

Reducing Risk for a Fair & Resilient Food System

Insight Report

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EIT Food – Europe's leading food innovation initiative, working to make the food system more sustainable, healthy and trusted

Knowledge & Innovation Center on Food, part of the European Institute of Innovation and Technology (EIT)

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1. Foreword

Some issues are so big they can only be solved if we work together. That's the thinking behind EIT Food – a community that has come together to respond to problems in the food system that affect us all. And while those problems are complex, our mission is clear and focussed – to improve outcomes for people and planet alike.

Healthier Lives Through Food

We'll give consumers access to healthier, more affordable, products which balance nutrition with environmental footprint and use a more diverse range of proteins. We will support this change with better access to practical, useful information. With better advice, we can all make better choices and improve our quality of life.

A Net Zero Food System

Our three-point plan will smooth the path to a net zero food system by:

- Enabling farmers and producers to lead the transition to regenerative agriculture.
- Creating new markets and opportunities to reduce our food waste and food loss in production.
- Empowering consumers, making their food purchasing choices count and play a crucial role in the circular food economy.

Reducing Risk for a Fair and Resilient Food System

We'll improve food security and safety for consumers everywhere by enabling and establishing resilient and dependable digitally enabled food supply chains.

We co-invest public funds alongside resources from our community partners to drive innovation, develop new business, build skills, and engage the public while we move towards system-wide change in how the food system works for all of us.

This is both a privilege and a challenge. We know we have to prioritise our investments, funding, advocacy and interventions to make a real difference.

Taking stock of the great progress we've made in the first 3-4 years of operations, we put together three teams of experts from the EIT community to look at how we can best implement our strategy.

Each team ran an open programme of research, consultation and systems thinking co-design workshops to produce detailed reports, including key Mission insights and recommendations.

These reports stretch beyond the boundaries of what we, the EIT Food community, can do on our own. That's why we're publishing them as a public call to action on behalf of our community. If these reports inspire you, please get in touch – tell us how we can help you make change happen.



On behalf of the leadership team and wider EIT Food community, I would like to extend our gratitude to the teams involved, and to the many experts and members of the public who volunteered their valuable time and insights. The passion for change behind these reports is a constant inspiration for us at EIT Food as we reach for a more trusted, fair, sustainable and healthier food system for all.

Andrew Carlin

Director of Missions & Strategic Programmes,
EIT Food

<https://www.eitfood.eu/missions>



2. Introduction

EIT Food's overarching purpose is to create a world where everyone can access and enjoy sustainable, safe and healthy food with trust and fairness from farm to fork. To achieve this overarching vision and purpose, EIT Food has defined Missions that form the basis of their strategic drive. As part of its Missions, EIT Food and its community are co-designing roadmaps to identify areas of impact and to provide solutions and opportunities for the agri-food system to step change and evolve, providing consumers with more sustainable, healthy and trusted food. These roadmaps are a recognition that it is time to change and refine areas for investment, forge new funding relationships and identify areas which can have a distinctive and significant impact on the food system. Within this report, we are focusing on EIT Food's Mission "Reducing Risk for a Fair and Resilient Food System" whose aim is to identify trends, opportunities, capabilities and enablers as a roadmap to gain trust for the consumer and the wider society.

The development of global food supply systems over the past 30 years has markedly altered how food is produced, distributed, and sold. While bringing about many changes for the better, it also greatly increases the risk of disease, contamination, fraud, and abuse of our planet and many who work in the food system. We have seen many examples of how vulnerable our food system is to these challenges. Notably, the potential for accidental contamination of animal feed and food has never been greater due to complex supply chains, climate change and environmental pollution. The prevention and early warning of such contamination incidents has become an imperative. In addition, the ingenuity of organised criminal networks who can exploit the growing complexity of the global food system is of increasing concern. This growing menace has necessitated the development of new ways of deterring and detecting food fraud. Worryingly, the low-income households, minority groups, primary producers and those living in urban and southern regions are the most vulnerable and at risk of

experiencing food insecurity and inadequacies in food integrity. The coming challenges are manifold, ranging from climatic threats to crop production to issues in livestock production and the need to advance food processing approaches and packaging procedures. Sustainable performance of the feed and food supply system needs to incorporate effective side stream management and approaches for effective waste avoidance. Managing these food safety and food security issues is vital for any society and is interconnected with various social dimensions and economic performance. Feed and food producers – along with other stakeholders – rely on a steady output of scientific advances to continually improve food safety management systems; whilst knowledge, upskilling and public engagement are vital.

To achieve a fully transparent, resilient, and fair food system, a radical rethink of the whole agri-food system is needed: from production and consumption to policy and legislation. We first need to define the root causes of the problems and learn from the activities, operations, and programmes in place around the world at country level as well as pan-European and global initiatives to deal with food system transparency, resilience and fairness. This needs to be followed by an evaluation and prioritisation of opportunities and solutions for a pathway to full transparency, resilience, and fairness.

The aim of the roadmap is to help shift Europe's food system towards one that is fully transparent, resilient, and fair. The vision is to achieve ambitious outcomes and measures, including, but not limited to:

- Reducing the financial burden of food insecurity and food safety issues.
- Societal Return on Investment (SROI) exceeding the amount invested by EIT Food.
- Increasing the number of new digital solutions in use to improve supply chain efficiency, integrity, and transparency.
- Improvement in indicators supporting SROI such as employment, new business creation, investment in innovation and startups, development of economic clusters, regional development funding secured.
- Improvement in trust metrics identified by EIT Food's Trust Report and Trust Tracker data. Construct a report to document the overarching roadmap and Impact Priority Areas for a fully transparent, resilient, and fair food system.

To identify and respond to the areas of greatest need and where EIT Food can make significant and distinctive progress in the Mission of Reducing Risk for Fair and Resilient Food System, this road mapping exercise included three key phases:

1. **Scoping priority areas:** review of published and grey literature
2. **Shaping priority areas:** surveys, interviews and expert inputs from key stakeholders,
3. **Roadmapping priority areas and recommendations:** multi-stakeholder road mapping workshop.



3. Executive Summary

Building trust in the agri-food sector is essential in the shift to a greener, fairer and more sustainable Europe, in line with climate commitments and other international pledges. For that reason, EIT Food is seeking to shape its priorities for action over the next 3–5 years via the following Mission: Reducing Risk for a Fair & Resilient Food System.

The roadmapping exercise for the EIT Food Mission Area, reducing risk for a fair and resilient food system, focused on three thematic areas – transparency, resilience, and fairness.

A transparent food system is one in which information about the production, processing, distribution, and sale of food is easily accessible to all stakeholders and consumers in easily understandable formats. Accessibility and readability are therefore important. This includes information about the source of the food, how it was grown or raised, and any certifications or labels it may have.

A resilient food system is one that can adapt to and recover from disruptions, such as natural disasters, economic downturns, or pandemics. This includes having a diverse array of food production methods and sources, as well as systems in place for emergency food distribution.

A fair food system is one in which all members of society have access to healthy and affordable food, regardless of their income or location. This includes addressing issues such as food deserts, food insecurity, and the exploitation of workers in the food industry.



Therefore, a transparent, resilient and fair food system is one that promotes transparency and traceability of food production, provides robustness and adaptability in the face of external disruptions, and ensures equitable access to safe, healthy and affordable food for all.

With these ideals in mind, a road mapping exercise was commissioned to explore this Mission, the outputs of which will shape EIT Food’s Strategic Initiatives actions, business planning and decision-making priorities for 2023–2025 and beyond. This Mission sits alongside EIT Food’s other two Missions: ‘Healthier Lives through Food’ and ‘A Net Zero Food System’. This report aims to deliver an overarching Roadmap to guide EIT Food in driving change in the food system by identifying priority opportunity areas. An extensive literature review followed by an online survey and in-depth interviews provided the material to identify key drivers, trends, opportunities, capabilities, and enablers as well as overall vision for the mission. Over 150 paper reviews, 175 questionnaires, 41 in-depth interviews, 30+ case studies and 30+ experts working together to develop the priorities provided the basis to the overall conclusions developed.

The vision to reduce risk for a Fair and Resilient Food System as identified in this report must include key drivers. Food, and the supply chains that produce it, must be: accessible, affordable, equitable, sustainable, diverse, local, traceable from farm to fork, safe, quality, authentic and meeting dietary needs for everyone.

The roadmap exercise has identified a prioritised list of 16 macro-level trends and drivers and 10 market drivers/needs to inform the roadmapping exercise. Based on these drivers and the overarching vision statement, delegates explored potential opportunities that might satisfy emerging priorities within the agri-food sector on the path towards a transparent, resilient, and fair food system. 51 opportunities were identified during the pre-workshop desk research, and a further 86 opportunities were ideated during the workshop by the participants. These were then prioritised based on their high potential impact and feasibility for positive change towards the vision, resulting in a short-list of seven key opportunities. These opportunities were taken forward for detailed ‘road mapping’ to explore the required capabilities and enablers, barriers and risks, feasibility and impact, and the potential roles for EIT Food to play in facilitation and driving change towards a fully, transparent and resilient food system. Following the roadmapping process, the seven opportunities were categorised into four priority opportunities and two overarching enablers for action to achieve a fully transparent, resilient and fair food system, which were:

Priority opportunities :

1. Resilient and sustainable farming practices
2. Urban integration of food
3. Radical transformation of the supply chain and new retail models
4. Extended producer responsibility & true cost accounting

Overarching enablers to help achieve fully transparent, resilient and fair food system:

1. Digitalisation of consumer communication and labelling to build trust
2. Food insecurity indicators and framework development



Across all opportunity areas, the required enablers and capabilities of change present significant potential roles for EIT Food spanning all four of EIT Food’s core pillars: innovation, entrepreneurship, education and public engagement. The identified enablers and capabilities are to:

- Engage with policymakers is key in shaping policy & legislation to support the net-zero transition.
- Forge collaboration & partnerships between government, academia, NGOs, industry from big brands down to individual farmers.
- Foster knowledge & skills among the farming communities and among society, particularly young people to enable the future transparent, resilient, and fair food system. Technologies and methodologies do already exist, but adoption will require a new generation of farmers willing and able to work differently.
- Develop resources and infrastructure and the technological innovation required to scale up solutions and drive down costs – to make solutions economically attractive and affordable for consumers.
- Facilitate a supportive funding landscape for innovation and entrepreneurship to drive experimentation in new production methods, products, services, and innovative new business models. Social enterprise should be encouraged. New models for use of food waste will be particularly important.
- Engage the public, particularly young people to inform on food systems and raise awareness and increase consumer acceptance of innovative new solutions such as protein diversification.
- Obtain data across the supply chain, ensuring transparency of data, promoting data sharing and interpreting data to measure and improve transparency, resilience and fairness within the food system.

This report provides detailed recommendations as a key input to the strategic planning for EIT Food and highlights many key areas for potential intervention and facilitation for a transparent, resilient and fair the food system. There remains important work for EIT Food to do to further develop and refine the strategy.



4. Approach and Methodology

Co-designing a three-year roadmap to shape priorities for sustainable transformation pathways to Reduce Risk for a Fair and Resilient Food System.

4.1 Overview to the roadmapping process to Reduce Risk for a Fair and Resilient Food System

To identify the areas of greatest need and where EIT Food can have a significant and distinctive impact on the Mission, Reducing Risk for a Fair & Resilient Food System, the roadmapping exercise included three key phases.

4.1.1 Phase 1 – Scoping Priority Areas

An impact scoping exercise included an extensive review of the literature (grey and published) including industry reports in the Mission area, sector-level roadmaps and horizon scanning reports available in the public domain, the university and start up innovation ecosystem and the activities and funding opportunities already in place around the world. The aim was to identify: (1) Which indicators of food insecurity should EIT Food prioritise and why? (2) Which populations in Europe are most likely to experience these indicators and why? (3) Which causes of food insecurity should EIT Food prioritise and why? (4) Which factors contributing to food integrity should EIT Food prioritise and why? (5) Which consumer–industry relationships should EIT Food prioritise for efforts in building trust and public understanding?

This scoping exercise established the baseline and identified drivers, market needs, opportunities, capabilities, and enablers for delivering impact for a Fully Transparent, Resilient and Fair Food System. The results informed the Phase 2 survey and fed into the draft roadmap landscape.

4.1.2 Phase 2 – Shaping Priority Areas

Phase 2 investigated, assessed, and ranked the greatest market needs and priority opportunities for Reducing Risk for a Fair & Resilient Food System from a stakeholder’s perspective; identified any gaps from the literature review; and informed the draft roadmap landscape for the road mapping workshop. Based on the literature review findings, an online questionnaire, in-depth interviews and a partner assembly workshop were held with stakeholders in the food system to collect this data and shape the draft roadmap landscape.

Findings from the survey and interviews with stakeholders then fed into the draft landscape for a Fully Transparent, Resilient and Fair Food System, which was used during the roadmapping workshop.

4.1.3 Phase 3 – Road mapping Priority Areas

In Phase 3, the roadmapping process to Reduce Risk for a Fair and Resilient Food System was facilitated via a multi-stakeholder workshop consisting of 35 experts, during a two-day event in Paris, France in December 2022. During the workshop stakeholders refined priority opportunities in the transition to a fully transparent, resilient and fair food system and identified the role(s) EIT Food could play. The workshop results were synthesised and the opportunities where EIT Food could lead change in these areas were elaborated on, including how EIT Food’s impact indicators can be met consistently in the next 3–5 years. Finally, a search was conducted for current and future stakeholders and collaborators including funding sources which might be available to fund development or scaling of solutions in these areas; and might be accessible by EIT Food and partner organisations working together as consortia.

The overall research question to be answered was: What are the most powerful areas of intervention in the next 3–5 years that will allow for a fully transparent, resilient, and fair food system by 2050?

The full details on the roadmapping approach and methodology can be found in the [appendix](#).

4.1.4 Road mapping workshop

The overall design process of the roadmap to Reduce Risk for a Fair and Resilient Food System Mission is shown in Figure 1. The comprehensive data collection took place through: a review of 200 academic and industry publications, conduction of 41 expert interviews, collection of 179 survey responses, and exploration of ~100 case studies.

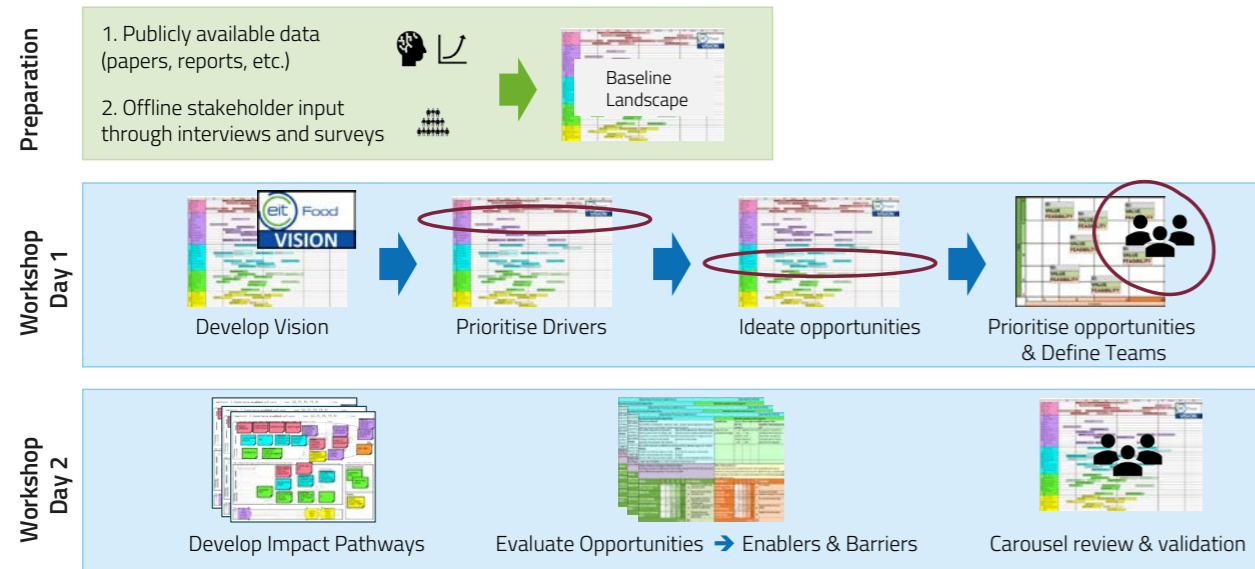


Figure 1: Overview of the road mapping process (from IfM Engage)

Roadmaps provide a structured visualisation of information for specific strategic aspects. They are used to support strategic planning across a broad spectrum of applications. A common roadmap layout will contain two axes (Figure 2). There is a horizontal, time-based axis; often

encompassing the past, short-, medium- and long-term, as well as the vision. The vertical axis usually pertains to perspectives, or dimensions, relevant to the focal point of the roadmap; often represented as horizontal layers, forming a matrix across the time dimension.

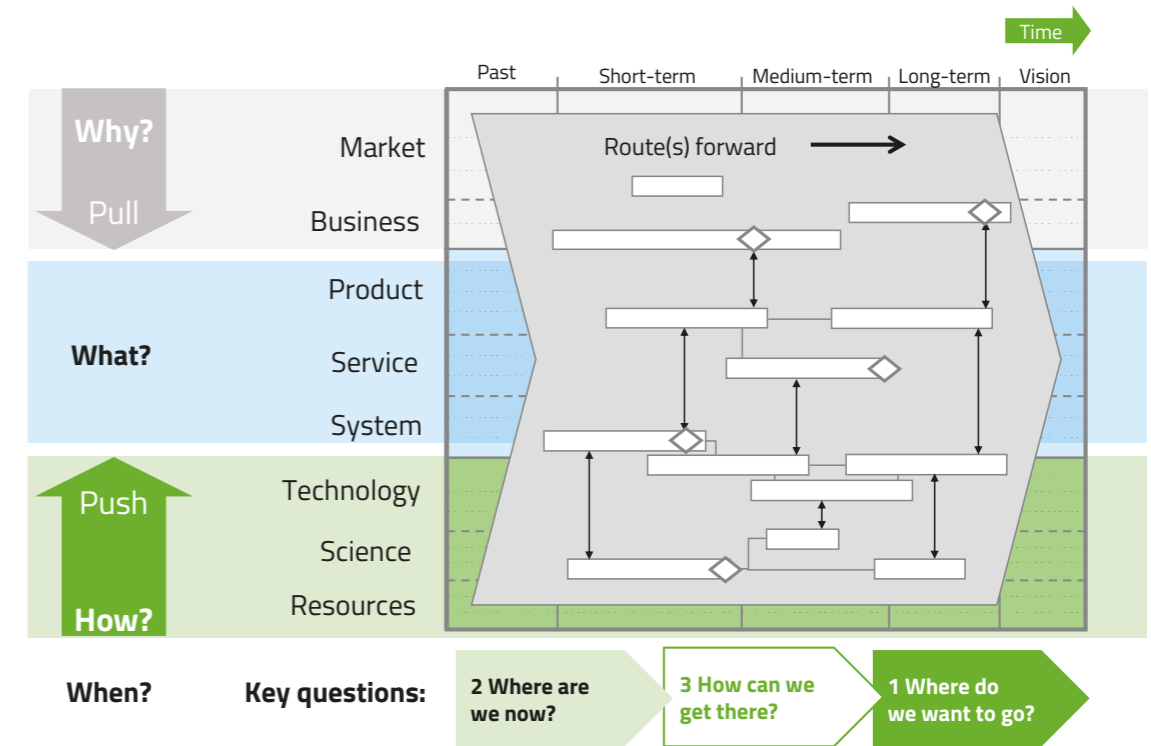


Figure 2: Roadmap structure (from IfM Engage)



Figure 3 below shows the customised roadmap structure for the Mission 3 objectives. The vision and subsequent goals for the Transparent, Resilient and Fair Food System are on the right-hand side of the roadmap showing the direction of change. The top layer 'Why?' captures the relevant trends, drivers and market needs that

influence and drive the change. To address these drivers, the value creation opportunities are typically shown in the middle layer 'What?' of the roadmap. And finally, the bottom 'How?' layer contains capabilities, technologies, and enablers required to realise the opportunities.

