Fork strategy, the European Climate Pact and initiatives under sustainable industry and eliminating pollution, as well as the long-term vision for rural areas, and the SDGs. Some examples of initiatives are the ones on microbiome, food from the oceans, urban food systems, alternative proteins, agri-food ecological approaches and Living Labs. The **Horizon Europe Missions** 'A Soil Deal for Europe' and the 'Restore our Ocean and Waters' are also to be highlighted. The Horizon Europe Mission 'A soil deal for Europe' is specifically dedicated to the improvement of soil health.

Several **Horizon Europe partnerships** of relevance to the ecosystem have been or will be set up: The **'Sustainable Food Systems for People, Planet and Climate' partnership** will coordinate, align, and leverage European and national R&I efforts to future-proof food systems for co-benefits through an integrated and transdisciplinary systems approach; the European partnerships on **'accelerating farming systems transition – agroecology living labs and research infrastructures'**, '**on animal health and welfare'**; **'of Agriculture of Data'** will coordinate R&I on the primary production part of the agri-food system. The **'Circular Biobased Europe' (CBE)** brings together private and public actors to support innovation and deployment of circular bio-based solutions, which cover improved residual biomass use from agri-food processing and consumption and R&D on food and feed ingredients, nutraceuticals, probiotics and agrochemicals, in addition to food packaging. The **'European Partnership for a climate neutral, sustainable and productive Blue economy'** aims to catalyse the transformation of Europe's blue economy, including seafood production, towards climate neutral status by 2050.

In addition, the Common Agricultural Policy (CAP) supported **'European Innovation Partnership for Agricultural productivity and Sustainability' (EIP-AGRI)** which contributes to the innovation

([117]) FoodDrinkEurope (2020), Data & Trends of the European Food and Drink Industry 2022
([118]) EIT Food Entrepreneurs, Scale
([119]) Horizon Europe, as part of the MFF has a budget of €95,5 billion (including €75,9 billion from the MFF and €5 billion from the Next Generation Europe) to spend over a seven-year period (2021-2027).
([120]) Under Pillar II

in the sector, and helps linking R&I supported under CAP and Horizon Europe to foster competitive and sustainable farming and forestry.

The work on Horizon Europe for the intervention area on food systems contributes to the objectives of the Farm to Fork Strategy. **Food 2030** is the EU's research and innovation policy to transform food systems and provides a framework to accelerate the transition. ([121])

Digitalisation of the agri-food ecosystem is embedded as an objective in Cluster 6 of Horizon Europe. Several topics under Horizon Europe look into the current data economy of food systems and how to exploit and develop it for a sustainable food system transformation. The European Partnership 'Agriculture of Data' will support sustainable agriculture in the EU as well as policy monitoring and implementation, by using digital and data technologies in environmental observation. It will generate EU-wide data sets and information through combining geospatial and Earth observation datasets. ([122])

The **European Innovation Council** provides support for innovations with potential breakthrough and disruptive nature with scale-up potential that may be too risky for private investors, with 70% of the budget earmarked for SMEs. ([123]) **EIT Food** - the European Institute of Innovation & Technology Knowledge and Innovation Community for Food - brings together businesses (large corporates and SMEs, including start-ups), research centres and higher education institutions as partners, creating a favourable environment for innovation. It supports innovative agri-food tech scale-ups and start-ups, also via its funding calls. ([124])

Similarly, **European Technology Platforms (ETPs)** are industry-led stakeholder fora that support innovation, knowledge transfer, and European competitiveness. Particularly, the **ETP 'Food for Life'** works on a precompetitive research agenda for the agri-food ecosystem. ([125]) In addition, National Food Technology Platforms are agri-food industrial networks linked to the ETP 'Food for Life', based on the national institutions engaged in research, development and innovation on food, promoted by the national federations of the food and drink industry. ([126]) Other relevant ETPs are the European Aquaculture Technology and Innovation Platform (EATiP) ([127]), the ETP 'Plants for the Future' ([128]), TP Organics ([129]), and the Farm Animal Breeding & Reproduction Technology Platform (FABRE-TP). ([130])

5.2. R&I infrastructures and new technologies

R&I infrastructures and new technologies are enablers supporting the agri-food ecosystem in its green transition. For example, renewable energy facilities and technologies to transform waste to energy are particularly important to ensure energy security and overall resource efficiency. Given the importance of access to sustainable pan-European energy sources for food companies, it is key to develop decarbonisation technologies (e.g., related to green electricity and hydrogen). Technologies for sustainable and functional packaging are also important for the performance of the ecosystem.