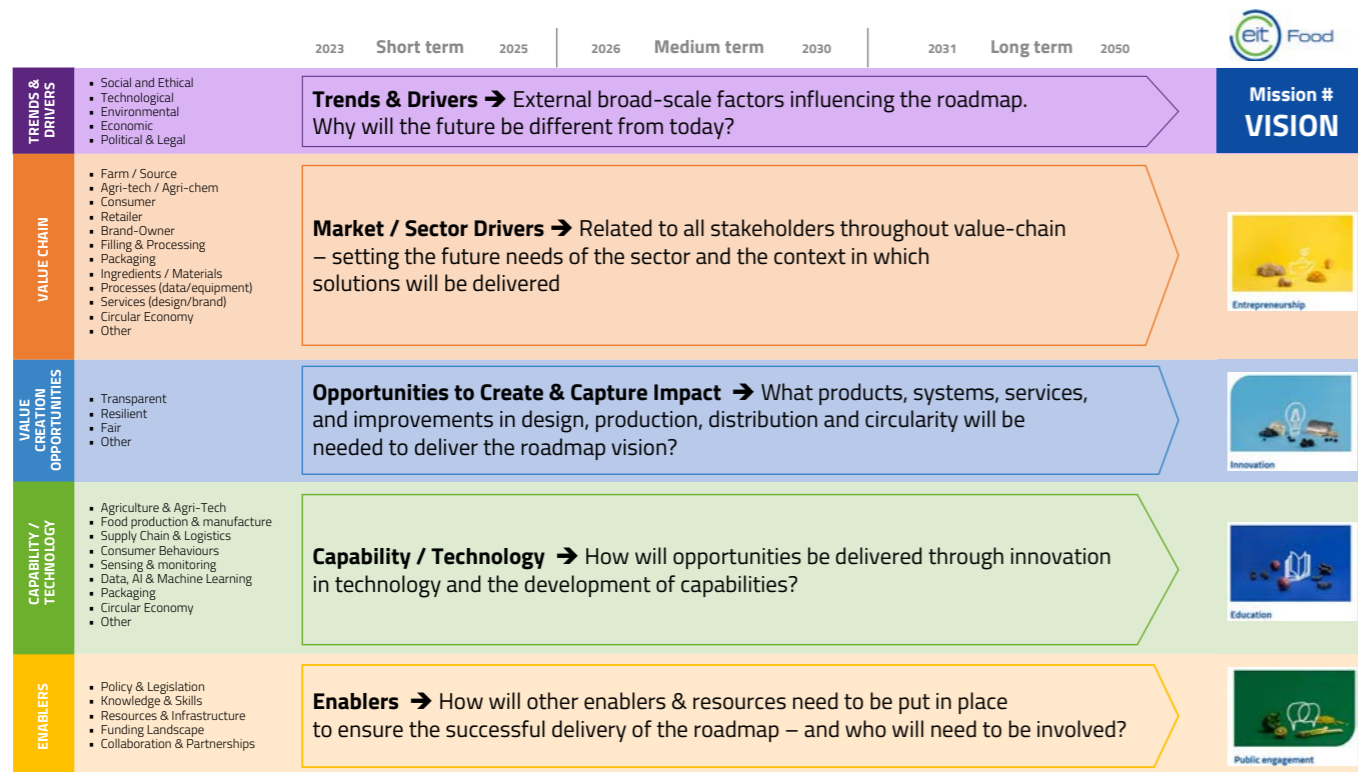


Figure 3: Roadmap landscape for Mission 3 (from IfM Engage)

Ideally, to prioritise different value creation opportunities a full business plan would be created and those that would make the best contribution to the bottom line are selected. But often, and especially for value creation opportunities in their early stages, there may simply not be enough valid information to do this, and time and resources are limited. IfM's (Institute for Manufacturing [IfM] at Cambridge University) portfolio prioritisation method provides a scoring and selection process for early-stage innovation ideas. It helps to evaluate those ideas using multiple impact and feasibility factors and not just financial criteria to reduce the uncertainty in decision-making. Both dimensions are defined in Table 1.



Table 1: Impact and feasibility factors for evaluating the priority value creation opportunities for a fully transparent, resilient and fair food system

<p>IMPACT: What is the contribution of the opportunities towards the vision for the transparent, resilient, and fair food system? Impact factors:</p> <ul style="list-style-type: none"> Overall impact of this opportunity space across whole food/drink sector Potential to scale – Deliverable improvement of roadmap vision by 2030 Positive impact related to for example SDGs and other Missions Negative impact related to for example SDGs and other Missions 	<p>FEASIBILITY: How likely are these opportunities to happen from the technical, market and regulatory point of view? Feasibility factors:</p> <ul style="list-style-type: none"> Likelihood of Adoption across value chain (Farm => Brand => Retail => Consumer => Circular) Technical probability of success: Feasibility of key technologies and capabilities required Relevance of role for EIT Food in enabling pathway to impact through innovation, education, entrepreneurship, and public engagement Regulatory, legal, safety and governance
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The portfolio prioritisation was done based on an individual assessment of all opportunity ideas and a group review of the scoring results and the selection of the priority opportunities. Figure 4 shows schematically how the results are presented.

For mapping and evaluating the priority value creation opportunities, the topic roadmaps were utilised to describe the desired outcome including contribution to the Mission's vision, main implementation milestones, capabilities, technologies and enablers required as well as likely barriers, risk aspects and potential knowledge gaps. From these the top priority opportunities will be recommended to EIT Food.

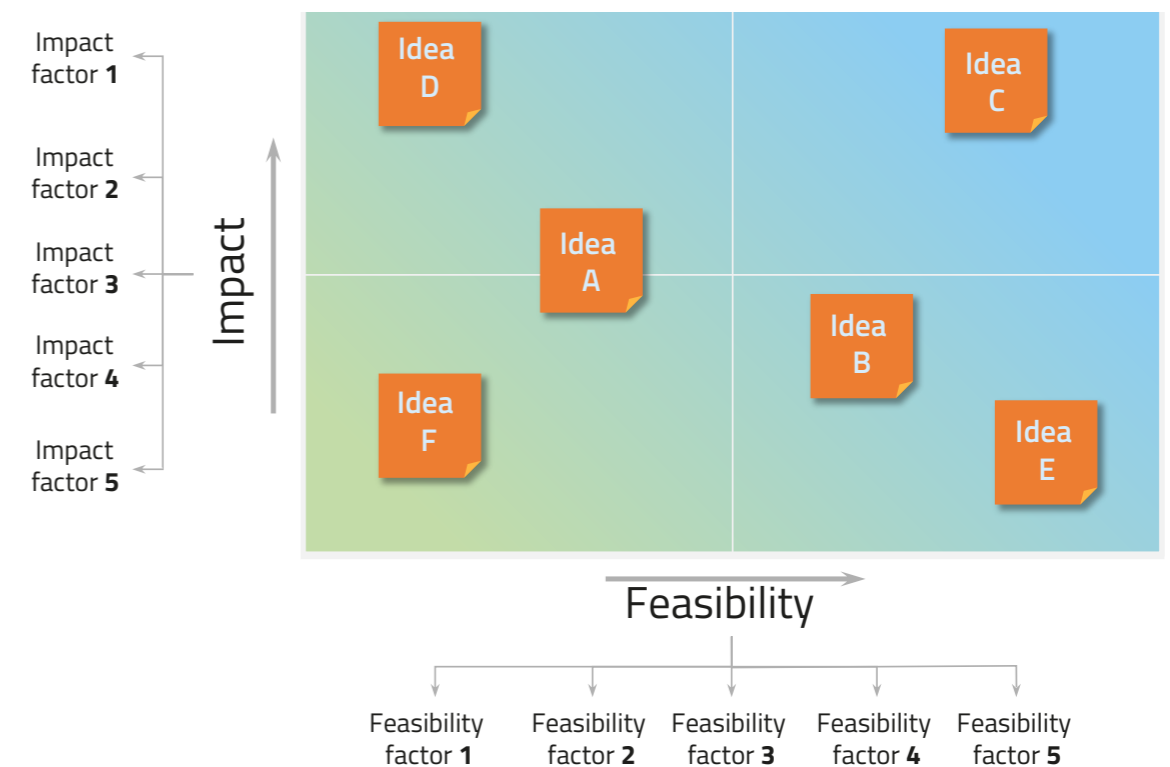


Figure 4: Prioritisation of the value creation opportunities

5. Results

5.1 Scoping Priority Areas

The findings of Phases 1 and 2 provided a baseline and targets in the form of priority areas and KPIs regarding the scale and consequences of unmet societal and economic needs, answering the following key questions in the transparent, resilient and fair food system Mission area:

1. Which indicators of food insecurity should EIT Food prioritise and why?
2. Which populations in Europe are most likely to experience these indicators and why?
3. Which causes of food insecurity should EIT Food prioritise and why?
4. Which factors contributing to food integrity should EIT Food prioritise and why?
5. Which consumer–industry relationships should EIT Food prioritise for efforts in building trust and public understanding?

5.1.1 A Transparent, Resilient and Fair Food System

At the outset of the roadmapping exercise for the EIT Food Mission Area, reducing risk for a fair and resilient food system, the scoping activity focused on three thematic areas – transparency, resilience, and fairness.

A transparent food system refers to one in which information about the production, processing, distribution, and sale of food is easily accessible to all stakeholders. Data must be reliable, factual and easily understood; accessibility and readability are therefore important. This includes information about the source of the food, how it was grown or raised, and any certifications or labels it may have (Hofstede et al., 2004; Wognum & Bloemhof, 2011).

A resilient food system is one that can adapt to and recover from disruptions, such as natural disasters, economic downturns, or pandemics. This includes having a diverse array of food production methods and sources, and systems for emergency food distribution (Tendall et al., 2015).

A fair food system is one in which all members of society have access to safe, healthy and affordable food, regardless of their income or location. This includes addressing issues such as food deserts, food insecurity, and the exploitation of workers in the food industry (Coleman et al., 2021; Generation Nutrition, 2020).

A transparent, resilient and fair food system is therefore one that promotes transparency and traceability of food production, provides robustness and adaptability in the face of external disruptions and ensures equitable access to safe, healthy and affordable food for all.

The literature review identified the key areas of interest which have an impact on the transparency, resilience and fairness of the food system. (For a detailed overview of literature review results see [appendix 1.2.](#)) The key trends and drivers covered by the literature included external drivers such as climate change, growing population, war and conflict, pandemics and crises response, urbanisation and scarcity of natural resources. Within the food system, relevant factors included: long and complex food systems providing opportunities for fraudulent activity; increase in foodborne illness and contamination of food; and variability in food fraud definitions and regulations causing confusion within the industry. Additionally, the literature review determined factors relating to: food insecurity (availability of and access to safe food); subgroups of the population more vulnerable to experiencing food insecurity (those with lower income or education levels, different household compositions, women, older adults, people with disabilities, primary producers, and populations in southern regions and urban areas); factors relating to food integrity (i.e., food fraud, food safety and supply chain transparency); and consumer trust in the food system.

5.1.2 Overview of the main factors influencing a fully transparent, resilient and fair food system

Climate change is adding pressure to the food system and can directly exacerbate food insecurity. Climate change has become a key global challenge threatening sustainability of lifestyles, economies, and ecosystems. Due to the current climate challenges agri-food researchers place increasing emphasis on the sustainability of food systems (Berner et al., 2019). Various slow – but major – shifts such as climate change are adding pressure to the European (and global) food system (Brzezina et al., 2016; Tendall et al., 2015). Climate change, weather unpredictability and extreme weather events threaten food production and safety. With changing climate patterns and weather extremes, resilience of global food supply is paramount (Coomes et al., 2019; Fan et al., 2021; Macfadyen et al., 2015). Vulnerabilities due to the limited shelf life of food, and variability in quality and availability of food products are exposed by an increased incidence of extreme weather linked to climate change (Fan et al., 2021; Stone & Rahimifard, 2018). In the context of a changing climate, deteriorating natural resources, growing population as well as many other emerging challenges and uncertainties, there are growing concerns that the European food system is vulnerable and thus unable to withstand disturbances without undesirable outcomes (Brzezina et al., 2016). Sustainable farming practices and new innovative technologies can help produce food in a climate-resilient manner, potentially requiring zero pesticides and fertilisers, and with lower land and water use than conventional agriculture (van Delden et al., 2021). However, resilience and sustainability are a complementary concept: a whole system perspective is required, not only change or transformation in one part of the system (Tendall et al., 2015).



Scarcity of natural resources, including growing competition and scarcity of land, water and energy for food production and overexploitation of the wild fisheries threatens the agri-food supply chain (Brzezina et al., 2016; Fan et al., 2021). Water availability and accessibility are the most significant constraining factors for crop production, addressing this issue is indispensable for areas affected by water scarcity (Mancosu et al., 2015). Whilst the declining availability of soil nutrients and loss of arable land from land degradation, urbanisation and other competition will impact the sector's ability to meet demands for a growing population if the current dietary trends continue (Fan et al., 2021).

Population growth is adding pressure to the global food system (Astill et al., 2019; Stone & Rahimifard, 2018; Tendall et al., 2015). Meeting the food demands of a growing and increasingly affluent global population while simultaneously promoting more sustainable agriculture and resilient food systems is a grand challenge for humanity (Coomes et al., 2019; Macfadyen et al., 2015). In particular, population growth in urban settlements is impacting on the sustainability of food systems (Berner et al., 2019); whilst migration demands for longer supply chains and adds further pressure (Brzezina et al., 2016). This is because immigration and international tourism can affect the import demand for certain food products (Fischer, 2010). For example, the growth of Chinese communities abroad has increased Asian food importation (D'Amico et al., 2014).

Urbanisation is directly linked to the changing demand for food that will impact rural areas and agricultural supply chains (European Commission, 2020). Today, approximately 55% of the world's population live in urban areas and this percentage is predicted to increase to over 68% by 2050 (Ritchie and Roser, 2018). Such population growth in urban settlements is impacting on the sustainability of food systems (Berner et al., 2019). Consumer demand for food, which is more nutritious and safer, will increase from urbanisation (Fan et al., 2021). In urban areas, there are increasing requests for local food, even outpacing those in rural areas (Mui et al., 2019). Growing urbanisation is also a concern as it can result in loss of productive arable land (Fan et al., 2020). Considering that 79% of all food produced is destined for consumption in cities, such urbanisation is directly linked to the changing demand for food that will impact rural areas and agricultural supply chains; not only because food needs to be easily stored and transported but also because of the increased land competition between land-intensive economic sectors (e.g. agriculture) and the living and working space of other sectors (European Commission, 2020). Despite most of the food produced being destined for cities, residing in an urban area does not equate to increased food security. Poverty, food insecurity, and malnutrition become increasingly urban problems as urban populations expand everywhere. Persistent child undernutrition, micronutrient deficiencies, and an alarming rise in overweight and obesity in urban areas mark the shift of the burden of malnutrition from rural areas to cities (IFPRI, 2017). Additionally, urban areas are the biggest source of post-consumption food waste, with organic waste accounting for more than half of total urban waste (Kaza et al., 2018).

Social unrest, war and political conflict can place pressure on the resilience of the food supply chain (Stone & Rahimifard, 2018). The conflict in Ukraine has triggered a significant additional disruption in global food supply chains compounding impacts of the COVID-19 pandemic (Jagtap et al., 2022). For example, as exports from Ukraine came to a halt following the Russian invasion (Feb 2022), countries

were forced to source their wheat elsewhere, at considerably higher prices due to the disruption of supply (Berkhout, 2022). Civil war also hinders crop production and threatens food security, as seen in Syria (Li et al., 2022).

Pandemics, epidemics & crises situations add further pressure to the agri-food system. Food insecurity existed before COVID, worsened during this crisis, and will unfortunately be a persistent phenomenon in the post-COVID world (Sharma et al., 2022). COVID-19 has led to a spike in food insecurity, especially among racial/ethnic minority households (Hines et al., 2021). As COVID-19 forced many schools to close, students who depended on the public schools to meet the majority of their nutritional needs faced an even larger battle with food insecurity (Fox & Frye, 2021). Minimising food insecurity during the next crisis will require coordinated efforts across the system (macro-meso-micro levels) (Sharma et al., 2022).

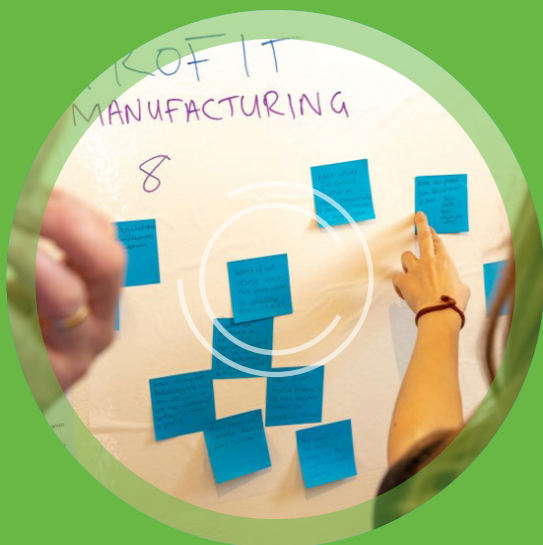
Poverty & social inequality has a role to play in food insecurity. In 2021, 95.4 million people in the EU (21.7% of the population) were at risk of poverty or social exclusion, a slight increase compared with 2020 (Eurostat, 2022). Unemployment can negatively affect a household's food security status, making it more difficult to meet basic household food needs (Nord, 2007), and high food prices affect people's ability to buy food and can add further pressure to low-income households, including in the EU (European Council, 2022).

Inflation and higher food prices are hitting citizens in EU countries and impacting the accessibility and availability of food. Affordability is a top concern for EU leaders, particularly regarding low-income and vulnerable groups, which are affected most. According to Eurostat, food prices in the EU were almost 9% higher in July 2022 than in the same month in 2021 (European Council, 2022). Based on the Low-Income Measure (LIM) model, higher minimum wage, lower income tax, and lower unemployment rate were associated with lower odds of food insecurity (Men et al., 2021).

Food waste & overproduction is putting unnecessary pressure on the food system. The food currently wasted in Europe could feed 200 million people (European Commission, 2020c). According to European Commission Food 2030 Pathway: 'Food waste and resource efficiency', reducing food loss and waste would close the gap between the amount of food needed to adequately feed the planet in 2050 and the amount of food available in 2010 by more than 20% (European Commission, 2020c).

Growing & complex global food supply chains increases food fraud vulnerability. There are challenges with integrity and authenticity of products due to ever-lengthening and increasingly complex global food supply chains (Robson et al., 2021). This complexity creates difficulties in surveillance; whilst rising prices, the scarcity of raw ingredients, the competitive nature of the industry, the constant drive to reduce costs and maximise profits and the customers desire for variety and access at low cost makes the food system vulnerable to opportunistic individuals looking to exploit the food system for economic gain (Fox et al., 2018). In particular, high-value commodities which are in long, complex and opaque supply chains can experience a high prevalence of food fraud throughout the entirety of their supply and logistical chain, for example seafood (Lawrence et al., 2022) and herbs and spices (Galvin-King et al., 2018).

Lack of harmonisation surrounding food fraud regulation & enforcement. Food fraud is usually a violation that is defined by a patchwork of requirements and enforced by several agencies. Each agency has a different set of priorities and expectations for enforcement and compliance (Spink et al., 2019). The EU has not set a legal definition for what food fraud is and this has led to inconsistencies among researchers and regulatory bodies, confusing the understanding of food fraud and related terms (Robson et al., 2020). The patchwork creates inefficiency for government agencies and confusion for industry (Spink et al., 2019).



Increase in food borne illness and food contamination: In 2021 there were 4,005 foodborne outbreaks in the EU – a 29.8% increase compared with 2020 (EFSA & ECDC, 2022). This is an important public health concern. There is a greater need for transparency and the detection of foodborne illness outbreaks (Astill et al., 2019). In particular, food insecurity exposes vulnerable people to food contamination, such as mycotoxins, because they will be forced to eat what they might otherwise have rejected (Ayalew, 2022).

Consumer trust in the food system plays a key role in a Transparent, Resilient and Fair Food System. Trust in the food chain is vital to encourage people to eat more healthily and sustainably (EIT Food, 2022). Consumer trust is therefore of enormous interest and value to food system researchers, actors and policymakers alike because of its connection with consumer confidence as well as the demand for products with credence characteristics like healthfulness and sustainability (Macready et al., 2020). Adulteration can negatively affect the food industry and consumer trust (Galvim-King et al., 2018). Higher levels of transparency lead to higher purchase of more sustainable foods (Sabio & Spers, 2022). It has been found that for example, transparency around cultured meat health and safety are paramount to the industry's success (Bryant & Barnett, 2020) and that public resistance to genetically modified (GM) products could be better addressed by developing more transparency and trustworthy governance (Nep & O'Doherty, 2012). To uphold consumer trust, authentication of claims through transparency in the food supply chain is required (Singh & Sharma, 2022). Consumers have previously expressed distrust in food labelling and manufacturers (Bryant & Barnett, 2022). One study found that consumers tend to trust farmers and retailers more than authorities and food manufacturers (Macready et al., 2020). Consumers hold manufacturers more accountable than farmers and retailers in terms of transparency (Macready et al., 2020). Retailers are generally trusted to bring safe products to market but don't always seem to care about healthy/sustainable choices (EIT Food, 2022). Trust in the regulatory bodies responsible for ensuring food safety is also an important issue (Bryant & Barnett, 2022). Distrust in the governance of for example, GM foods has been reported by consumers previously (Nep & O'Doherty, 2012). Independent inspections to improve safety, quality and sustainability of supply chains could help build trust (EIT Food, 2022).



Increasing awareness and changing consumer behaviour and food choices plays a key role in the food system. Food products from sustainable chains have increased in the past years, motivated by consumers' interest in reducing the negative environmental, economic, and health impacts of their food choices (Sabio & Spers, 2022). There is an ongoing 'nutrition transition' that has transformed food systems globally, from mainly plant-based diets with fresh foods towards rich diets high in sugar, fat and ultra-processed and animal-sourced foods (Baker et al., 2020; Masters et al., 2016), bearing significant environmental and health consequences. A recent model estimated that by 2050, 45% of the world population will be overweight and 16% obese (Bodirsky et al., 2020). Additionally, current global food systems are failing many individuals who are deficient in nutrients needed for good health (Reisch, 2021). Changes to farming and production such as more diverse, nutritious, and resilient crops will improve the availability of healthy food for consumers (Reisch, 2021). Transformation of current food systems to improve availability, affordability and uptake of nutritious, safe, affordable, attractive and sustainable diets is key to tackling malnutrition in all its forms and promoting health (European Commission, 2021).

Based on the insights gained from the literature review, surveys, interviews and the roadmapping workshop, the following section provides answers to the key questions EIT Food posed at the beginning of this Mission. The answers to these important questions will aid in the prioritisation of the opportunities derived from this roadmap exercise.

5.1.3 Food Security

In 1948, the General Assembly of the United Nations announced the Universal Declaration of Human Rights with a total of 30 rights and freedoms. One of these rights is the right to food. The World Food Security Summit in 1996 defined Food security as follows: when all people, at all times, have physical, social and economic access to sufficient, safe & nutritious food that meets their dietary needs and food preferences for an active and healthy life.

Food insecurity can be experienced at different levels of severity and can be experienced because of numerous factors/causes including poverty and social inequalities (e.g. racial, gender), war and conflict, climate change, food shortages, food waste, poor nutrition, poor public policy, poor economic status, forced migration and chronic health conditions. Around 2.3 billion people in the world were moderately or severely food insecure in 2021 (nearly 30 percent of the global population), over 350 million more people than in 2019, the year before the COVID-19 pandemic unfolded (FAO, 2022). Close to 40 percent of people affected by moderate or severe food insecurity in the world were facing food insecurity at severe levels. The prevalence of severe food insecurity increased from 9.3 percent in 2019 to 11.7 percent in 2021 – the equivalent of 207 million more people in two years (FAO, 2022). Food insecurity is associated with increased risk for several health conditions and with poor chronic disease management (Barons & Aspinall, 2020). Food insecurity also exposes vulnerable people to food safety issues such as mycotoxin contamination because they will be forced to eat what they might otherwise have rejected (Ayalew, 2022).

5.1.3.1 Key Indicators of Food Security

According to the Food and Agriculture Organization (FAO) definition: A person is food insecure when they lack regular access to enough safe and nutritious food for normal growth and development and an active and healthy life. This may be due to unavailability of food and/or lack of resources to obtain food. As previously discussed, there are many factors which contribute to food insecurity. In relation to the key indicators for food security, this report supports that availability, accessibility, safety and healthiness of food should be prioritised:

Access to food: Ensuring access to safe, nutritious and affordable food is vital to ensure food security among populations. From the literature it was found that affordability is a concern for EU leaders as inflation and higher food prices hit EU citizens, particularly regarding low-income and vulnerable groups. Higher minimum wage and lower unemployment rates are associated with lower food insecurity. Poverty and inequality were also reported as key drivers by both interview and survey responses. Poverty and social inequality were deemed by survey participants as one of the main short-term drivers, highlighting it as an urgent priority. Improving accessibility of food was a common opportunity proposed by interview participants and fair food prices and improved wages and working conditions were considered by survey participants as being among the most urgent market needs to achieve a fully transparent, resilient and fair food system. EIT Food should therefore focus on ensuring that food is affordable for all citizens.



An additional barrier to food accessibility is consumer food procurement, with one in four food insecure adults reporting transportation as a limitation to acquiring food. Lack of nearby shops and poor public transport services increase the susceptibility of older adults to food insecurity. Improving food distribution also emerged from stakeholder interviews as important to achieving the aim of this Mission. Enabling consumer food procurement should therefore be a priority of EIT Food to improve access to food.

Availability of food: To ensure availability of food, EIT should prioritise promoting resilient and sustainable food production and supply chains. It is important that the food system can withstand disturbances and react to change without undesirable outcomes. The literature also acknowledges the vulnerabilities of the supply chain because of climate change, war and conflict, growing population and depleting natural resources to name a few. These impacts on food production also emerged strongly from stakeholder interview and survey responses. Sustainable farm management and resource efficiency and water management were among the top ten urgent market needs identified by stakeholder surveys. Interviewees raised concerns with limitations on resources, current farming practices and the potential for climate smart agriculture. EIT Food should extend its efforts along the entire food supply chain to improve resilience and sustainability to minimise the undesirable effect of external factors and ensure the availability of food to all consumers.

The literature also acknowledges food and resource waste as a key area of concern. The imbalance of food production should be considered in order to prevent surplus food being wasted in some regions while others struggle to meet basic demands for food. Overproduction and food waste also emerged strongly from both the stakeholder surveys and interviews. With waste management and utilisation of waste resources proposed as opportunities to overcome this issue. EIT Food should therefore prioritise ensuring that food is subsequently consumed and does not go to waste while many citizens struggle with food insecurity.

Health through diet: EIT Food should work to ensure that all consumers have access to and can afford healthy, nutritious food as part of a well-balanced diet. The literature suggests that current food systems are failing many individuals with high levels of obesity and nutrient deficiencies. Changes to farming and production have been proposed as having the potential to improve the availability of healthy food for consumers. More diverse, nutritious, and resilient crops will be useful for this. To promote health, it is vital that nutritious food is made available and affordable. Changing consumer diets and demand for more healthy food choices was reported within the survey and interview findings, highlighting its importance within the Mission. EIT Food should therefore prioritise these improvements within current food systems to promote healthy diets, and this has a strong connection with EIT Food's other Mission "Healthier Lives Through Food".

Safety of food: It is vital that even those who are suffering food insecurity consume food which is safe to eat. Those experiencing food insecurity are more vulnerable to food safety issues, as they may be forced to consume food which they otherwise would not. Reducing contaminants in food (both chemical and natural) was considered one of the most urgent opportunities from the stakeholder surveys. Is it important that food safety is a priority along the supply chain. Additionally, such efforts should be complimented with effective transfer of transparent information on food safety to the consumers. EIT Food should therefore prioritise the safety of food and prolonging food shelf life to reduce the risk of foodborne illness or contamination.

5.1.3.2 Populations in Europe more at risk of experiencing these indicators of food insecurity

Certain populations are more vulnerable to experiencing the indicators of food insecurity due to a wide range of factors. Based on the literature those with lower incomes or education levels, different household compositions, women, older adults, people with disabilities, primary producers and those living in urban areas or southern regions, are more at risk of experiencing food insecurity.

Low-income households: Based on the literature, individuals from low-income households are more at risk of poverty, social exclusion and therefore food insecurity. Unemployment can also negatively affect a household's food security status combined with high food prices which add further pressure to low-income households. Fair food prices and improved wages and working conditions were considered among the most urgent market needs by survey participants. Therefore, improving employment opportunities for low-income households and ensuring fair, affordable food prices are two areas in which EIT Food should focus their efforts to reduce the vulnerability of low-income households to food insecurity.



Urban populations: According to literature, more than half the world population live in urban areas, which is expected to increase to over 70% by 2050. The growth of urban populations means that most of the food produced globally is destined for consumption in cities. Despite this, residing in an urban area does not equate to increased food security. Poverty, food insecurity, and malnutrition are becoming increasingly urban problems as urban populations expand. Additionally, urban areas are the biggest source of post-consumption food waste. However, despite this excess food going to waste individuals in urban areas are still experiencing food insecurity. Urbanisation was reported as a key driver of food insecurity among interview and survey respondents. Additionally, survey respondents perceived optimising local supply chains as one of the most urgent opportunities which could help achieve the aim of this Mission. Enhancing urban social resilience to ensure urban food and nutrition security and shortening of supply chains are two approaches which can help transform urban food systems and are two areas which EIT Food can focus on to help reduce food insecurity within urban populations.

Those with low education levels: Alongside low household income, low education level is another main factor associated with food insecurity (Alarcão et al., 2020; Dudek & Myszkowska-Ryciak, 2022). People with a university degree present a lower probability of experiencing food insecurity, both for men and women (Grimaccia & Naccarato, 2022). Individuals with lower education levels may be at greater risk of food insecurity and should be considered in efforts to mitigate risk concerning food insecurity across Europe.

Gender disparities: There is a gender gap in food insecurity with women experiencing more food insecurity than men. Previous research acknowledging gender-based disparities and investigating the drivers that could mitigate food insecurity in European women reported level of education, composition and number of children in the household as having a significant contribution in the risk of food insecurity (Grimaccia & Naccarato, 2022). Ensuring equality and addressing gender disparities when it comes to food insecurity mitigation efforts are necessary.

Household composition: Household composition has been associated with food insecurity within Europe. The number of children in a household increases the risk of food insecurity (Dudek & Myszkowska-Ryciak, 2022). The number of children in the household, presents a higher impact on women's food insecurity than on men's, highlighting again the gender disparities in relation to food insecurity (Grimaccia & Naccarato, 2022). Single parents are more at risk of food insecurity than those with partnered parents (Brown et al., 2022). It has also been reported that it is not only lone parents who have a statistically higher chance of being food insecure, but also single working age adults living alone (Sosenko et al., 2019).

Older adults: Food insecurity has been reported as more prevalent among older people within the UK and Europe (Garratt, 2019; Purdam, Esmail & Garratt, 2019). Many older people live alone and in poverty, and increasing numbers are constrained in their spending on food and are skipping meals (Purdam, Esmail & Garratt, 2019). In addition to financial constraints, lack of shops nearby and unfunctional public transport services, especially for people who do not drive, have also been identified as key factors impacting on food accessibility for as people age (Gajda, R. and Jeżewska-Zychowicz). Ensuring the financial and physical accessibility of food for older adults is necessary to combat food insecurity.

People with disabilities: People with disabilities may also be at increased risk of experiencing food insecurity (Garratt, 2019). In 2021, 29.7% of the EU population aged 16 or more with a disability (activity limitation) was at risk of poverty or social exclusion compared with 18.8% of those with no disability (Eurostat, 2022). Both the number and type of disabilities are associated with higher risk of food insecurity among disabled adults (Hadfield-Spoor, Avendano, & Loopstra, 2022). Those with a disability should be a key focus in efforts made to tackling food insecurity across Europe.

Primary producers: Approximately 500 million smallholder farms produce close to 80% of the global food supply, with close to 2 billion people depending on those farmers for their food, and yet of the almost 700 million people worldwide who do not get enough food, many are farmers (IFAD, 2022). The vulnerability caused by the EU agriculture sector's reliance on importing specific products such as feed protein combined with high input costs, such as fertilisers and fossil energy, is causing production challenges for farmers and risks driving up food prices (European Commission, 2022). To survive and live a comfortable life, primary producers require fair prices for their work. Fair revenues for primary producers were considered one of the most urgent needs by survey participants and additionally, the need for support for primary producers was commonly noted during stakeholder interviews. Diversification of food production has the potential to improve the resilience of primary producers (Valencia et al., 2019); as well as more sustainable farm management, according to the literature and stakeholder responses during surveys and interviews. Ensuring fair profit sharing along the food supply chain is vital to ensure farmers can meet their basic needs and do not experience food insecurity, this should therefore be a priority for EIT Food.

Southern regions: Literature reports that the level of food security in the EU is not uniform as the performances of both Mediterranean countries and central and eastern Europe are significantly lower than in western and northern Europe (Global Food Index, 2021). As a result of climate change, drought frequency is predicted to increase, especially in the Mediterranean region with higher temperatures also affecting the livestock sector in terms of decreased animal health and livestock production (European Environment Agency, 2019). Additionally, farmland values in southern regions of Europe are expected to decrease by 60%–80% by 2100 (European Environment Agency, 2019). This anticipated impact on agriculture and livestock production may result in increased food insecurity in this region, due to reliance on food imports at presumably higher prices for the consumer. Climate change emerged from interviews and surveys with stakeholders as one of the main external factors impacting the food system. EIT Food should prioritise building supply chain and food production resilience to climate change and changing weather conditions to minimise the non-uniform levels of food security within the EU.

5.1.3.3 Key causes of food insecurity

As previously mentioned, there are many factors which contribute to food insecurity, based on the findings of this report. The key causes which EIT Food should prioritise are environmental degradation and climate change; food loss and food waste; the resilience of the supply chain; urbanisation; poverty and poor financial situations; and poor dietary choices.

Environmental degradation and Climate

Change: Ensuring access to safe food for all is a key pillar of food security. This is increasingly challenging due to changing in weather patterns and the increased incidence of extreme weather events linked to climate change which can have a devastating effect on primary production, negatively impact on the shelf life of food, and cause variability in the quality, safety and availability of food products. Environmental degradation, from intensive agriculture and other human activities along with climate change, threatens the availability of already scarce natural resources and can contaminate soil, water and air which will compromise the safety, quality and sustainability of food production. Notably, the reduction of food contaminants was perceived as an urgent need by stakeholders within the survey responses, and climate smart agriculture was referred to on numerous occasions during the interviews. Both were considered important opportunities to overcome issues related to environmental degradation and climate change. EIT Food should therefore promote sustainable food production practices in a climate resilient manner and prioritise improved food safety, with a particular focus on addressing the impact of climate change on food safety.

Overproduction, Food Loss and Food Waste:

In 2011, the Food and Agriculture Organization (FAO) estimated that one third of the annual food produced for human consumption was either wasted or lost (FAO, 2011). This accounted for 24% of freshwater use, 28% of total global cropland area, 23% of global fertiliser use and approximately 8% of total GHG emissions (Do et al., 2021). It is a notable and worrying cause of sustainability issues in the food system and food insecurity. Worryingly, data from a more recent

report from WWF and Tesco (2021), Driven to Waste, indicates that in fact over 40% of food produced is lost or wasted, 1 billion more tonnes than originally thought, with a contribution of approximately 10% of all GHG emissions. The Driven to Waste report estimates that over 2.5 billion tonnes of food is lost or wasted, with 1.2 billion tonnes of food lost at the farm (WWF, 2021), 436 million for postharvest up to but not including retail (based on calculations from FAO, 2019) and 931 million tonnes lost in retail, food service and consumer homes (UNEP, 2021) every year. It is estimated that food currently wasted in Europe could feed 200 million people. The control of supply and demand; redistribution of surplus food; and ensuring food is not lost or wasted across the food system could help to reduce food insecurity faced by many EU citizens. EIT Food should therefore prioritise a reduction of food loss at primary production and by consumers; the redistribution of surplus food; the valorisation of side streams; and recycling (e.g., anaerobic digestion of food waste).

Food Supply Chain Resilience: The global food system is facing challenges in feeding a growing population expected to reach over 9.7 billion by 2050. Simultaneously, the food system has been dramatically disrupted in recent years due to global pandemics and conflict, notably covid-19 and the war in Ukraine. Such disruptions to food production and distribution have heightened food insecurity in many regions due to increased food prices as a result of heavily relied upon food supply chains being unable to respond to unexpected changes. The impact of war and conflict and supply chain response to crisis situations featured among the top external drivers impacting on the food system in the survey responses. Minimising food insecurity during the next crisis will require coordinated efforts across the system. The resilience of the supply chain is paramount in ensuring food security and should therefore be a primary focus for EIT Food to ensure supply chains can weather unpredicted challenges and continue to provide safe, affordable food for a growing population.

Urbanisation: As previously highlighted, more than half of the world's population live in urban areas, which influences the demand for food, creates competition for arable land and poses challenges for food distribution. As urban areas expand so too do the problems of poverty, food insecurity, and malnutrition. For these reasons, populations in urban areas are at greater risk of experiencing food insecurity, despite urban areas having greater levels of food waste. Building the resilience of urban areas is vital to ensure food security. EIT food should therefore focus on building the resilience of urban populations and urban food systems to ensure sufficient food is made available and distributed effectively to prevent food insecurity in such areas. Balancing food waste and food insecurity in urban areas should also be a priority. Survey participants reported a consumer shift towards locally sourced food as one of the key drivers of a more transparent, resilient and fair food system. Shorter supply chains and improved distribution were considered important by stakeholders during interviews and surveys to improve food accessibility.

Poverty and poor financial situation: One of the main causes of food insecurity in Europe is poverty and a poor financial situation which can reduce an individual or household's ability to afford an adequate and nutritious diet. This has been exacerbated by inflation, the cost-of-living crisis and rising food prices leaving people with less money available for food expenses, with people finding themselves unable to buy all the food they need or enough variety to provide nutritional needs. EIT Food should take a leadership role to define food insecurity indicators; measure food poverty within Europe; support food donation and welfare systems; reduce food loss and food waste; and provide prioritise education and public engagement programmes for vulnerable groups.