([121]) European Commission, Food 2030
([122]) European Partnership under Horizon Europe (2022), Agriculture of Data
([123]) European Innovation Council
([124]) EIT Food
([125]) FoodDrinkEurope, Food for life
([126]) NFTPs
([127]) EATIP – European Aquaculture Technology and Innovation Platform
([128]) ETP Plants for the Future
([129]) TP Organics
([130]) Farm Animal Breeding & Reproduction TP

Developing advanced sorting and recycling technologies, such as chemical recycling, will help the shift towards circular packaging.

Important trends in relation to developing sustainable food technology include the areas of alternative proteins, personalised nutrition, microbiome, transparency in the food chain, reducing food waste and developing food e-commerce. These need to be considered within a systemic approach.

GUIDING QUESTIONS
Which techniques and technological solutions can be rapidly deployed to increase the efficiency of the agri-food industrial ecosystem in the short run? What existing solutions could help to achieve sustainability and digitalisation of the ecosystem?
Which are the most promising and scalable technologies for the ecosystem that could also be deployed by SMEs?
What actions are needed to stimulate R&I at national level?
What are the unmet R&I (including technology and prototyping) needs in realising the sustainability and digitalisation of the ecosystem? What actions could help meet the identified needs?
Are there barriers to the knowledge and technology transfer from research institutions to industry? What actions could help overcome the barriers?
What techniques or changes to business models could accelerate the sustainability and digitalisation of the ecosystem? What actions could help identify and promote such techniques and business models?
What innovation, technologies and partnerships can support pan-European infrastructure for food production?
Are there any critical technologies or technological infrastructures for which special protective measures should be planned (including the development of new innovations)? How can EU programmes, such as Horizon Europe, contribute for this effort?

6. THE SINGLE MARKET AND INFRASTRUCTURE

6.1. Market barriers and trade disruption

The Single Market is one of the EU most important assets, offering certainty, scale and a global springboard for European companies. More than 60% of EU food and drink exports are distributed within the Single Market, accounting for €236 billion. ([131]) It ensures diversification of agri-food production across EU territories improving the resilience to adverse conditions. The COVID-19 crisis has further revealed that the Single Market is essential for food availability, diversity and affordability in the EU. The EU acted to ensure the free movement of goods, for instance by implementing 'Green Lanes', showing that transport plays an important role in the resilience of the food chain. ([132]) Moreover, Russia's invasion of Ukraine hindered Ukraine's ability to export its food produce. The

([131]) FoodDrinkEurope (2021), Data & Trends of the European Food and Drink Industry 2021
([132]) European Commission, Transportation during the pandemic

Commission set up, in close collaboration with the Member States, the Ukrainian authorities and business operators, 'Solidarity Lanes' to facilitate food exports from Ukraine via different land routes and EU ports. ([133])

Following the COVID-19 pandemic, several national measures risked impacting the proper functioning of the Single Market for food. Those included measures favouring national products over products originating from other Member States. Measures such as obligations on retailers to advertise or source a certain percentage of food products from national producers, giving preference to national food in public procurements or promoting national food products with national or EU funds.

In the months following Russia's invasion of Ukraine, export bans of agricultural products and measures to cap consumer prices of certain food items were adopted by some countries. Furthermore, several Member States have in the last years adopted specific measures on food packaging and food labelling that led to different conditions for food operators on national markets.

The European Commission analyses if such export-limiting measures (such as export restrictions, export bans, price caps etc.) breach the EU Single Market and EU competition rules as well as EU's obligations under international agreements. The notification procedure established by means of the **Single Market Transparency Directive** ([134]) allows to examine technical regulations that Member States intend to introduce before their adoption to provide comments and ensure that texts are compatible with EU law and the Single Market principles. The number of notifications received in the agri-food area were 163 in 2019, 142 in 2020, 153 in 2021, and 172 in 2022 (representing respectively 23.5, 15.9, 16.5, and 18.6% of all notifications for the given year).

Measures impacting the functioning of the Single Market are also discussed with Member States in the **Single Market Enforcement Taskforce (SMET)** with the objective to find solutions that do not have adverse, discriminatory impact on business operators. In the SMET forum, the European Commission and Member States discuss the most pressing single market barriers needing to be addressed. As part of the SMET project on barriers in the agri-food sector, SMET members were asked to check their legislation on platforms to promote agri-food products for elements that could distort the Single Market. Most SMET members reported that no national measures were introduced, or they considered that their measures did not create any risk of distortion. Four SMET members acknowledged the existence of obstacles for the Single market and indicated steps undertaken to eliminate existing or planned measures. One SMET member clarified that their measures are not restrictive and indicated a willingness to continue the dialogue to avoid any misperceptions.