Poor dietary choices: Poor dietary choices i.e. diets that are high in added sugars and unhealthy fats and low nutrient dense foods, can result in a low intake of micronutrients and can lead to micronutrient deficiencies and food insecurity. According to the global hunger index, more than two billion children and adults globally are estimated to suffer from deficiencies of crucial vitamins and minerals due to a poor diet. There is a limited comprehensive, reliable and up to date data on micronutrient deficiencies across Europe. However, national surveys have indicated micronutrient deficiencies (e.g. iron, iodine and vitamin D) within the populations sampled. Micronutrient deficiency has also been termed 'Hidden Hunger'. It is defined as occurring when an individual may be eating enough calories however, they have a low intake and absorption of micronutrients. The consequences may not be initially noticeable but include poor growth, cognitive development, anaemia, osteoporosis, cardiovascular disease and even cancers (Das and Padhani, 2022). Worryingly, the Lancet published that dietary risks was the greatest risk factor for death globally in 2017 (Afshin et al., 2019). EIT Food has a role to play in ensuring healthier lives through food (linked to Mission 1), with education programmes on nutrition particularly important alongside efforts to increase access and availability of healthier foods.

5.1.4 Food Integrity

Food integrity has been defined as: the condition of a food product to be safe, of quality, authentic, traceable and genuine in all its aspects, whose nature has not been altered or modified and whose claims are honest and meet consumer expectations (Elliott, 2014). Inadequacies in food quality, safety, defense and fraud surveillance have been identified as food integrity risks of increasing sectoral, governmental and consumer concern (Fox et al., 2018). Food quality refers to the characteristics of the food which positively or negatively influence the consumers acceptability of food, including nutritional value, colour, taste, texture and sustainability performance. Food safety ensures food is free from any food safety hazards i.e. biological, chemical, physical, radiological or allergenic contaminants; and is fit for human consumption. Food fraud is food which is deliberately placed on the market for financial gain, with the intention of deceiving the customer. Whilst food defense counteracts activities which are carried out to intentionally inflict pain, damage or danger; or as a tool for terrorism. It is clear food integrity is influenced by numerous factors. Manning (2015) argued that food integrity includes four elements that need to be considered to safeguard food integrity in the food supply chain: product, process, people and data integrity.

In particular, food fraud is of heightened concern as there has been several large scandals, massive economic losses and declines in consumer confidence in many parts of the world. Food fraud costs the global food industry US \$40 billion per year (Śliwińska-Bartel et al., 2021). Food fraud is usually driven by economic incentives. However, the availability of potential contaminants introduces the unknown into the supply chain and can lead to severe illness or death depending on the potency of the materials used and the susceptibility of the consumer. In addition, it may also, in some instances be malicious acts and so the potentially significant food safety implications and associated public health risks should not be overlooked (European Commission, 2019). Non-compliance with legislation for example, can range from mistakenly mislabelled items and mis-description of quality claims to sophisticated, malicious and dangerous acts. The Chinese milk scandal of 2008 is a tragic example of how an act for economic gain can have public health risks. In this case, melamine, a chemical used to make plastics, fertilizers and concrete, was added to milk powder to increase the nitrogen content of diluted milk. This gave it the appearance of higher protein content to pass quality control testing. However, those carrying out the act did not realise melamine can cause kidney stones and kidney failure and in particular, melamine toxicity in babies and infants can be fatal. In 2008, eleven babies are known to have died and over 290,000 children suffered from urinary tract stones due to milk being adulterated with melamine (Smulders et al., 2019).

The traditional food safety and food defense plans that exist are not considered sufficient to prevent, mitigate, detect, and deter food fraud (Robson et al., 2021). These plans concentrate on critical control points in the supply chain which pose the highest risk. However, this approach is reactive in nature, focusing on historic or existing knowledge (Fox et al., 2018). Food fraud is ever evolving and opportunistic and therefore, the food industry requires specific, bespoke plans that focus on food fraud and its mitigation and prevention (Robson et al., 2021). These plans need to review the supply chain from a different perspective, identifying vulnerable nodes, intelligence gathering and predicting important medium-long term issues and taking effective preventative action. Systems and processes at the industrial level are also required to enable early and rapid detection of non-compliance and link to quality systems (European Commission, 2019). The European Commission, Food 2030 Pathway 'Food Safety Systems of the Future' proposes to ensure food safety along the entire

food chain, among all actors, by developing and implementing traceability systems supported by available and new safe technologies (European Commission, 2020b). This is important as current traceability systems are a concern in the food supply chain mainly due to reported limitations and food safety issues (Pradana & Djanta, 2020). It has been reported that revealing information on recipes and food supply chains positively affects business transparency and contributes to higher food authenticity (Yang et al., 2022). In summary, food fraud has become an urgent topic due to ongoing global development of the food industry standards and certification requirements in response to food fraud scandals. There is a trend towards a new proactive, holistic, all encompassing, preventative approach to food fraud (Spink et al., 2019).



5.1.4.1 Factors contributing to food integrity

Based on the findings of this report it is proposed that the main factors contributing to food integrity which EIT Food should focus on are food product safety, food fraud mitigation and ensuring transparency along the supply chain.

Food product safety: Based on the literature, food safety issues impact the integrity of food. Food-borne bacteria, viruses, parasites, toxins and allergens cause about 23 million cases of illness and 5,000 deaths every year in Europe (WHO, 2016). It is therefore clear that one factor contributing to the need for supply chain transparency is the detection of food safety issues. For example, non-compliance with food safety regulations can pose a threat to the safety of food products. Improvements in traceability of food products was considered an important opportunity to improve food safety and integrity during stakeholder interviews and reducing food contamination considered an urgent need by survey respondents. Climate change will add pressure to the safety of food products and must also be considered. Ensuring food safety within the supply chain is therefore recommended as a priority focus for EIT Food in improving food integrity.

Food fraud mitigation: The literature reveals that the food system requires specific plans which focus on food fraud with emphasis on its mitigation and prevention which should take an all-encompassing, preventative approach. Stricter food fraud regulations and improved mitigation measures also emerged from stakeholder interviews as an important opportunity to improve food integrity. While ensuring integrity of food supply chains was reported by survey respondents as an urgent market need. This is potentially one of the areas in which EIT Food can prioritise to combat food fraud and protect the authenticity of food.

Transparency from farm to fork: The literature suggests that when data is made available to the consumer via traceability systems, it can improve consumer trust in the integrity of their food. Consumers want improved traceability, and by revealing information, businesses are encouraged to improve their transparency and thus, produce and distribute safe, authentic, nutritious, and sustainable food produced using systems that respect the environment, those who work in the industry and to the highest ethical standards. However, there are many challenges and inadequacies of the current traceability system due to the increasing complexity of global food systems. Traceability systems are a key concern expressed in the literature and improving traceability of food chains was a commonly discussed opportunity by stakeholders during interviews. EIT Food could play a role in ensuring the desired information is provided by supply chain actors and provided to consumers in an understandable manner while providing evidence of the integrity of food products.

5.1.5 Consumer–industry relationships to build trust and public understanding in the food system

There are a range of food system aspects in which consumers may have differing levels of trust in and understanding of, and should be considered priorities of EIT Food:

Transparency of food supply chain to build trust: In order to make informed choices it is important that consumers trust and understand the food system. Consumer demand for clarity of food product ingredients and origin are rising. Food fraud negatively affects consumer trust in the food industry. Higher levels of transparency can lead to improved consumer trust. EIT Food should therefore promote public engagement activities which will improve consumer awareness of the food system to remove any false preconceptions they may have; help them understand where their food comes from and why such processes are required; and increase the value they place on food.

Awareness of food production processes: To build consumer trust in the food system it is important that they understand the processes within it. For example, improving consumers' awareness of farming practices will help consumers understand where their food comes from and help to alter the perception some consumers have of farming having a detrimental impact on the environment and animal welfare for example. Understanding farmers' roles in the food chain will also help consumers understand the need for farmers to receive a fair price for their work which may be reflected in the price consumers pay. EIT Food should therefore promote public engagement activities which will improve consumer awareness of the food system to remove any false preconceptions they may have; help them understand where their food comes from and why such processes are required; and increase the value they place on food.

Clarity of food packaging labels & claims: To uphold consumer trust, it is necessary that claims on food labels are accurate and based on robust scientific evidence; and food supply chains are transparent with their information. Consumers have previously expressed distrust in food labels; therefore, it is important that consumers are educated on how food labels should be interpreted but also manufacturers should ensure simplicity and clarity of information so that consumers can easily absorb the information and make informed choices. Clear and accurate food labelling verified by a trusted and independent organisation was voted during the stakeholder workshop as one of the priority market needs for this Mission. It is therefore necessary that food packaging labels are consistent, and accuracy is ensured in order to improve consumer trust. EIT Food should therefore utilise data from the supply chain and ensure that the information provided to consumers is consistent so that consumers can easily understand and make informed decisions. Additionally, making it a requirement for all food products to be labelled the same with the same information will increase transparency along the supply chain and to the consumers, helping to build trust in the food system.



Trust in supply chain actors: Additionally, given the numerous actors within food systems it is likely that consumers will view each with different levels of trustworthiness. One study found that consumers tend to trust farmers and retailers more than authorities and food manufacturers (Macready et al., 2020). EIT Food should therefore consider how consumer trust in the various food chain actors may be improved with a focus on building trust in manufacturers and authorities.

Farmers are generally more trusted than other supply chain actors. Distrust in food companies has previously been reported by consumers and it was found that they hold manufacturers more accountable than farmers and retailers in terms of transparency. Some consumers view manufacturers as potentially being money driven and willing to compromise on quality for profitable gain. Retailers are generally trusted to bring safe products to market but don't always seem to care about healthy/sustainable choices. Like farmers, retailers have been considered more trustworthy than manufacturers and authorities within the food supply chain. Trust in the regulatory bodies and authorities responsible for ensuring food safety is also an issue of importance. Consumer distrust in the governance of for example, genetically modified foods has previously been reported. Independent inspections to improve safety, quality and sustainability of supply chain could help build trust. EIT Food should therefore prioritise building the consumer relationships with manufacturers and authorities. These stakeholders are often perceived as less trustworthy than other actors along the supply chain. Efforts to improve transparency along the supply chain, and providing consumers with an understanding of the role and needs of stakeholders within these sectors could improve consumer trust in them and the food system.

5.1.6 Importance of Resilient Food Supply Chains

Resilience of the global food supply chain is paramount to enable all populations to have access to adequate, sustainable food. The resilience of the food chain is necessary to overcome many of the factors which impact on food security.

The food system faces vulnerabilities from weather extremes, depleting natural resources and other emerging uncertainties and challenges which impacts its ability to meet the dietary needs of an ever-growing population. In order to withstand these challenges and overcome vulnerabilities, improvements to the resilience of food supply chains are necessary.

Innovations in farming practices can help to promote practices which require less resources and can produce food in a more sustainable, climate resistant manner, enabling adequate food for all citizens. Such practices are vital especially when unforeseen disturbances occur which threaten the ability of the food supply chain to operate effectively. Changes to farming and food production methods such as more resilient crops will help to improve the availability of healthy food for consumers.

The global food system has been dramatically disrupted in recent years due to global pandemics and the war in Ukraine, highlighting the need for improved resilience. Such disruptions to food production and distribution have heightened food insecurity in many regions due to increased food prices. The impact of war and conflict and supply chain responses are key drivers impacting on the resilience of the food system. Minimising food insecurity during the next crises will require coordinated efforts across the entire food system.

5.2 Shaping Priority Areas

5.2.1 Survey results

A total of 562 individuals opened and launched the online questionnaire on *Lime Survey*, of which 179 completed the questionnaire (further details of survey participants are available in [appendix 2.3](#)). The figures below illustrate the key findings for each of the survey questions, more detailed graphs can be found in [appendix 2.3](#).

Barriers to a Fully Transparent, Resilient & Fair Food System

Survey participants were asked to determine to what extent they believed a range of factors were barriers to a fully transparent, resilient and fair food system. Figure 5 below shows the significance perceived for each of the barriers.

Policy and government appears to be the biggest barrier in the opinion of respondents. This was perceived as a very significant cause by over 50% of participants (additionally a significant cause by close to 30%). Climate & emerging risks, global food supply chains, food waste and war & conflict were all considered very significant barriers by at least 40% of participants. Complex supply chains, intensive, industrialised food production systems and lack of education & training were considered significant or very significant by at least 60% of participants. Additionally, malicious and opportunistic individuals and lack of trust were considered a very significant barrier by just over 30% of participants (additionally a significant barrier by over 20%).

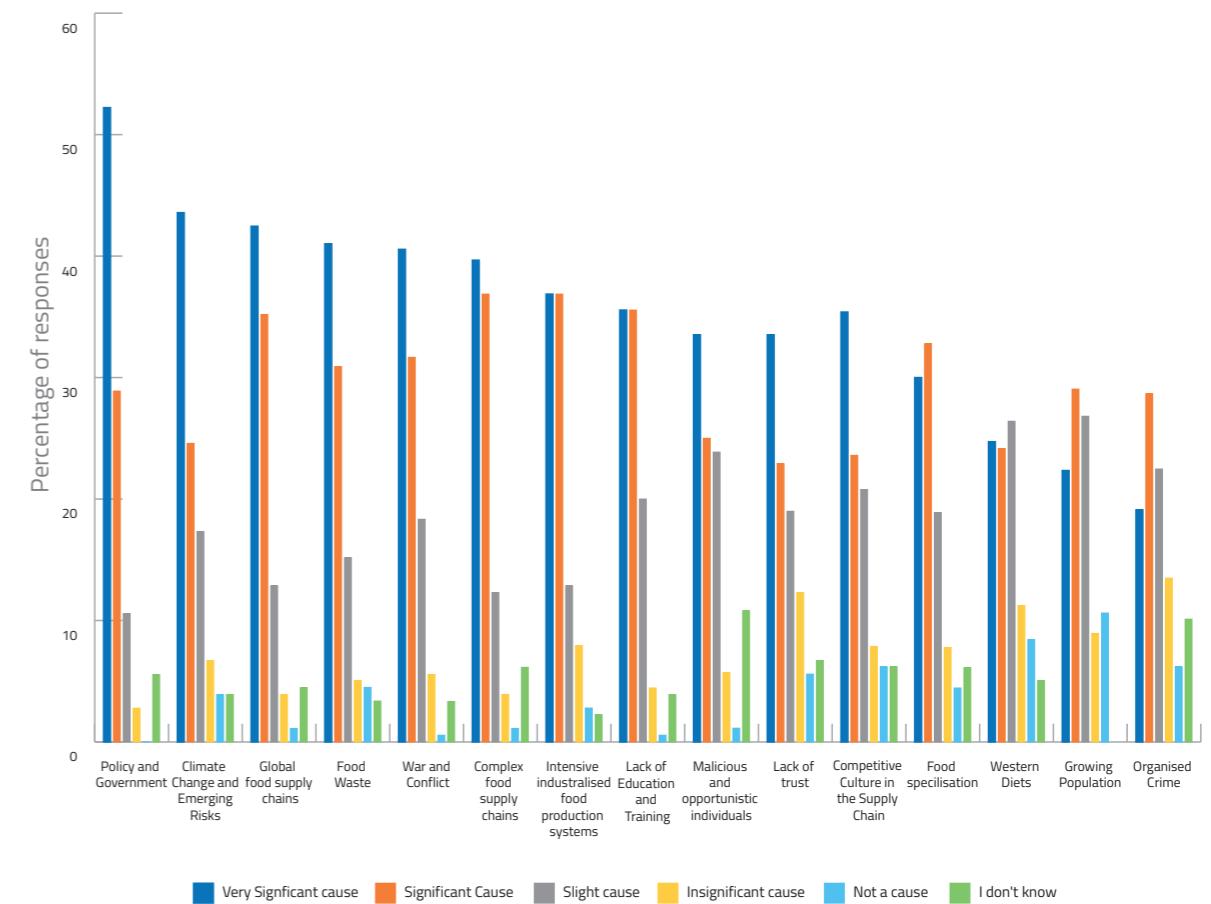


Figure 5: Barriers and Challenges to a Fully Transparent, Resilient and Fair Food System

Trends & drivers influencing a Fully Transparent, Resilient & Fair Food System

Figure 6 below outlines the top 10 immediate external trends and drivers identified by participants as impacting on a fully transparent, resilient and fair food system.

The top external trends and drivers with a short-term impact (2023–2025) on a fully transparent, resilient and fair food system were: war & conflict; rampant inflation; increases in expenditure for the food industry; and rampant inflation and increases in non-food expenditure for consumers (according to approximately 60% of respondents). Social media influencers were also considered to have a short-term impact by approximately 50% of respondents and the cost and availability of cheap fossil fuel energy was considered a short-term impact by just over 40%. Poverty, inequality & social security, work

stress & long working hours and labour and skills availability were all deemed external drivers with short term impact by just under 40% of respondents.

The top external trends and drivers with a medium-term impact (2025–2030) on a fully transparent, resilient and fair food system were: use of crops for energy or non-food materials (e.g. fibre, for textile); availability of new technologies; a movement towards locally sourced goods; environmentally conscious consumers; and digitalisation.

The top 5 external trends and drivers with a long-term impact (2030–2050) on a fully transparent, resilient and fair food system were: growing population; availability of natural resources; climate change; rapid urbanisation & growth of megacities and availability of raw materials.

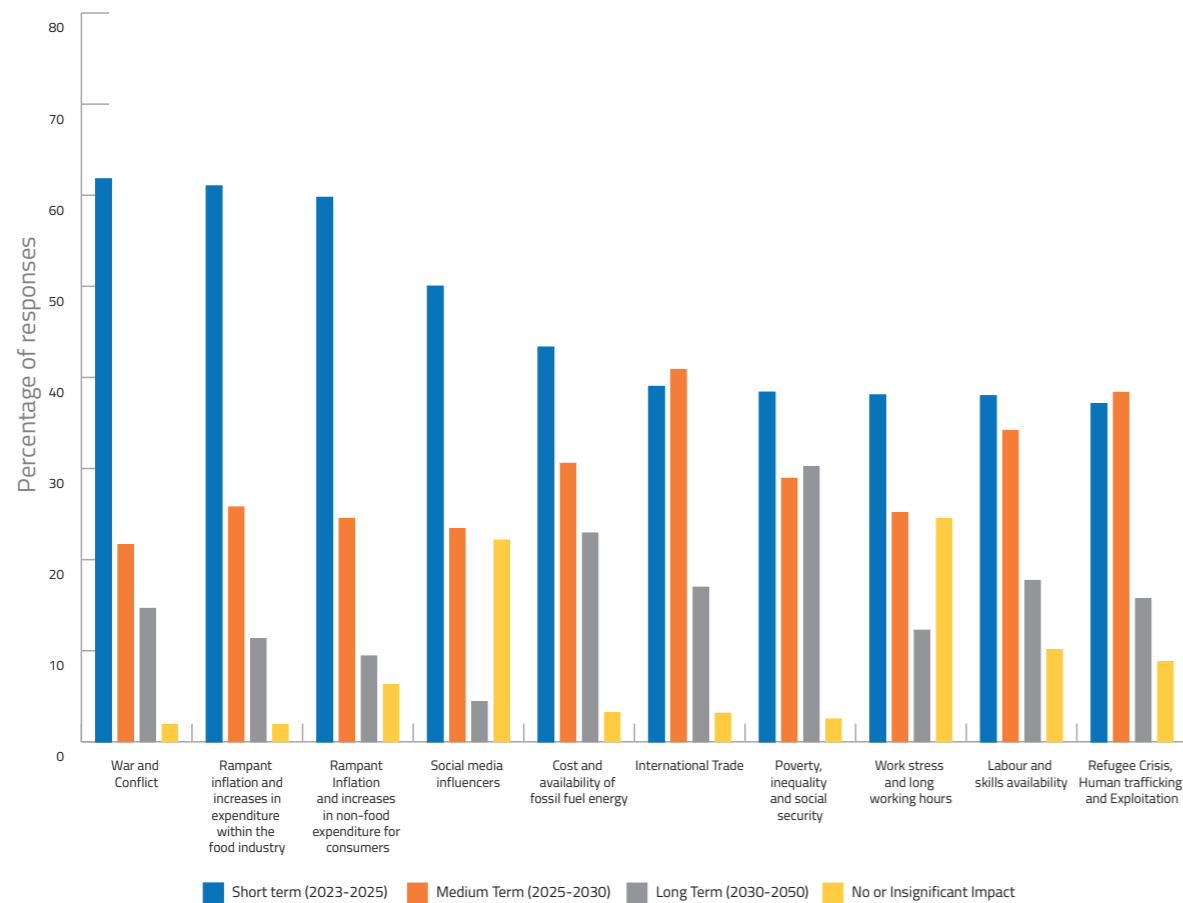


Figure 6: Top 10 immediate trends (2023–2025) influencing a fully transparent, resilient and fair food system

Market needs for a Fully Transparent, Resilient & Fair Food System

Market needs in the food system to facilitate a fully transparent, resilient and fair food system were ranked by participants. The top 10 urgent market needs for a fully transparent, resilient and fair food system were: food waste reduction (80%); fair food prices; assuring fair revenues to primary production sector; water management &

resource efficiency (~70% for each); sustainable farm management techniques; ensuring integrity of food supply chains; sustainable packaging; consumer education and improving wages and working conditions (~60% for each). Figure 7 below shows the top 20 market needs for a fully transparent, resilient and fair food system.