The **Single Market Emergency Instrument (SMEI)** aims to preserve the free movement of goods, services and persons and to ensure the availability of critical products in case of future emergencies affecting the Single Market. The objective is to ensure greater transparency and coordination when a critical situation emerges, and the instrument is intended to complement existing EU frameworks for crisis management. In the food domain, it will complement the monitoring work of the European **Food Security Crisis preparedness and response Mechanism (EFSCM)**. The EFSCM is specific to the food system and is a forum with regular and ad hoc meetings for exchange of information among Member States and other stakeholders in relation to food supply and food security and proposes recommendations and deliverables including the creation of a dashboard with info on prices, inflation, self-sufficiency etc. On the other hand, the SMEI aims to set up a generally applicable crisis-response mechanism and is structured around 3 phases: contingency, vigilance and emergency modes. A

([133]) European Commission (2022), Solidarity Lanes: European Commission launches EU-Ukraine business matchmaking platform
([134]) Directive (EU) 2015/1535

dedicated advisory group will be set up under the SMEI in order to provide a forum for exchange of information between the Member States and the Commission on all matters related to the implementation of this instrument. Considering the broad material scope of the SMEI, which has the vocation to apply in the absence of sector-specific crisis-management provisions, the advisory group under the SMEI will discuss aspects relating to a broad range of sectors and will liaise with all the relevant crisis-response mechanisms and bodies at Union level. Furthermore, the activation of the vigilance or emergency modes under the SMEI enables the deployment of a number of specific crisis-response tools such as strategic reserves, information requests to economic operators or priority rated orders *inter alia.*

The Single Market is also at the core of making Europe's digital economy a world leader. According to European Parliament figures, an extra €176.6 billion in annual revenue could be generated when all measures in the **EU's Digital Single Market Strategy** are fully realised. ([135])

6.2. Infrastructure for sustainability and digitalisation

The shift towards sustainability can only be realised if the right infrastructure is put in place. To ensure resource efficiency and energy security, facilities focused on renewable energy and transforming waste to energy will be indispensable EU-wide. Pan-European infrastructure is also relevant when it comes to packaging, since packaging waste collection, sorting and recycling infrastructure should be in place in all Member States. Putting in place systems for reusable packaging for food and drinks require specific facilities to be installed at the points of sale. Having the infrastructure necessary to prepare, deliver and store the foodstuffs properly is essential for the supply of safe and nutritious food.

Broadband coverage and a good internet connection are essential for the digital transition but can be especially poor in remote rural areas. ([136]) For remote communities, such a challenge translates into a lack of services and widespread unemployment. Currently, only 60% of EU rural households have high-speed internet access, compared to the EU's total average of 86%. ([137]) The Digital Compass, adopted in 2021, sets the EU target to ensure that all populated areas will be covered with 5G service by 2030. The Farm to Fork Strategy includes the target to achieve 100% fast broadband internet for all rural areas in 2025.

GUIDING QUESTIONS
What events could put at risk the development, expansion or maintenance of the Single Market necessary for the resilience of this ecosystem?
What actions could support the realisation of the Digital Single Market to benefit the food system?
What actions could prepare this ecosystem or improve the adaptability for such disruptions?
Are there any infrastructure related issues, that suggest bottlenecks may arise in the future that may significantly affect the ecosystem's ability to undertake the sustainability and digital transition?
What infrastructure improvements can be proposed to ensure quality public infrastructures in the

([135]) European Parliament (2019), Contribution to growth: The European Digital Single Market, *Delivering economic benefits for citizens and businesses*

([136]) European Parliament (2019), Research for AGRI Committee - Impacts of the digital economy on the food chain and the CAP

([137]) European Commission (2022), Connectivity: key to revitalising rural areas

current economic and geopolitical situation? What actions could help meet the identified infrastructural needs (with a special focus on SME-specific needs)?
As new infrastructures must be adapted to the needs of industry to achieve efficiency of the ecosystem, can clusters be a valuable way to study and collect these needs?

7. SKILLS

7.1. Up- and reskilling the workforce

A skilled workforce is key in ensuring successful transitions, supporting the competitiveness of the European economy and quality job creation. ([138]) The ecosystem needs human resources, including trainers and training of trainers for up-skilling and re-skilling and has difficulties in attracting the right talent, especially skilled workers. ([139]) The skills challenges facing the agri-food ecosystem may require a multi-disciplinary response, with an increase in the required number of STEM (Science, Technology, Engineering and Math) graduates, especially related to biology, biochemistry and chemistry. ([140])

With an ageing farming population and overall low level of education and training, the EU primary sector is faced with a drain of workforce that may put at risk the sector's productivity growth, sustainable development, and long-term resilience. The EU agri-food sector is expected to suffer a fall of 13% of low skilled workers in the next decade, while the demand for workers with higher level of entrepreneurial and management skills, digital know-how, business and marketing experiences is expected to increase, thus worsening the already high skills misalignment ([141]).

Attracting the right talent is also an issue for many food retailers. In addition to high employee attrition in food retail, demand for different skills, such as social-emotional skills and advanced analytical and technical skills, has gone up. To attract talent, retailers may want to adjust their people models to strategically plan and manage for the required skills for the next three to five years, ensure workforce retention, and offer a robust reskilling program. ([142])

To tackle such issues, which are also present in other ecosystems, the **European Skills Agenda** was launched, which is a five-year plan to help individuals and businesses develop more and better skills and to put them to use. ([143]) In November 2020, the Commission launched the Pact for Skills**,** a shared engagement model for skills development in Europe. ([144]) To support a fair and resilient recovery and deliver on the ambitions of the green and digital transitions and of the EU Industrial and SME Strategies, the Commission invited public and private organisations to join forces and take concrete action to upskill and reskill people in Europe.

The **Pact for Skills agri-food partnership** was launched in February 2022. The Pact represents an opportunity to address challenges of the agri-food ecosystem such as ageing workforce, particularly in

([138]) European Commission (2021), Meeting report: Pact for Skills Roundtable with Commissioners Schmit and Breton for the Agri-food Ecosystem
([139]) European Commission (2022), Promoting education, *training & skills in the bioeconomy : final report*
([140]) Science, technology, engineering, mathematics
([141]) OECD (2023) Labour and skills shortages in the agro-food sector
([142]) EuroCommerce and McKinsey (2022), The State of Grocery Retail 2022
([143]) European Commission, European Skills Agenda
([144]) European Commission, Pact for Skills

production activities, the need for up-skilling and attracting new talent. ([145]) It will make use of relevant work done by CEDEFOP ([146]), such as their Skills Panorama and upcoming foresight exercise on the skills needs of the agri-food ecosystem, and other available outputs. Moreover, it will build on the results and recommendations outlined in the policy brief on 'Promoting education, training and skills across the bioeconomy' ([147]) and the Erasmus+ projects FIELDS ([148]) and I-RESTART. ([149])

For the primary sector, the Common Agricultural Policy provides opportunities for Member States to support up-skilling and re-skilling of farmers and farm workers through an effective offer of training and skill building activities. These include demonstration activities, training for famers and their advisors, peer-to-peer learning and the support for collaborative projects for innovation under the EIP-AGRI. Overall, the 28 CAP Strategic Plans foresee to reach around 6 million participants through such activities. ([150])

The issue of skills has also been high on the social dialogue agenda. The EU **Social partners** EFFAT (the European Federation of Food, Agriculture, and Tourism Trade Unions) and FoodDrinkEurope (the European Food and Drinks industry association) dedicated the project 'Delivering high-level food industry skills in the digital economy' to the topic. ([151]) The project identified new technologies, new skills, emerging jobs, and types of qualifications required.

Finally, the Communication on the functioning on the EU CFP (Common Fisheries Policy) announced a foresight project on fishers of the future. This project in the area of fisheries will identify the trends, opportunities and threats that drive the attractiveness of the fishing sector and will illustrate profiles of fishers in a 2050 horizon. ([152])

7.2. Digital skills

A crucial factor in addressing the skills challenge in the agri-food sector is the 'digital divide' in the EU. All actors in the food chain need cross-cutting skills to benefit from digital technologies. Such skills range from basic ICT skills, to use digital applications and tools, to skills to navigate the internet safely and using digital decision-making tools. Primary producers generally have lower levels of formal training and tend to rely on practical experience, which can be an obstacle in further adoption of digital technologies. ([153]) Tackling digital skills in the fisheries sector, among many others in the blue economy, is also the objective of a new European Maritime Fisheries and Aquaculture Fund (EMFAF) call on Blue Careers.