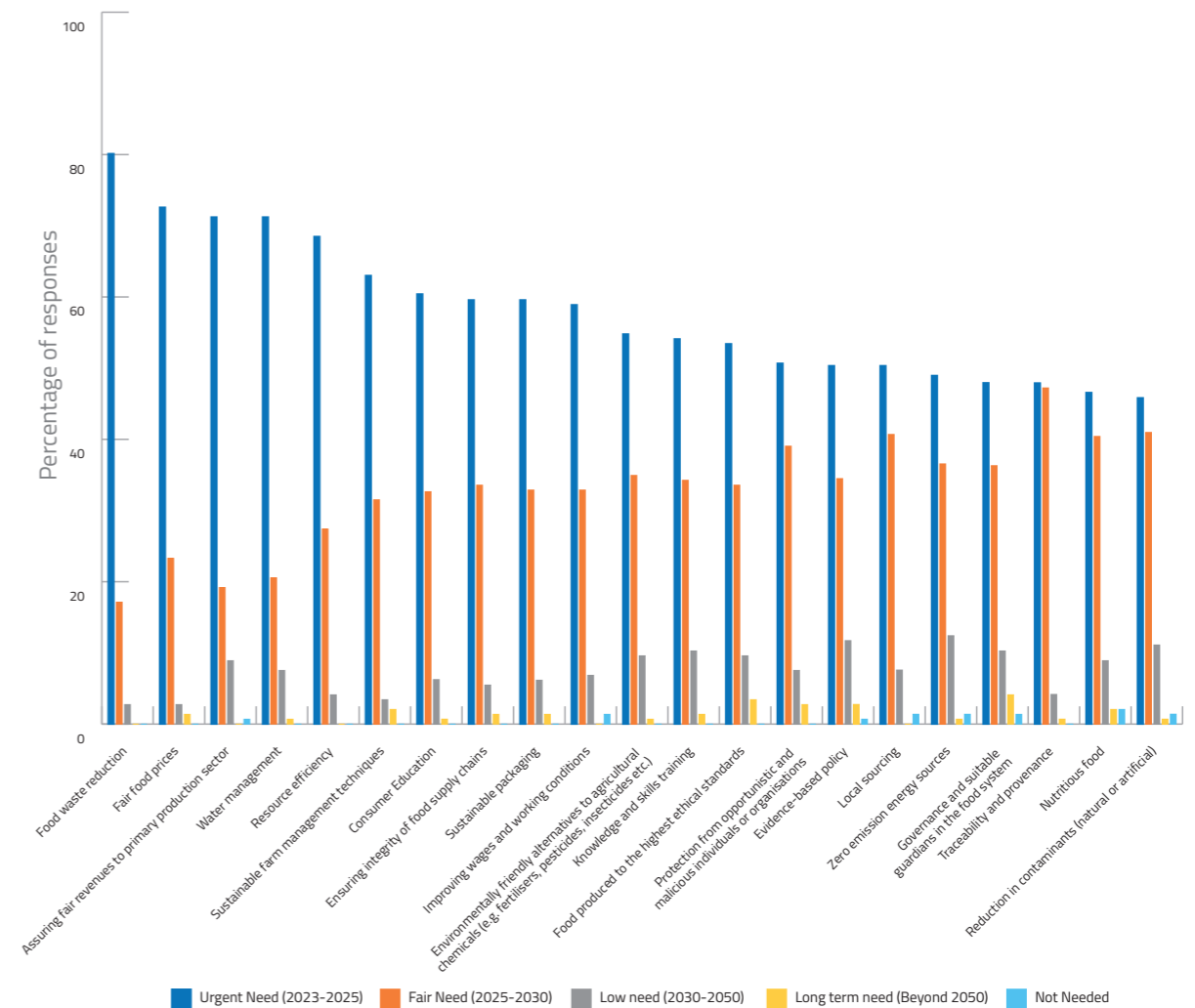


Figure 7: Top 20 market needs for a fully transparent resilient and fair food system

Value creation opportunities towards a Fully Transparent, Resilient and Fair Food System

Survey participants prioritised the opportunities required to deliver value for a fully transparent, resilient and fair food system. The top 10 most urgent (2023–2025) opportunities were: water management; waste management and circular economy; sustainable farm management; optimising local food supply chains (~70%

respondents); sustainable aquaculture production; improving animal welfare; evidence-based policy (~60% respondents); consumer behaviour and diets (50% respondents), reduction in contaminants (natural and artificial) and supply chain distribution and management (~45% respondents). Figure 8 shows the top 20 opportunities for a fully transparent, resilient and fair food system.

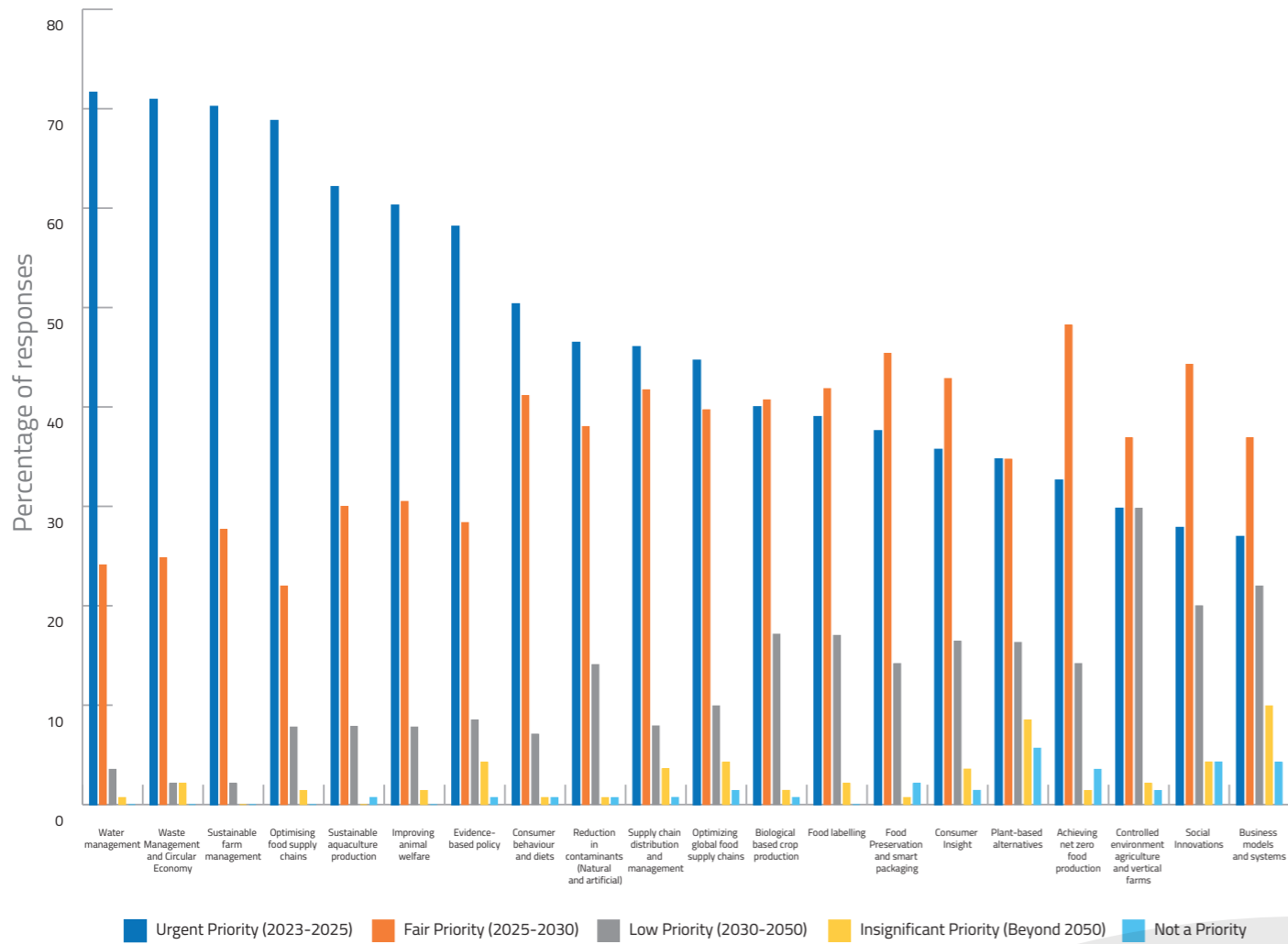


Figure 8: Top 20 Opportunities for a Fully Transparent, Resilient and Fair Food System

Enablers of a Fully Transparent, Resilient and Fair Food System

Survey participants identified the priority enablers needed to realise a pathway to a fully transparent, resilient and fair food system. At least 50% of respondents perceived each of the enablers to be of high priority, the enablers in order of priority are: policy and

legislation; knowledge and skills; resources and infrastructure; collaboration and partnerships; research and innovation (~70% respondents); public engagement and funding landscape (~55% respondents). Figure 9 outlines these enablers and to what extent participants felt they were a priority (i.e. high priority, fair priority, low priority).

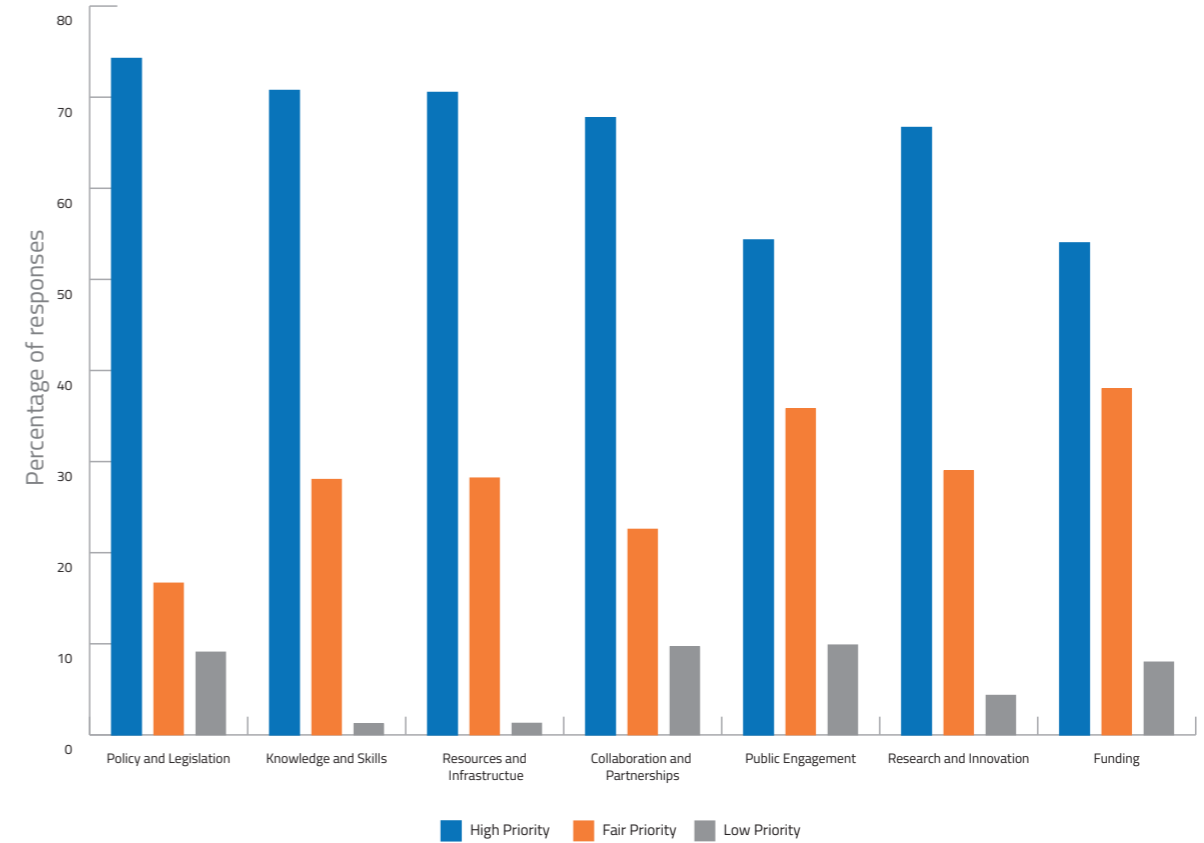


Figure 9: Enablers for A Fully Transparent, Resilient and Fair Food System

Summary of key survey insights

Survey findings highlighted the main barriers to a food system that is transparent (malicious and opportunistic individuals, lack of trust), resilient (war & conflict, climate change, global and complex food supply chains, growing population) and fair (food waste and emerging risks from climate change). The top trends and drivers having a short-term impact (2023–25) on the food system were war and conflict, rampant inflation and increases in expenditure for the food industry and non-food expenditure for consumers. Climate change, urbanisation, population growth and availability of natural resources and raw materials were viewed as the main drivers having a long-term impact (2030–2050) on the food system. Among the most urgent needs for a fully transparent, resilient and fair food system were: reduction in food waste, fair food prices and revenue for the primary production sector and water management and resource efficiency. Sustainable farm management techniques, ensuring integrity of food supply chains, sustainable packaging,

consumer education and improving wages and working conditions were also highly ranked by participants as urgent needs. The top value creation opportunities for a fully transparent, resilient and fair food system included water and waste management, sustainable farm management and aquaculture production and optimising local food supply. The enablers of a fully transparent, resilient and fair food system in order of priority were: policy and legislation; knowledge and skills; resources and infrastructure; collaboration and partnerships; research and innovation; public engagement and funding landscape.



5.2.2 Interview results

A total of 41 interviews were conducted with thought leaders and subject matter experts from various sectors and countries across Europe to explore their views on a fully transparent, resilient and fair food system and to shape the priority opportunities. Full interview data and demographic information on the interviewees can be found in [appendix 3.3](#).

The key external needs and drivers for a fully transparent, resilient and fair food system identified by the stakeholder interviews related to: climate change; war and conflict; social inequality; energy costs; population growth; capitalism; urbanisation and crisis situations and response (e.g. pandemics). Within the food system the identified market needs and drivers are: food distribution, formation of monopolies, overproduction and food waste; limitations on resources; consumer diets and lifestyles; and current farming practices. In terms of the key opportunities to a fully transparent, resilient and fair food system, interviewees focused on: promoting more sustainable consumption; improving food accessibility; utilisation of technology; improved self-sufficiency; support for primary producers; profit sharing along supply chain; improved traceability systems; stricter regulation and food fraud mitigation measures; changes to current agricultural practices; reducing food waste and improved

stakeholder collaboration. Interviewees suggested that to realise these opportunities, innovations and capabilities were required which included: technology; connectivity; climate smart agriculture; changes to food production practices (precision farming, diversified production); improved water resources; alternative energy sources; forecasting and prediction models for weather and agricultural practices; transparency for consumers; improved food distribution and use of waste resources. Political engagement, orientated change with strengthened partnerships within the food system, global thinking, the European Union, power of consumers, social media, startups and motivated individuals, upskilling of food system workforces and empowering and educating the next generation of food system actors were considered key enablers of achieving a fully transparent, resilient and fair food system by interviewees.



Key trends & drivers impacting a fully transparent, resilient and fair food system

The key trends and drivers impacting on a fully transparent, resilient and fair food system as reported by interview participants were:

Environmental: Climate change was one of the key recurring factors impacting on a fully transparent, resilient and fair food system by interviewees. It was acknowledged that the impact of climate change is already seen globally and is expected to increase in the coming years. It was also acknowledged that the climate crisis and food crisis are linked.

Economic: Capitalism and power of monopolies was referred to by interviewees as impacting on the food system, suggesting that sacrifices in other areas such as fairness or transparency are made to obtain maximum profit. A driver commonly referred to by interviewees was over production of food and food waste, with an emphasis on food companies producing to make a profit often resulting in surplus food going to waste, impacting on sustainability and fairness within the food system. Additionally, the issue of globalisation was commonly referred to, as reliance on global trade and imports from other regions means that if a crisis occurs and food supply is disrupted, resilience is impacted. Rising energy prices affects the food system as food production utilises a lot of energy and many companies are now struggling to cover their energy costs. It was acknowledged that it is important to identify better sustainable energy systems over the long term.

Political & legal: War and conflict were also regularly mentioned, particularly the impact of the war in Ukraine which resulted in crop shortages and food distribution issues. It was suggested that political instability in general affects the food system as it influences the distribution and production of food. The supply chain's ability to react to crisis situations with the example of the recent coronavirus pandemic was noted by many interviewees as impacting the food system highlighting the need for more stability within local supply chains.

Social & ethical: A further driver was the growing inequality among citizens, undermining many people's ability to afford a healthy diet. The ever-widening gap between the rich and the poor is influencing the fairness of the food system. Growth of urban areas and people being too disconnected from agriculture also emerged as a trend affecting a fully transparent, resilient and fair food system, as well as migration on a large scale. This suggests the need to support people to remain within their home regions to make a safe living from food production. Changes in consumer lifestyles and food demands was suggested as a trend towards a fully transparent, resilient and fair food system, with a growing demand from consumers to know the origin of their food products. Additionally related to consumers, it was reported that a lack of education and awareness of the food system is a barrier to employment uptake within the food system which is weakening supply chain resilience.

Technological: New technologies, digitalisation and digital tools are already available and if they are used in the proper way they can help to share and provide information along the whole chain and help to increase the transparency, resilience and fairness of the food system.



Key opportunities needed to achieve a fully transparent, resilient and fair food system

The key opportunities for a fully transparent, resilient and fair food system as reported by interview participants were:

Promoting more sustainability to citizens: the need to promote more sustainable citizens was a commonly suggested opportunity by interview participants. This included professional communication to the consumer promoting sustainable lifestyle practices such as reducing food waste and recycling, and good public relations to effectively communicate the need to act collectively to save the planet.

Improving food accessibility: Improved food accessibility was suggested as a key opportunity to overcome unfairness in the food system relating to food insecurity. Emphasis was placed on the need for a healthy diet to be affordable, especially for people on a low income and food assistance programmes.

Utilisation of technology: The use of technologies was commonly suggested by interviewees to link data along the supply chain, improve the supply chain's ability to react to changes and to ensure an efficient food supply.

Improved traceability systems: Supply chain data should be used to connect businesses and increase transparency of supply chains according to interview participants. It was acknowledged that addressing transparency is essential for stimulating consumer behaviours and increasing confidence.

Improved self-sufficiency: enabling self-sufficiency along supply chains and among consumers was recommended as an opportunity to improve food system resilience. Regulations to favour locally produced food – instead of imports – was a suggested example of how to achieve this. Additionally, promoting home growing of food by consumers was another suggested opportunity to improve self-sufficiency.

Changes to current agricultural practices & support for primary producers: Interviewees highlighted the importance of primary producers within the food system, and it was reported that they need to be strengthened to build the resilience of the food system. Small-scale farmers especially need to be supported and get value for their work in terms of higher incomes.

Profit sharing along the supply chain: Another opportunity for improved resilience within the food system was fair distribution of profits between supply chain actors. Profits within the food supply chain should be relative to the work performed by each actor so that each actor can make a good living.

Stricter regulation & mitigation measures for food fraud: Interviewees said there needs to be stricter regulations for the food sector to prevent food fraud, and harsher punishments should be applied to those who do not adhere to regulations. Mitigation measures to prevent food fraud were also highlighted as an opportunity to improve transparency and food integrity. Setting up collaborations to sample and measure risks, and data collection and analysis of food products and ingredients, were suggested to detect food fraud.

Reduction to food loss and food waste: A systematic approach to food loss and food waste was suggested by interviewees as an opportunity. Reviewing laws and policy on food loss and food waste to prevent safe food going to waste while many people suffer from food insecurity was highlighted as an important opportunity.

Improved stakeholder collaboration: Interviewees suggested that collaboration within the food system is needed to achieve a fully transparent, resilient and fair food system. Unification and communication between all actors involved in the food system from farm to fork is needed to work together and achieve changes within the system.

Key innovations and capabilities to help achieve a fully transparent, resilient and fair food system

The key innovations and capabilities for a fully transparent, resilient and fair food system as reported by interview participants were:

Connectivity, data, artificial intelligence, and machine learning: Data and digital technologies such as blockchain, artificial intelligence and machine learning approaches provide greater insight, increase efficiencies and improve transparency, food distribution and communication and engagement of consumers. Data and artificial intelligence can also help to measure individual needs of different populations and support fair food systems. Additionally, connectivity in rural areas to connect primary producers to Wi-Fi networks to use forecasting apps for example would be advantageous.

Sensing and monitoring: Sensors, forecasting and prediction models allow weather and environmental conditions to be monitored, which in turn supports farm management decisions. For example, this can help to determine the optimum areas to cultivate specific crops and raise livestock; determine the best time to plant for maximum efficiency and ensure effective application of fertilizers and other inputs.

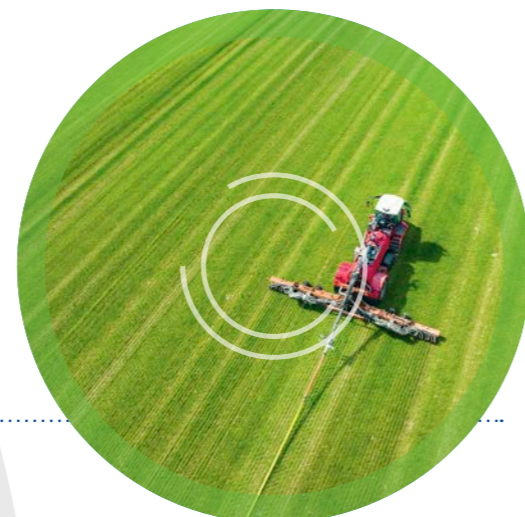
Sustainable farming practices and Agri-Technology: Resilient and sustainable farming practices which regenerate soils, boost productivity, reduce emissions and capture carbon are vital. Technology innovations and production processes to support this are important. For example, precision farming to reduce chemicals and improve soil quality, new ways of animal production to maximise efficiency of food production and diversification of production (e.g. different types of milk or crops), climate smart agriculture to reduce effects of climate change on food quality and safety, novel and resistant crops, new breeds and gene editing, technologies for clean, fresh water and water efficiency, alternative technologies for pesticides and alternative sources of energy (e.g. solar panels to enable farms to be self-sufficient with energy) were all

highlighted by interviewees. Using loss or waste resources for energy was another proposed capability. Many agricultural products may be reused for further production, for example, heat waste should be used by food companies.

Food Manufacturing: A number of important capabilities exist to support manufacturers in playing their role in achieving a transparent, resilient and fair food system. These included: scientifically robust life cycle assessment of their products, with consideration of nutritional performance; technology innovations to reduce food loss; alternative protein sources (e.g. lab grown meat); fast portable analytical methods which can accelerate and improve transparency and fairness; technologies for long term storage and preservation of food; technology innovations for transparency; alternative energy sources (e.g. hydrogen); and energy saving technologies for food processing.

Supply chain & logistics: Improve fairness within the supply chain, reliably track money along the chain to ensure fair distribution of profits and increase the value of food. Improve food distribution, apply better logistics in the primary sector and promote more local storage capacities to minimise transportation.

Consumer behaviours: Improve transparency for consumers by measuring real transport distances and label carbon footprint on products, use of QR codes on food products for consumers to receive detailed information about the components and origin of products. Education of consumers to promote healthier lifestyles and food choices to increase quality of nutrition and health status.



Key enablers and resources to help achieve a fully transparent, resilient and fair food system

The key enablers and resources to achieve a fully transparent, resilient and fair food system as reported by interview participants were:

Policy & Governance: Political engagement was considered a key enabler, it was suggested that political interest must be raised, and political actors need to listen to citizens and the industry. Change must be orientated, the reliance on food assistance needs to be addressed, individuals in economic difficulty need to be supported so that food assistance is only for emergency situations. Strong and evidence-based regulations, governance and enforcement are a key enabler towards reducing risks towards a fair and resilient food system. This includes clarity and transparency in terms of what institutions and departments are responsible for what in relation to our food system.

Collaborations & Partnerships: Boosting associations between stakeholders within the food system was considered vital. To drive cross learning within the system, collaboration between both food and non-food companies is needed. Those who actively work in the field must be supported to make the necessary changes. International collaboration can promote preventative thinking on a global scale to provide long term solutions within various sectors of the food system.

Public engagement: Consumers are considered to have the power to change the food system. However, it is believed that they do not know this and that there is a need to educate consumers on the implications of transparency, resilience and fairness within the food system, and provide credible declarations for food products which they can trust. Social media platforms are suggested to reach the younger generations, to improve consumer understanding of the processes within the food system.

Business creation: The flexibility of startups is considered an enabler as they can try out new technologies or ideas which can be implemented on a larger scale if successful. Startups and motivated individuals should be sought out to make the necessary changes in the food system.

Education & up-skilling: up-skilling of food system workforces and empowering and educating the next generation of food system actors were also considered key enablers for achieving a fully transparent, resilient and fair food system.



Overview of activity to achieve A Fully Transparent, Resilient and Fair Food System

The opportunities, resources and enablers to help achieve a fully transparent and resilient food system have been summarised in figure 10 below. These activities fell under 9 different categories: Policy and strategies; Research; Innovation; Sustainable farming practices; Food packaging and labelling; Food waste and circular economy; Measuring, verifying and reporting; Supply chain traceability; and educating, lobbying and advocacy.

Literature review, survey and interview findings were combined to create an extensive list of trends and drivers, market needs, opportunities, capabilities and enablers relating to a fully transparent, resilient and fair food system. This information was used to form the basis of the roadmapping template for the stakeholder workshop. The stakeholder workshop then further prioritised and validated the roadmap content to identify the key steps necessary to achieve a fully transparent, resilient and fair food system.

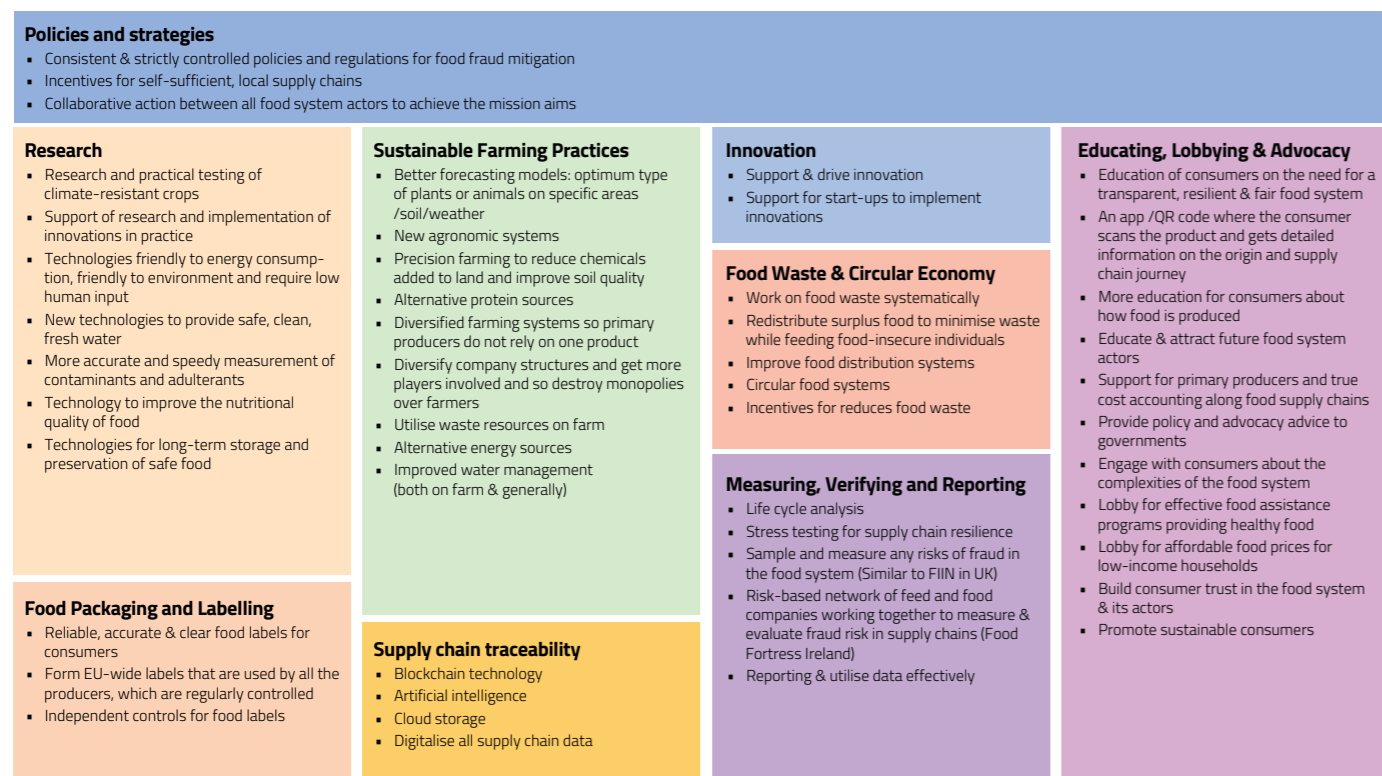


Figure 10: Overview of activity to help achieve a fully transparent, and fair food system

5.3 Roadmapping Priority Areas

5.3.1 Roadmap Workshop Summary

The final phase involved roadmapping the priority areas during a 2-day intensive workshop with 35 participants selected from a broad range of stakeholder groups to provide diverse perspectives to the workshop processes, including: industry, research, government and non-governmental organisations and funders and investors.

As a reminder, Phase 1: Scoping Priority Opportunities involved desk-based research, and Phase 2: Shaping Priority Opportunities involved the survey, interviews and engagement with thought leaders and subject matter experts. Findings from phases 1 and 2 were used to develop a preliminary vision and draft roadmap landscape for a Roadmap to A Fully Transparent, Resilient and Fair Food System. During the workshop, through a process of prioritisation and clustering, the participants prioritised: 15 macro-level trends and drivers; 10 market drivers and needs; and 7 opportunities. In assigned groups, delegates then developed detailed topic roadmaps on the 7 priority opportunities.

5.3.2 Vision for a fully Transparent, Resilient & Fair Food System

The workshop participants discussed and voted on the vision for a fully transparent, resilient and fair food system. Good stakeholder alignment was observed across identified priorities, with particularly strong stakeholder alignment on accessible, affordable, and equitable aspects of the food system. The resulting vision which emerged from the workshop discussion consisted of 5 key priority elements for a fully transparent, resilient and fair food system. In order of priority, they were:

1. Accessible, affordable, and equitable
2. Sustainable, diverse, and local
3. Traceable from farm to fork
4. Safety, quality and authentic
5. Feeds dietary needs of everyone.



5.3.3 Prioritisation of trends & drivers, market needs & opportunities

The combined literature review, survey and interview findings identified a consolidated list of 31 macro-level trends and drivers, 49 market-level drivers and needs and 51 opportunities for a fully transparent, resilient and fair food system. These were discussed and voted for by stakeholders during the workshop to create a prioritised list of trends and drivers, market needs and opportunities. This resulted in 15 priority trends and drivers, 10 priority market needs, and 7 priority opportunities being determined. (Further detail on voting can be found in [appendix 4.5](#)).

The macro-level trends and drivers and market-level drivers and needs which emerged from phases 1 and 2 were reviewed by the workshop participants. A voting exercise during the workshop prioritised the key factors facing the food industry, with a cut-off of 4 votes used to short-list the higher priority factors. The priority macro-level trends and drivers which emerged, in order of importance were: climate change and its emerging risks on the food supply system; poverty, inequality and social security which threatens access to food and therefore food insecurity; and scarcity of natural resources and land degradation and unfair access to resources across the globe.

The priority market drivers and needs which are influencing a fully transparent, resilient and fair food system in order of priority, as voted by the workshop participants were:

- Intensive, industrialised and unsustainable farming practices to feed the global population and for increased profits
- The impact of climate change on productivity and crop yields in regions which are required to produce more food in the future
- Food specialisation due to a reliance on a small number of plant and animal species to supply most of the world's food
- Sustainable and resource-efficient farming practices
- Inequality and power imbalance within the food system.

Phase 1 and 2 generated a consolidated/clustered list of 51 opportunities for Mission 3 (see [appendix 4.2](#) for full list of consolidated opportunities). In addition to this list, further opportunities were identified by the workshop participants. Workshop participants took part in clustering of opportunities on the wall chart to group overlapping topics, and then used 'dot voting' to select priority opportunities to align with the agreed vision and address the priority trend and drivers. Participants firstly evaluated the impact of the opportunities, voting for the opportunities most likely to deliver a positive impact and change towards a fully transparent, resilient and fair food system. Secondly, after voting on impact, a short-list of opportunities was developed, and participants then voted on feasibility of implementation of the opportunities and indicated their interest in the topic for deeper exploration on day 2 of the workshop. Based on the impact, feasibility, and level of interest in the topic a list of 23 topics was developed (Figure 11).

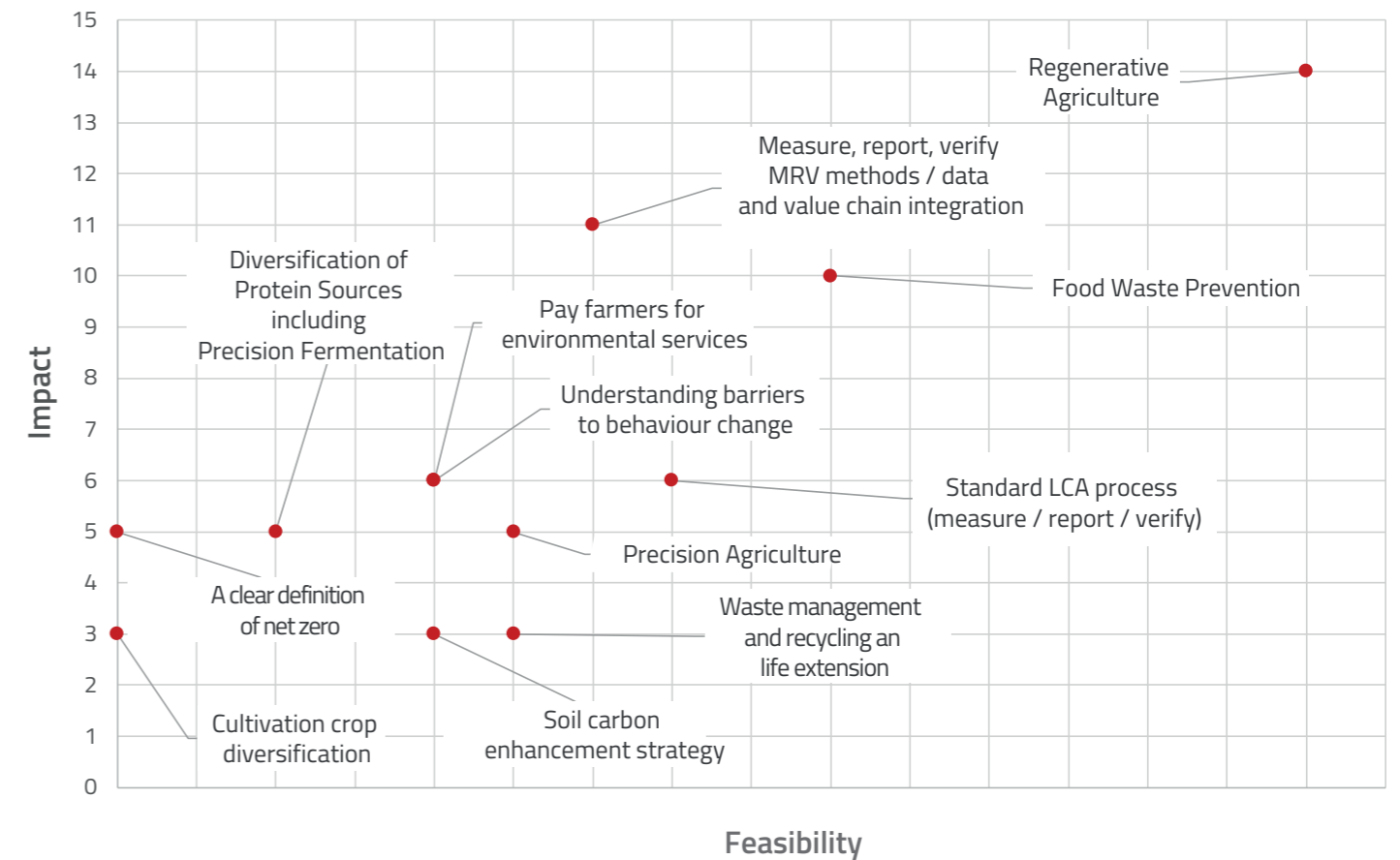


Figure 11: Impact-feasibility matrix

A final review and clustering of similar opportunities was conducted by the core project team to establish and agree 7 distinct priority opportunities for a fully transparent, resilient and fair food system. These were:

- Resilient and sustainable farming practices
- App for consumer transparency and digital connection
- Labelling and communications for consumers
- Urban integration of food
- Sustainable packaging and extended producer responsibility incl. true cost accounting
- Radical transformation of food system and new retail models
- Food donation system and food insecurity framework

Finally, the delegates were assigned to groups for the next step of the workshop – developing detailed topic roadmaps. During this final stage, the seven priority impact pathways were explored to determine the opportunities where EIT Food can have a significant and distinctive impact in the next 3–5 years.

The following section describes each opportunity in further detail, provides a summary of the opportunity, the potential implication for the overall Mission and the potential role of EIT Food for each opportunity, as defined by the workshop participants.

5.3.4 Priority Opportunity: Resilient and Sustainable Farming Practices

Overview of opportunity: The discussion focused on the opportunity to adopt resilient and sustainable farming practices for food production in Europe. It was noted that the problem is not only farming procedures but also individuals and the amount they collectively consume, therefore a system perspective rather than an individual perspective is needed. Emphasis was placed on the need for collaborative action along the supply chain. Farmers are big players in resilient and sustainable farming practices; however, they are guided by policy. It is suggested that farmers need to be included in the policy process. Science must be connected to policy and practices along the supply chain, with more interactive engagement with farmers and other stakeholders relating to more resilient and sustainable practices and how to achieve them. The need to connect urban consumers with rural communities and producers was also acknowledged by this group, suggesting that consideration must be given to the process of educating the next generation of farmers.