Since the lack of digital skills of the workforce is one of the main barriers for digitalisation of the agri-food ecosystem, one of the main aims of the Pact for Skills partnership for the agri-food

([145]) European Federation of Food, Agriculture and Tourism Trade Unions (2019), Toolbox: Good practices and tools from the food and drink industry in Europe
([146]) European Centre for the Development of Vocational Training
([147]) European Commission (2022), Promoting education, *training & skills in the bioeconomy : final report*
([148]) Erasmus Fields
([149]) Erasmus I-Restart
([150]) European Commission (2023) Approved 28 CAP Strategic Plans (2023-27)
([151]) European Federation of Food, Agriculture and Tourism Trade Unions and FoodDrinkEurope (2019) New professions and career paths in the food and drink industry: Delivering high-level food industry skills in the digital economy
([152]) European Commission (2023). On The common fisheries policy today and tomorrow: a Fisheries and Oceans Pact towards sustainable, science-based, innovative and inclusive fisheries management
([153]) EIP-AGRI Seminar (2020), New skills for digital farming

ecosystem is to also tackle this issue. The importance of digitalisation is also recognised in the new Erasmus+ project I-RESTART, which will focus on the implementation of the Pact for Skills. As a follow-up to the FIELDS project, I-RESTART will facilitate inter-sectoral and intergenerational skills transfers through the adoption of an innovative micro-credentials methodology. The project will address the skills, competence and experience needs in the ecosystem by assessing the potential of digitalisation and innovation through the analysis of scenarios, surveys and focus groups.

The **EU DIGITAL programme** foresees specific actions to boost the number of people with advanced digital skills in all sectors and make the EU education offer in digital more attractive. In September 2022, a new call was launched for additional projects in this domain, including the development of interdisciplinary education and training programmes, for example targeting the acquisition of AI skills in the agri-food sector. In addition, the Commission is leveraging the Networks of Excellence of European AI research centres ([154]) to develop the AI Doctoral Academy, which offers access to knowledge often in collaboration with industry. The AI-on-demand platform ([155]) will also host up-skilling and re-skilling services, as well as a specialised chapter on agriculture to support innovators in the sector.

Adequate support for SMEs is key to help them address the lack of digital skills and to achieve the digital transition of the agri-food ecosystem. With the support of the Digital Europe Programme, the Commission will develop digital crash courses for SME employees to become proficient in areas such as AI, cybersecurity or block chain, building on the experiences of the digital skills and jobs coalition platform. The Commission will also launch a programme for 'digital volunteers' to allow young skilled people and experienced seniors to share their digital competence with traditional businesses. ([156])

GUIDING QUESTIONS
What skill needs exist in the workforce at all levels of the ecosystem to realise sustainability and digitalisation? What actions could help meet the identified needs and in what ways could SME-specific skills challenges be tackled?
How can social dialogue be used in the development of skills strategies relating to sustainability and digitalisation?
Are there sufficient higher education and vocational training, reskilling and upskilling programmes developed to secure job to job transition in the affected ecosystem?
What actions could meet the identified education and skills needs, develop adequate trainings, reskilling and upskilling programmes for the workforce?
What types of skills can be needed in the ecosystem in a crisis and how can people be trained accordingly?

([154]) European Network of AI Excellence Centres
([155]) AI on Demand
([156]) European Commission, SME strategy

8. INVESTMENTS AND FUNDING

8.1. Financing the transition

Investment in food and agriculture can create jobs, support families, advance the economy, and address climate change. As previously mentioned, the agri-food ecosystem is faced with a wide range of challenges, such as climate change, demographic growth (adding more pressure to value chains) and the lack of disruptive innovation. In addition, 99% of the companies active in the sector are SMEs with limited investment capacity. This high fragmentation of the sector makes economies of scale harder to reach and reinforces the need for external financing. ([157]) However, investors and banks, when facing low equity ratios, low margins, long payback periods and the lack of benchmark data to assess potential investments associated with the sector, tend to adopt a risk-averse attitude and lower their investments. Despite this difficult context, the agri-food sector has been able to gather a significant investment volume that has increased by 27% since 2011. ([158]) Yet, this significant increase in volume of capital available is still not enough to surpass the financing needs of the sector. The financing gap to overcome the current challenges of the agri-food sector is estimated to be between €19.7 to €46.6 billion for agriculture and up to €12.5 billion for the agri-food sector, of which, for the latter, 78% affects small-sized agri-food enterprises and 57% is attributed to long-term loans. ([159])

The annual investment in R&I amounted to around €3 billion in 2019, which was considerably lower than in other sectors (health, for instance, accounted for a total investment of €41 billion). In relative terms, European companies, operating in the agri-food sector, spend 0,2% of their revenue on innovation, while US and Japanese competitors display more robust investments in this field: 0,44% and 0,65% respectively. ([160]) Regarding **Foreign Direct Investment (FDI)**, the EU, along with North America, were the regions with companies providing the main sources of inflows to foreign countries in the period 2007-2017, both in agriculture (around 50% of total inflows) and food processing (around 66% of total inflows). Investments in agriculture tend to be dispersed across multiple regions (EU, Asia, Central and South America and Oceania), while the inflows for food processing tended to be more concentrated in the EU and North America. ([161])

With the current crisis, investments in the sustainable competitiveness of the EU's agri-food sector have become even more necessary. This enhances the importance of public investment to assure the sustainability of the agri-food sector.