Implications for overall Mission: This opportunity addresses a range of trends and drivers influencing the overall Mission of Reducing Risk for a Resilient and Fair Food System. Specifically, more resilient and adaptive farming practices will help to combat the growing challenge faced by food production as a result of climate change. Climate-resilient farming practices may help overcome the risk climate change poses for food safety, which is a key priority area EIT Food should focus on to ensure everyone has access to food but equally that the food is safe to eat. More resource-efficient and sustainable farming will reduce pressure on the land and nature and will result in better grown food which will nourish better. Building resilient and sustainable farms will help to feed growing populations and may help to overcome poverty and social inequalities, one of the causes of food insecurity which EIT food should focus on.

Potential impact factors for EIT Food to consider:

- Soil health, biodiversity, water management based on hydrological context
- Use water more effectively and reduce reliance on irrigation
- 100% recycled water on farms

Potential role of EIT Food:

Education: EIT Food could play a key role in educating all supply chain actors on the importance of sustainable and resilient practices, provide practical education and training for farmers and facilitate youth connection and education to promote interest in and uptake of farming jobs. Additionally, EIT Food could enable knowledge sharing and capacity building within local networks.

Public engagement: EIT Food can play a role in engaging with consumers to connect rural and urban consumers to farming.

Leadership: EIT Food could play a leadership role to improve access for SMEs, support industry front runner demonstrations, facilitate an integrated approach to regulation and planning, and assist with sharing best practices with emerging countries beyond Europe, before they implement intensive practices.

Collaboration & partnerships: EIT Food can facilitate multi-stakeholder initiatives and collaborations across the food supply chain.

Funding: EIT Food could provide funding support for Living Labs and sustainable practice demonstrations for farmers.

Advocacy: There is a potential for EIT Food to undertake science-based advocacy from a systemic perspective. EIT's insights and understanding of what comes out of these programmes could provide important insights to policymakers.

Priority Area	Successful Outcomes	Impact	Roadmap Milestones to A Fully Transparent, Resilient & Fair Food System				
			2023	2025	2030	2050	
Resilient and Sustainable Farming Practices	Reduce nutrient losses by at least 50% , while ensuring no deterioration in soil fertility	Contribute to UN SDG 2 , contributing to the goal of ending hunger, achieving food security and improved nutrition and promoting sustainable agriculture	LEADERSHIP				
	Reduce fertiliser use by at least 20% by 2030		Improve access for SMEs within EIT Food	Industry-supported front runner demonstrations	Integrated approach to regulation & planning	Beyond Europe: share best practices with emerging countries before they implement intensive practices	
	Reduce by 50% the use and risk of chemical pesticides by 2030	Protect the environment and preserve biodiversity, in line with EU Green Deal	EDUCATION				
	Reduce by 50% the use of more hazardous pesticides by 2030	Make sure Europeans get healthy, affordable and sustainable food, in line with EU Green Deal	Educate all sectors of supply chain	Facilitate youth connection and education to promote uptake of farming jobs	Practice orientated training for farmers	Knowledge sharing and capacity building within and between local networks (hubs)	
	By 2030, widespread implementation of agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change		PUBLIC ENGAGEMENT				
		Connect rural and urban consumers to farming	COLLABORATION & PARTNERSHIP				
		Facilitate multi-stakeholder initiatives and collaboration across food supply chain	FUNDING				
			Fund & support Living Labs & sustainable demos	ADVOCACY			
				Science based advocacy from a systemic perspective			

Figure 12: Summary of resilient and sustainable farming practices opportunity



5.3.5 Priority Opportunity: App for Consumer Transparency & Digital Connection

Overview of opportunity: This opportunity focused on the proposal of an app that provides consumers with information about their food. A platform like TripAdvisor which would integrate different information related to food products such as nutritional content, environmental impact and, in the long run, the actual cost of food, with feedback loops. It was advised that this opportunity should not be solely aimed at changing consumer behaviour, but also include an aspect of changing the food system as such. Consumers should be enabled to find comprehensive information about food products/services and rate them to put pressure on policymakers and industry to change their practices and provide the products consumers want. The main problem associated with this opportunity was data availability and how to transform such data into a usable, user-friendly and regularly updatable format. Appropriate technologies for such platforms and applications already exist, but co-creation with the consumer is a crucial element. The regulatory, legal, security and government requirements are a big barrier to use and integration of the data. Therefore, a change in the regulatory framework and legislation related to data is an important factor in getting companies to open up and share their information. The likelihood of adoption across the value chain varies among stakeholders: while consumers are likely to embrace the initiative, retailers and brands would probably prefer to keep their data. There are many retail apps, but this idea is to unify all information for the consumer to simplify their life. A consumer does not want to have many apps, but just one solution will help them in every country.

Implications for overall Mission: this opportunity proposes a circular platform and app used by 30% of EU consumers daily, run by an independent organisation, which aims to change behaviour of both consumers and food supply chains. Such an app could massively improve the transparency of supply chains and help build consumer trust and public understanding of the food system which is a priority of EIT food as part of this Mission. If the barrier of data sharing can be overcome, the value of this opportunity is great. The element of consumer pressure which may come from such a platform in terms of increasing demands for more sustainable food products could also be advantageous for food system changes. This could result in a greater shift to more sustainable, resource-efficient practices, extending depleting natural resources and addressing pollution, all of which are threatening food security and safety and are of great importance for EIT Food in addressing this Mission.



Key impact factors for EIT Food to consider:

- More sustainable food choices
- More sustainable food supply

Potential role of EIT Food:

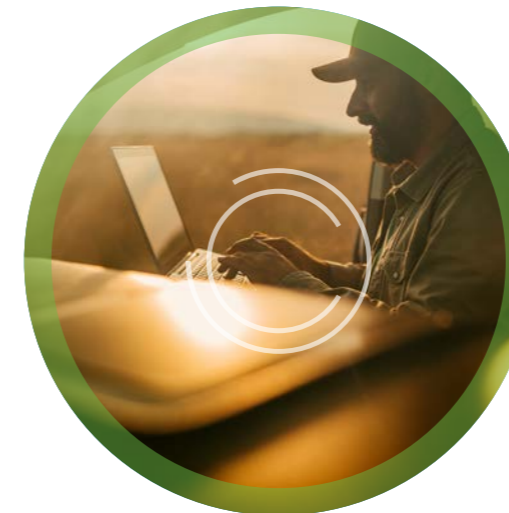
Innovation: EIT Food to enable innovation in database creation, platform and app development, set up and testing. Additionally, EIT Food could facilitate gap analysis and integration of existing data.

Leadership: EIT Food could develop “app ambassadors” to influence consumers to utilise this platform and app and additionally in time could be involved in facilitating geographical extension of the app for adoption globally. Emphasis on social enterprise when selecting start-ups to enrol to EIT Food programmes should be considered.

Business creation: EIT Food could call for start-up support for platform and app development. Emphasis on social enterprise when selecting start-ups to enrol to EIT Food programmes should be considered.

Collaboration & Partnerships: EIT Food can form collaborations with an independent organisation to create a quality stamp and standards for the app and in time collaborate with restaurants to expand product database to restaurant meals.

Funding: EIT Food could help fund the development, promotion and launch of the app.



Priority Area	Successful Outcomes	Impact	Roadmap Milestones to Reducing Risk for a Fair & Resilient Food System			
			2023	2025	2030	2050
App for Consumer Transparency & Digital Connection	Circular platform and app with 30% of consumers using daily	Improve supply chain transparency	LEADERSHIP Development of “App ambassadors” (2023-2025) Facilitate geographical extension/global expansion (2030-2050)			
	Consumer use of technology to change food choices and diet	Contribute to EIT Food goal of introducing 10 new digital solutions to improve supply chain efficiency, integrity and/or transparency by 2021 (20 by 2027)	INNOVATION Database creation, platform & app development, set up and testing (2023-2025) Gap analysis & integration of existing data (2023-2025)			
	Behaviour change for both consumer and suppliers	Contribute to EIT Food goal of 4000 consumers using technology, products or guidance by 2027	PUBLIC ENGAGEMENT Networking & promotion of app (2023-2025) Start-up support for platform & app development (2023-2025)			
	Running by independent organisation	Build consumer trust and public understanding of the food system	BUSINESS CREATION Collaboration with independent organisation to create quality stamp & standards for app (2023-2025) Collaboration with restaurants to expand product database (2030-2050)			
			COLLABORATION & PARTNERSHIP			
			FUNDING Assist with funding of development, promotion and launch (2023-2025)			

Figure 13: Summary of app for consumer transparency & digital connection opportunity

5.3.6 Priority Opportunity: Labelling and communications for consumers

Overview of opportunity: This opportunity aims to address the reliability of the information that underpins the labelling communication received by end consumers. It identified that currently, there are no uniform standards, much confusion and, as a result, a continuing lack of consumer confidence in existing labels. It leads essentially to low trust in the quality of the information provided. Also, it is not just about the data, but about the information, i.e. the data and the purposes for which that data is provided. It was suggested that there is the potential for a sector-wide initiative that would be more meaningful than focusing on individual labels, questioning if there was a way to bring together a consortium to describe what a gold standard for labelling might look like. This standard will contribute to what characteristics a “reliable, high quality” label should have. The introduction of the new labels will lead to the disappearance of low-quality labels from the system. This opportunity is also about building networks and bringing people together, engaging with consumers, piloting and testing with the aim of providing the best consumer communication and coming out on top, while low-quality consumer information slowly disappears. This could happen over the course of five to 10 years.

Implications for overall Mission: This opportunity proposes food labels that follow a consistent and independent standard, to allow consumers to make clear choices. This opportunity could feed directly into EIT Food’s priority of building consumer trust and public understanding of the food system. Receiving information on packaging that is consistent and clear will empower consumers to make informed choices. The additional element of a “gold standard” for labels has the potential to improve consumer confidence in the food system as supply chains will be required to increase their transparency which could in turn promote greater food integrity – another priority area for EIT Food within this Mission.

Key impact factors for EIT Food to consider:

- Reduction in number of labels in use
- Increase in number of food companies committing to a labelling standard

Potential role of EIT Food:

Innovation: EIT Food could scope available data to assess and compare current legal standards for food labels. To compare current food labelling standards and capture best practices.

Education: EIT Food could develop facilitated programmes of consultations and workshops for food businesses for adherence to labelling standards and educate consumers on new standards and interpretation of food labels.

Public engagement: EIT Food could carry out consumer engagement, advocacy and trust testing in relation to the new labelling standards. Additionally, through the creation of a consumer observatory EIT Food can assess the consumer response to labelling and the effect on their decision making.

Leadership: EIT Food could assist with the launch of draft labelling standards and widespread implementation once final standards have been agreed.

Funding: EIT Food could provide funding for research and development and information gathering for database use.

Advocacy & policy: EIT Food can engage with policymakers and advocate for mandatory implementation of new labelling standards.

Collaborations & partnerships: EIT Food could form a coalition of industry experts to agree labelling standards, develop action plan for implementation and co-develop long term financial and operational models.

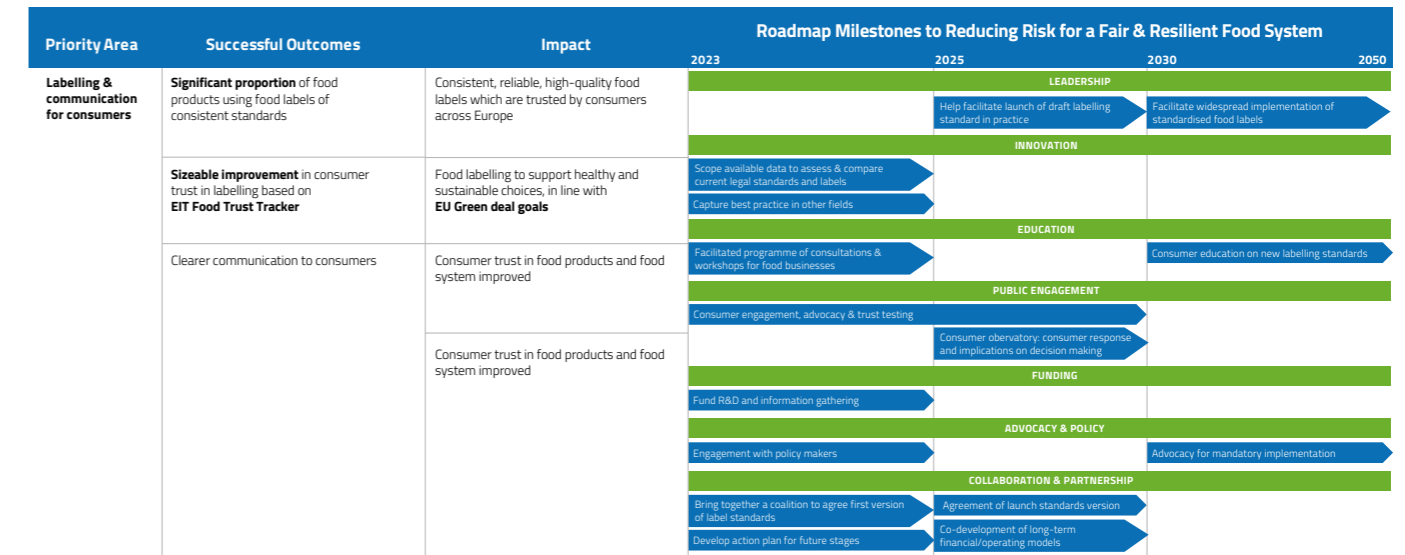
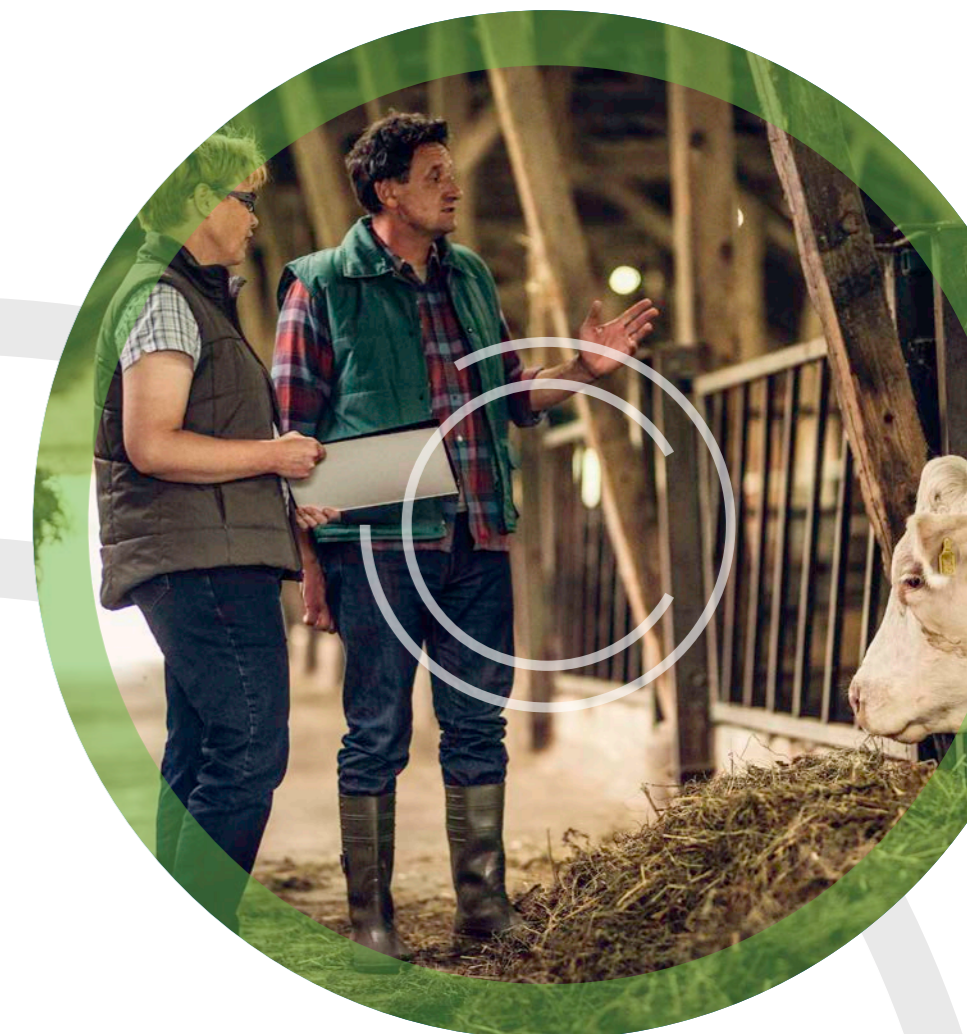


Figure 14: Summary of Labelling and Communication for Consumers Opportunity



5.3.7 Priority Opportunity: Urban integration of food

Overview of opportunity: To overcome the unsustainable supply of food to cities, this opportunity proposes urban integration of food. It means creating local food chains in the context of local supply logistics where there are cooperative grocery shops that distribute the food. An area where 20% of the population is involved in some form of food growing, production and distribution and where a significant number of people are eating healthier. City councils would be heavily involved in governance and have a comprehensive plan on how to feed the population and create jobs and all kinds of wealth for the population through food. The need for citizen education is high and there is also a need for links with farmers, to improve their practices and for the creation of new farms. A connection between councillors, policymakers and local government and farmers, who form cooperatives, needs to be organised. It in turn can help develop biodiversity of production, local processing and local logistics. The current focus is on setting up businesses to support these farmers, but they need to be funded, through a mix of private, public and philanthropic sources. It is difficult to change an established system. The big food retailers can be expected to resist this, so political will is also needed. A key enabler of this opportunity is the creation of geo-maps of existing networks of linkages between consumers and producers in cities including capturing information on the roles urban agriculture plays in the urban environment. The effect of such mapping is highly relevant to supporting linkages between different sectors. Moreover, the creation of a food council, which is a strategic partner for the implementation of policy activities, is important.

Implications for overall Mission: This opportunity proposes more resilient urban food systems, where the food belts around cities are restored with smallholder farmers cultivating a diverse food supply. Within this opportunity awareness of food is a focal point from a young age, food is taught at school and children visit local farms. Such early education of the food system can help with EIT Food’s aim

of improving public understanding of the food system. The opportunity proposes a system in which less than 50% of food produced within a territory is exported and more than 50% of food consumed within a territory is organic, local and unprocessed. The development of such urban food policy enables efficient distribution of food, can measurably improve population health, reduce food waste, and ultimately improves food security in urban areas where populations are more at risk of food insecurity. This opportunity would promote agro-ecological agricultural methods and aim to reduce the carbon footprint within territories, which in turn would help combat the negative effects of climate change on food quality and safety. This opportunity is linked to EIT Food’s Mission 1 “Healthier Lives Through Food”, due to the promotion of healthy food production, and to Mission 2 “A Net Zero Food System” by building a more energy efficient food system with a reduced carbon footprint.

Key impact factors for EIT Food to consider:

- Improving urban governance.
- Multi stakeholder: Politics, citizen farmers, small business associations = inclusive and fair.
- Healthier citizens.

Potential role of EIT Food:

Leadership: EIT Food can stimulate networking events for interaction between stakeholders, be involved in step-by-step strategy assessment and adjustment, and contribute to the strategic implementation of circular economies for food.

Innovation: Innovations are needed to obtain data on current urban integration activities, for instance EIT Food could undertake geo-mapping of food in urban environments. Additionally, the development of biodiverse production, local transformation, proximity logistics and community growers are areas for potential innovation.

Education: EIT Food can provide education for city councils, citizens, schools and supply chain actors. Additionally, EIT Food can ensure that farmers are well connected and understand this transition to urban integration by developing education on farming, agriculture and agroecology.