The EU provides financial support to the ecosystem to enhance its resilience in multiple ways.

The newly reformed **Common Agricultural Policy (CAP)** aims to contribute to the transition towards a smart, sustainable, competitive, resilient and diversified agricultural sector to ensure long-term food security. The new CAP supports resilience of the sector by supporting viable farm income through direct income support to the farming community. Furthermore, a new specific support scheme

([157]) European Investment Bank, European Commission (2019), Feeding future generations, how finance can boost innovation in agri-food, executive summary

([158]) European Investment Bank, European Commission (2020), Financial needs in the agriculture and agri-food sectors in the European Union

([159]) European Investment Bank, European Commission (2020), Financial needs in the agriculture and agri-food sectors in the European Union

([160]) European Investment Bank, European Commission (2019), Feeding future generations, how finance can boost innovation in agri-food, executive summary

([161]) OECD (2020), Foreign Direct Investment and Trade in Agro-Food Global Value Chains

(eco-schemes) will be available as from 2023 to encourage the transition towards a more sustainable farming model. Specific additional support will also be foreseen for young farmers as well as the farmers in areas under natural constrains.

The new CAP Strategic Plans will mobilise more than €35 billion (EU and national funding) for the period 2023-2027 to support investments in the agri-food sector: this type of support continues to be a key tool in the strategies of Member States to accompany farmers as well as other food and rural operators in introducing new technologies, and in scaling up and modernising their operations. While a large part of these investments is planned to be executed at farm level, an important part of them is addressed to projects on processing and marketing. ([162]) It does so not only via grants, but also through financial instruments (mostly loans and guarantees), which thanks to their leverage provide more support that would be purely possible with the European Agricultural Fund for Rural Development (EAFRD) grant budget used for them.

By the end of 2021, €860 million were programmed in Rural Development Programmes (RDPs) for agriculture and agri-food for the past period (2014-2022). In the current CAP Strategic Plans 2023-2027 in total 12 Member States programmed approximately €1 billion for financial instruments.To cope with future crises, the reformed CAP includes a new financial reserve amounting to at least €450 million per year. In 2022, the Commission has also set out a support package of €500 million, including by making use of the crisis reserve, to support the producers most affected by the consequences of the Russian invasion of Ukraine.

Furthermore, the **European Maritime, Fisheries and Aquaculture Fund (EMFAF)** provides support for fishers. ([163]) EU Member States have a key role to play in financially supporting the ecosystem. In March 2022, the Commission adopted a **Temporary Crisis Framework for State Aid measures (TCF)**, which was later extended to the end of 2023. It also activated the EMFAF crisis mechanism to enable Member States to support businesses affected by the economic consequences of Russia's invasion of Ukraine, including energy-intensive businesses. To complement this support, a legislative amendment to the European Maritime and Fisheries Fund (EMFF) was adopted in July 2022, allowing those Member States with remaining EMFF resources to provide the same type of compensation as the EMFAF until the end of 2023.

The **Technical Support Instrument (TSI)** is a demand driven instrument, with a budget of €864 million over 2021-2027 providing tailor made technical assistance to Member State's reforms, including in the agri-food sector. Various Member States have already used these funds to address the green and digital transition in the agri-food sector ([164]).

The EU's 2021-2027 budget, the **Multiannual Financial Framework ('the MFF')**, together with the **NextGenerationEU** recovery instrument ([165]) amounts to more than €2 trillion in current prices. Most funds from NextGenerationEU will be spent through the **Recovery and Resilience Facility (RRF) programme**. It is important that these resources are also targeted to support the agri-food ecosystem.

Food SMEs can also benefit from the **Single Market Programme (SMP)**. The SMP focuses on strengthening the governance of the Single Market and supporting the competitiveness of industry, in

([162]) Details on the support provided in the CAP Strategic Plans are available at: https://agriculture.ec.europa.eu/system/files/2023-04/approved-28-cap-strategic-plans-2023-27.pdf

([163]) European Commission, European Maritime, Fisheries and Aquaculture Fund

([164]) Technical Support Instrument in the agri-food sector

([165]) A €806.9 billion temporary recovery instrument

particular of micro, small and medium-sized enterprises. It has a budget of €4.208 billion for the period of 2021-2027 (€2 billion are allocated under the **InvestEU Fund**, in particular through its Small and Medium-sized Enterprises Window).

Under **InvestEU** an EU guarantee of €26.3 billion is expected to lead to €372 billion of additional investments in total for the EU economy. Under this support bank loans are also available to agriculture, agri-food as well as rural businesses as some financial products offered under InvestEU include the sectors of agriculture, forestry, bioeconomy, circular economy, or target SMEs. However, also under digitisation, some projects could potentially benefit agriculture and agri-food. One of the two main implementing partners, the **European Investment Fund (EIF)** created financial products under its so-called Framework Operations that could potentially benefit those sectors amounting to € 7.8 billion. Furthermore, Member States can increase the available support further by transferring money into the InvestEU's Member State compartment. Outside InvestEU, the **European Investment Bank (EIB)** can also provide direct lending to certain large-scale agri-food projects or indirectly support through intermediate lending the sector's development.

BlueInvest supports access to finance for early-stage businesses, SMEs, and scale-ups in the blue economy. EMFAF allocates €20 million a year in 2021-2027 from the European Maritime, Aquaculture and Fisheries Fund to a BlueInvest Fund running under the label 'InvestEU Blue Economy', which is matched by guarantees from InvestEU and by contributions from the European Investment Bank family. The fund mobilises up to €500 million EU risk finance in the next 7 years (2021-2027) resulting in up to €1,5 billion of investments to be made available to innovative blue economy SMEs.

Furthermore (as discussed in chapter 3), the European Commission runs a **Smart Specialisation Platform for Agri-Food (S3P Agri-Food)**. The key objective is to manage and support the efforts of EU regions developing a pipeline of investment projects on agri-food smart specialisation priorities. The S3P Agri-Food, co-developed and co-led by the regions themselves, ensures commitment of industry and related business organisations and clusters as well as research institutions, academia, and civil society.

The Horizon Europe Programme (discussed in section 5) is the world's largest public R&I programme (€95.5 billion within the 2021-2027 EU budget). The programme's Cluster 6 'Food, Bioeconomy, Natural Resources, Agriculture and Environment' has an overall budget of around €9 billion (including the area on environment).

The sustainability transition in agri-food will require substantial investments, be it for the adoption of sustainable production methods in agriculture, the switch to renewable energy in food processing or the set-up of circular systems for food packaging, to name a few. To achieve the goals set by the European Green Deal, the EU has pledged to mobilise at least €1 trillion in sustainable investments over the next decade. About 30% of the EU's multiannual budget (2021-2028) and the EU's unique NextGenerationEU instrument has been allocated for green investments. The Member States must devote at least 37% of the financing under the Recovery and Resilience Facility to investments and reforms that support climate objectives.

The European Green Deal Investment Plan includes the Just Transition Mechanism. It will mobilise investments to support citisens of the regions most impacted by the transition. ([166]) The InvestEU fund will also target at least 30% of investment contributing to climate objectives. In addition, sustainable finance measures, including the Taxonomy Regulation for classifying green investments via future delegated acts, will contribute to the Green Deal by boosting private sector investment in green and sustainable projects. ([167])

8.2. Digital investment

The integration of digital technologies within a company requires significant investment, used to develop new products or services and to improve the production process. ([168]) The RRF supports reforms and investments aiming to promote the digitalisation of businesses, in particular SMEs, as well as measures supporting digital-related R&D and the deployment of advanced technologies. The Recovery and Resilience Facility Scoreboard has shown that the share of the total financial allocation of the 22 adopted **Recovery and Resilience Plans** contributing to digitalisation is currently 26%. ([169])

The **Connecting Europe Facility** is one of the key instruments to support investment in digital infrastructure. It will contribute to the development of high-performance infrastructure including Cloud Backbones, Gigabit and 5G networks along transport paths (i.e., 5G corridors) and for smart communities. Narrowband IoT infrastructure is also important, with a specific focus on agricultural applications, such as greenhouse sensor and livestock monitoring. In particular, the programme foresees investments in the development of connectivity across the EU, including in remote and rural areas. ([170])

The Commission Regulation on CAP Strategic Plans provides an opportunity to progress towards digital transformation by including a cross-cutting objective for the fostering and sharing of knowledge, innovation and digitalisation in agriculture and rural areas, and encouraging their uptake. Each CAP Strategic Plan contains a description of a digital strategy to address the needs in agriculture and rural areas. ([171]) In their CAP Strategic Plans, Member States have also included interventions supporting the adoption of digital technologies and precision farming, the development of infrastructure such as broadband network, or development of digital skills.

The new **Digital Europe Programme** also aims at boosting investments in supercomputing, artificial intelligence, cybersecurity, advanced digital skills, and ensuring a wide use of digital technologies, including sectorial through **Testing and Experimentation Facilities (TEFs)**, some focused on the agri-food sector. TEFs are specialised large-scale reference sites open to all technology providers across Europe to test and experiment at scale state-of-the art AI solutions, including both soft-and hardware products and services, e.g., robots, in real-world environments. The agri-food TEF will help innovators bring their AI solutions to the agri-food industrial ecosystem, improving the competitiveness and helping the move to a Circular Economy for a more sustainable, affordable, efficient, and competitive production under high standards.

To support the digitalisation of businesses and the public sector, the European Commission is supporting the setup of a network of **European Digital Innovation Hubs (EDIH)**, which can be

([166]) European Commission, Finance and the Green Deal
([167]) European Commission, Finance and the Green Deal
([168]) FoodDrinkEurope (2020), Data & Trends of the European Food and Drink Industry 2020
([169]) European Commission, Recovery and Resilience Facility - Performance
([170]) European Commission (2021), Connectivity: key to revitalising rural areas
([171]) European Network for Rural Development (2020), Smart villages and rural digital transformation

useful for agri-food operators. They provide SMEs, and public sector organisations, with key services to enable a digital transformation. Hubs provide their clients with a digital maturity assessment, expert advice on technologies, information about local technology providers, opportunities to 'test-before-investing', training and skills development, and information on accessing finance.

GUIDING QUESTIONS
Are there any systemic barriers specifically for this ecosystem to access to funding for sustainability and digitalisation (particularly for SMEs)? What actions could help overcome the barriers?
What would be the most important actors in the private investment environment for development and adoption of sustainability and digitalisation solutions in the ecosystem? What actions could help fill key investment needs identified in this mapping?
What are the EU funding schemes or key national/regional funding programmes that are more relevant to the sustainability and digitalisation of the ecosystem stakeholders? What actions could help fill key funding needs identified in this mapping?
Considering the existing investment initiatives to strengthen the resilience of the ecosystem, what new initiatives could further strengthen it?
What information and advice on funding opportunities are needed by stakeholders?
Which new investment needs have emerged regarding the green and digital transition in the current economic and geopolitical situation (including SMEs)?
How can the ecosystem attract sufficient financial resources to deploy necessary technologies, techniques, and business models? How can the ecosystem become more attractive for private investors?

9. KEY PERFORMANCE INDICATORS

To support the ecosystem in its transition, it is important to gather data on progress in the different areas and analyse certain key performance indicators (KPIs) for the different sectors and the overall ecosystem. **The Commission will, together with stakeholders, look into such KPIs during the co-creation of the transition pathway and analyse which are relevant indicators for the transition**.

The indicators to monitor the sustainability transition of the ecosystem could include GHG emission change, water and land use, generation of waste, renewable energy use, use of recycled and bio-based material, private investment in circular solutions, technology adoption and supply of skills professionals. **Eurostat** provides EU-wide statistics on agricultural prices and production and economic indicators for the food industry and retail. Dashboards for gathering data on food chains will be developed as part of the work in the EFSCM and the new CAP lays down a common set of indicators as part of a new performance, monitoring and evaluation framework. The European Market Observatory for fisheries and aquaculture (EUMOFA) is also delivering data on volumes, values, and prices of seafood products, from the first sale to retail stage. Similarly, the Market observatories for

Milk, Meat, Sugar, Crops, Fruit and vegetables, and Wine ([172]) as well as the Commission's agri-food data portal provide detailed insight in agricultural markets. ([173])

Furthermore, the Commission is working on an EU wide monitoring framework for evaluating progress towards the EU's food sustainability objectives, as laid down in the Farm to Fork Strategy. Lastly, a mapping study on the Code of Conduct has been carried out, which reviews the commitments and activities of the different signatories to the Code to identify the areas in which commitments are most frequently made, and hence identify those areas where additional effort is needed.

10. NEXT STEPS

This SWD (Staff Working Document) has made an initial outline of some of the key issues and existing EU policy support frameworks for the resilience, sustainability, and digitalisation of the agri-food industrial ecosystem (with a particular focus on the middle part of the chain, yet considering the role and performance of all agri-food stakeholders). Agri-food stakeholders, large and small, public and private (including social partners) are invited to start the reflection on the transition pathway and provide feedback, guided by the questions set out in each section. They are invited to widen the analysis on the main challenges and suggest relevant actions for the transition at all levels. In addition, they are welcome to share ideas on the relevant KPIs that could be used to monitor progress.

The purpose of this document is to spur a reflection and collect feedback from stakeholders. Commission services welcome responses from the agri-food community through the related online public consultation. Follow-up workshops with stakeholders to discuss the feedback from the consultation and specific topics of the future pathway will also be organised.

([172]) European Commission (2023). Market observatories
([173]) European Commission (2023). Agri-food markets