Public engagement: create a web of consumers engaged in associations for transition to urban integration, organise public engagement events within cities and on farm community events to engage the public in the urban integration of food.

Funding: EIT Food could provide funding for universities to lead in the proposed geo-mapping of food in urban areas.

Business creation: EIT Food can provide business creation and entrepreneurship support for farmers making the transition to urban/local food production supply chains.

Advocacy: EIT Food can advocate to increase political interest and commitment to the need for urban integration of food.

Collaboration & Partnerships: EIT Food can help create local associations between cities, collaborate with professional changemaking organisations (e.g. NGOs) to structure projects on Living Labs, collaborate with tech companies to create community enabling technologies, the formation of co-operatives for farmers, production and distribution actors and support city councils adopting agendas and joining food councils.

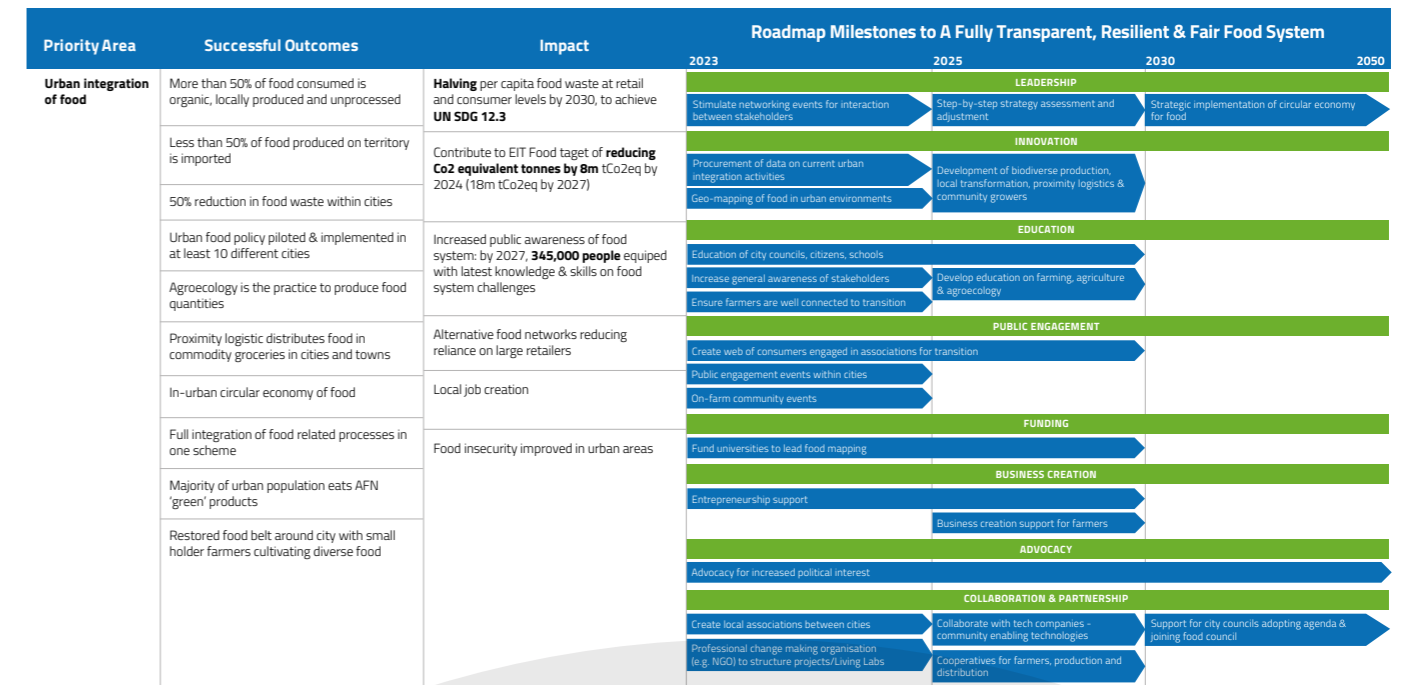


Figure 15: Summary of urban integration of food opportunity

5.3.8 Priority Opportunities: Extended producer responsibility, true cost accounting and sustainable packaging

Overview of opportunity: This opportunity combined aspects of the extended producer responsibility (EPR) and true cost accounting (TCA) with sustainable packaging as an example. By having access to the right data, partners can build a basis to address this topic in the value chain. TCA has a potential to benefit all aspects of sustainability. It is also closely linked to food accessibility and the food donation to people who are in need. Reference was made to the model in the Netherlands, which could then be used in a wider community in Europe where retailers display two prices: the price paid by the end consumer and the true price consumers would have to pay if the total costs associated with the product were considered. The sustainable product, whose price is based on the true costs, is more expensive than the unsustainable option. But consumption of the latter has negative consequences for society and the environment; and in the end the government pays for these consequences. Government and policymakers would be required to mediate on this issue of price, sustainability and health impact of food. One solution could be a tax that subsidises healthy food – making it more affordable. Such transition needs to be financed. Companies that currently make the biggest profits because they do not include the costs of externalities in the pricing of their products must also be involved. These funds can be used to help farmers transition to more sustainable practices for growing healthier food. In the discussion on true costs, the approach should help the sector to understand all consequences, positive and negative. If you reduce externalities, actors within the supply chain are safer, equity is improved and, finally, companies can improve their business models.

Implications for overall Mission: This opportunity proposes that food companies must account for non-sustainable practices (in particular, extraction) with taxation and incentive schemes, as enablers. This opportunity involved a life cycle analysis system that works fast. This

opportunity emphasises the environmental impact of products and can promote more resource-efficient food production: helping to build the resilience and fairness of the food system. The Life Cycle Analysis aspect of this opportunity has synergies with Mission 2 “A Net Zero Food System”.

Key impact factors for EIT to consider:

- Land & environmental measures.

Potential role of EIT Food:

Leadership: EIT Food can lead the way and achieve a leadership position in raising awareness of the accounting base processes within the transition to a fully transparent, resilient, and fair food system. It can support local initiatives, oversee governance for data sharing, promote ambassador companies within EIT Food and facilitate the roll out into new countries following successful local launches.

Innovation: this opportunity requires an agreed definition for EPR and to link this to data sharing, detailed mapping of all supply chain open data sources. An open and accurate database is needed for LCA and its automation. Additional innovation will involve the integration of IT systems, tested and evaluated within the supply chain, and new sensors along the supply chain. EIT Food can also facilitate the agreement of new accounting models globally and assist with monitoring reviewing and adjusting as necessary.

Public engagement: EIT Food can oversee public engagement initiatives to improve awareness of EPR and TCA, to convey what this means for consumers and the food system as a whole.

Collaboration & Partnership: EIT Food can facilitate collaboration with tech experts for big data management and formulate a work partnership with B CORP.

Education: EIT Food can provide education for all supply chain actors to enable adherence and implementation.

Business creation: EIT Food can release challenge-based calls for startups to assist with the development and implementation of this opportunity.

Advocacy & policy: EIT Food can advocate with the EU Commission, promote the adoption of a TCA model into policy, promote extended producer responsibility as a compulsory element of food production and advocate with the World Economic Forum.

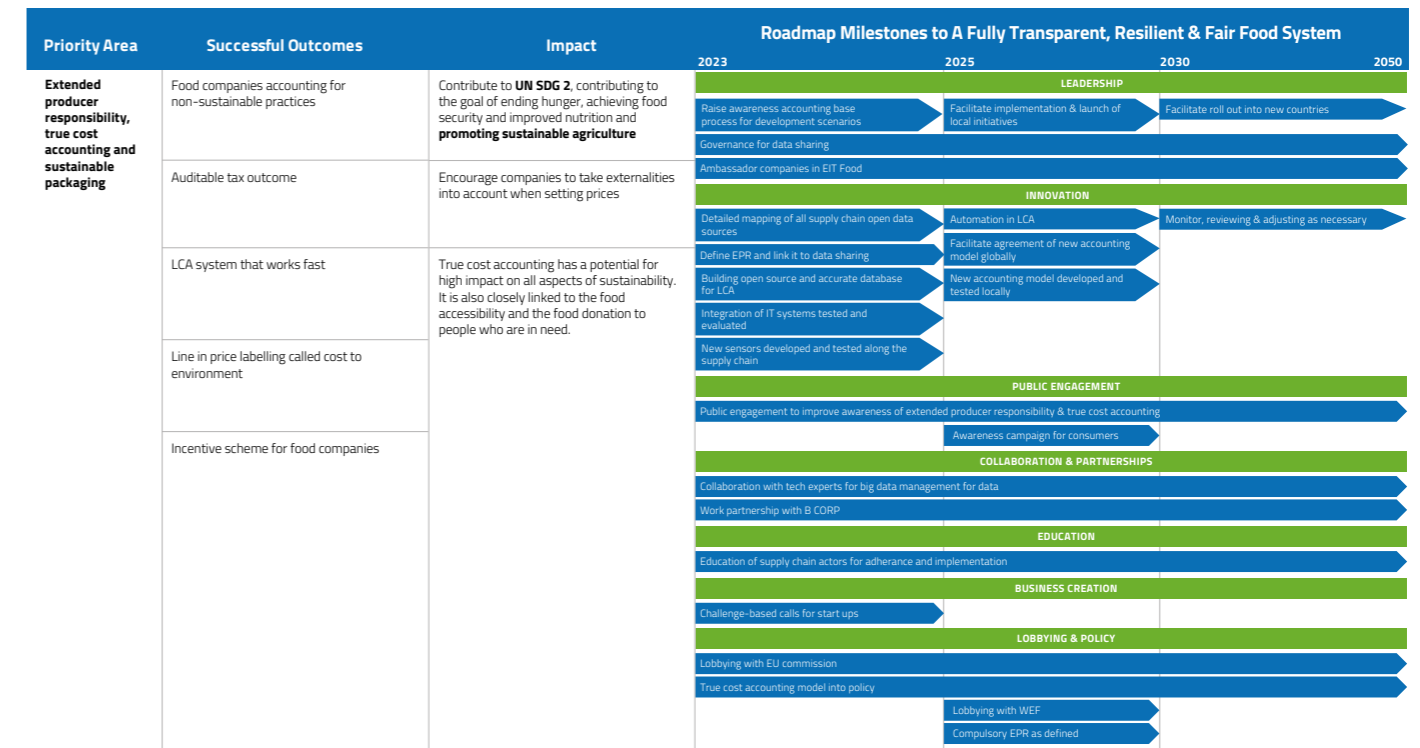


Figure 16: Extended producer responsibility, true cost accounting and sustainable packaging



5.3.9 Priority Opportunity: Radical Transformation of Food System & New Retail Models

Overview of opportunity: This opportunity focused on the discussion around the food system, particularly the retail system, and its link with sustainability. Although not yet a fully formed idea, one longer-term outcome of this opportunity could be a regulatory framework which allows only sustainable products to be commercialised, thereby radically transforming the current retail system. Creating and implementing such a framework requires a lot of engagement and needs a professional body to establish and govern it. For such an idea to come to fruition, parameters of sustainability are required keeping in mind that local food production does not necessarily mean it is sustainable. This opportunity proposes a carbon footprint threshold being placed on food labels, or alternatively if products go above certain levels they are categorised as low, medium, high for example. Depending on the food product, some may no longer be eligible for sale under such new restrictions. The ideal case for sustainable production would include a ceiling for the carbon footprint which would require collaborative discussion and regulatory input. In the mid-term, the ambition is for food production to be carbon neutral, and in the longer-term to be carbon negative. A significant aspect of this plan lies with consumers and consumer engagement, where digital tools would allow consumers to assess the sustainability of products. Education of actors within the value chain on how to transition to this system and business support would be needed.

Implications for overall Mission: This opportunity would demand for a fully transparent, resilient and fair food supply system by focusing on promoting sustainability (carbon neutral) food supply chains. This radical change of the retail system – requiring improved transparency of the sustainability of practices – would improve resilience along the entire supply chain. Promoting more sustainable practices will also help to combat climate change and could feed into improving food security. The improved transparency of practices along the supply chain

could also build consumer confidence in the food products which make it to retail and increase their trust in the food system.

Potential impact factors for EIT Food to consider:

- Reduction of carbon footprint of food products.

Potential role of EIT Food:

Leadership: EIT Food can undertake a leadership role in this opportunity by facilitating the setting of maximum sustainability indicator levels (thresholds) and promote role model food companies for implementation of sustainability labelling.

Innovation: innovation activities for EIT Food include the development of sustainability indicators, new and upgraded technologies to produce food sustainably, life cycle analysis, artificial intelligence models (digital tools for measuring sustainability impact of supply chains), creation of a sound database of sustainability indicators for supply chains and the potential of virtual reality to offer new, more sustainable ways of shopping for consumers.

Public engagement: consumer engagement is necessary to increase knowledge and awareness of the proposed retailing method so that consumers understand the importance and benefits of such sustainability labelling on food products.

Education: education of the value chain actors from farm to fork will be required for the adoption of this opportunity. EIT Food can also provide education for businesses both new and existing, to help them improve the sustainability of their processes and practices.

Business creation: EIT Food can provide support for businesses to implement more sustainable practices and improve the overall sustainability of their production systems. Emphasis on social enterprise when selecting start-ups to enrol to EIT Food programmes should also be considered for this opportunity.

Collaboration & Partnerships: EIT Food can facilitate collaboration between the energy sector and food production sector and additionally collaborate with tech experts to utilise the necessary technologies to realise this opportunity.

Advocacy & Policy: EIT Food can advocate for mandatory sustainability labelling on all food products, the development of a regulatory framework surrounding this labelling and support food assistance programmes to distribute surplus food.

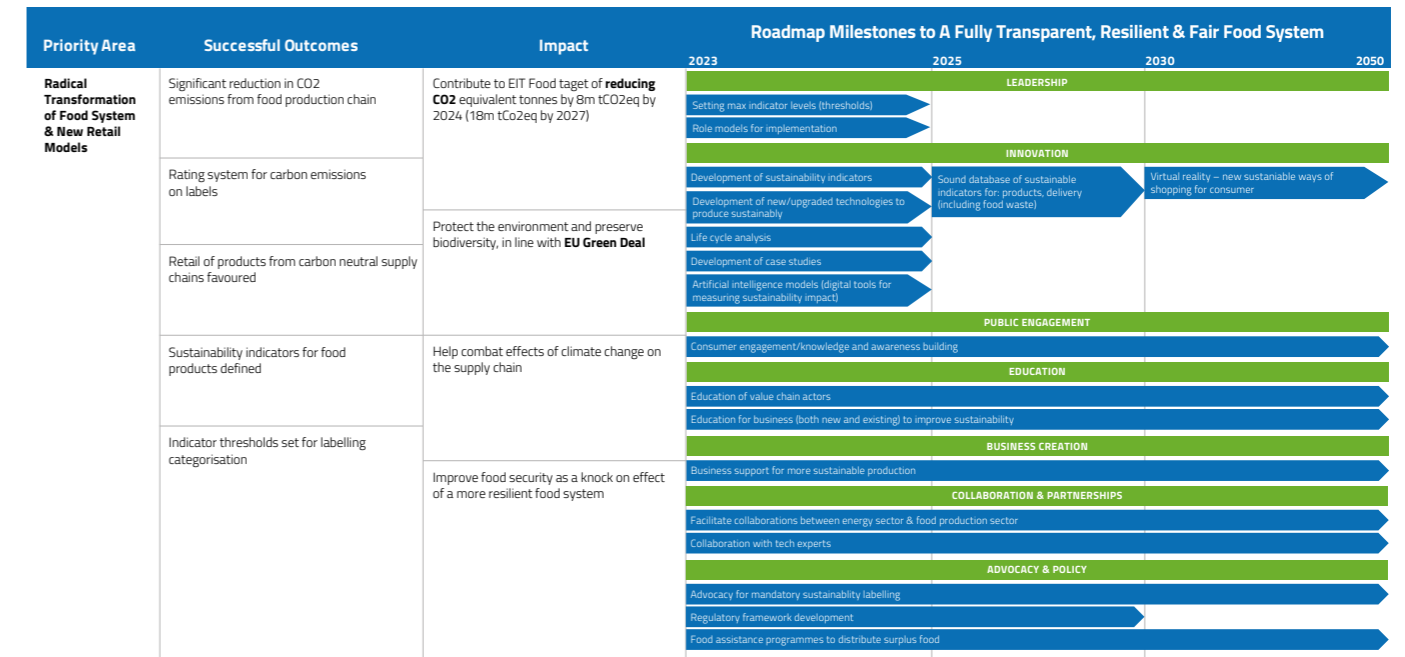


Figure 17: Summary of Radical Transformation of Food System and New Retail Models Opportunity



5.3.10 Priority Opportunity: Food Donation System & Food insecurity framework

Overview of opportunity: This opportunity focused on food security and the food donation system. The phenomenon of food security and food poverty was defined by three dimensions which need to be addressed simultaneously: material, social and psycho emotional. Currently, there is not enough data to assess food security so dedicated indicators are necessary. In the workshop, it was suggested that there are not many technical limitations on the development of such indicators but that political will is necessary. Therefore, the creation of a public policy framework on this phenomenon is important. Additionally, this opportunity highlighted the importance of not relying on food donations and the traditional charity system to overcome food insecurity but to instead focus more on empowering beneficiaries. There is high potential for food poverty initiatives to scale up and create more environmental, social and economic benefits. There are examples of best practices across Europe but a lack of dissemination and systematic data collection. With increased awareness and education there is the potential to recover more food from the food supply chain and use it to support those in need.

Implications for overall Mission: This opportunity aims to prevent safe, nutritious food from becoming waste along the supply chain by fostering and facilitating food donation. Through the creating of a public policy/welfare framework it aims to end food poverty. This opportunity is of value to EIT Food particularly in tackling the causes of food insecurity and promoting a fair food system, as it aims to ensure that everyone has access to safe and healthy food. The development of food insecurity indicators will aid in identifying vulnerable population subgroups that which may require more focus to become food secure and enable specific targets to be set for reducing food insecurity among them. This opportunity could also be linked with Mission 1 “Healthier Lives Through Food” and Mission 2 “A Net Zero Food System”.

Potential role of EIT Food:

Leadership: EIT Food can play a leadership role in promoting a shared understanding of food poverty, facilitating the adoption of food donation legislation at national level, share best practises and extend the right to food to also include dietary preferences, restrictions and needs of populations.

Innovation: Innovation activities for EIT Food could include:

- Better use of existing data
- Constructing a shared tool for measuring food poverty within Europe
- Collecting reliable, consistent data
- Expanding collection of food poverty and insecurity data at national and European level to cover a higher variety of indicators
- Developing national and local food welfare strategies integrated with urban food policies
- Using blockchain technology to foster traceability of food and facilitate food donation
- Implementing the food use hierarchy throughout the food supply chain.

Public engagement: EIT Food can play a key role in engagement with the public to improve awareness of food insecurity indicators, raise awareness regarding the potential social, environmental and economic impact of food donation and increase accountability of public institutions to tackle food poverty.

Education: EIT Food can facilitate public education to reduce data illiteracy i.e. to make people understand the importance of data and its use in measuring food poverty.

Funding: This opportunity requires both public and private funding. EIT Food can provide funding for public social services and food donation activities and offer targeted support, both financial and administrative for food banks to enable them to scale up food recovery and redistribution.

Advocacy: EIT food can also undertake advocacy and awareness raising activities relating to food poverty and food donation.

Collaboration & Partnerships: EIT Food can help in recovery surplus food recovery from all stages of the food supply chain and work with the hotel, restaurant and/or catering (HORICA) sector. Stable, respectful and fair (“eye-level”) collaborations between private and public

actors, businesses and NGOs (e.g. retailers and food banks) are necessary for the achievement of this opportunity.

Business creation: EIT Food currently promotes exclusively technology to recruit and train start-ups in its various programme. Specific considerations for a social enterprise based programme should be considered.

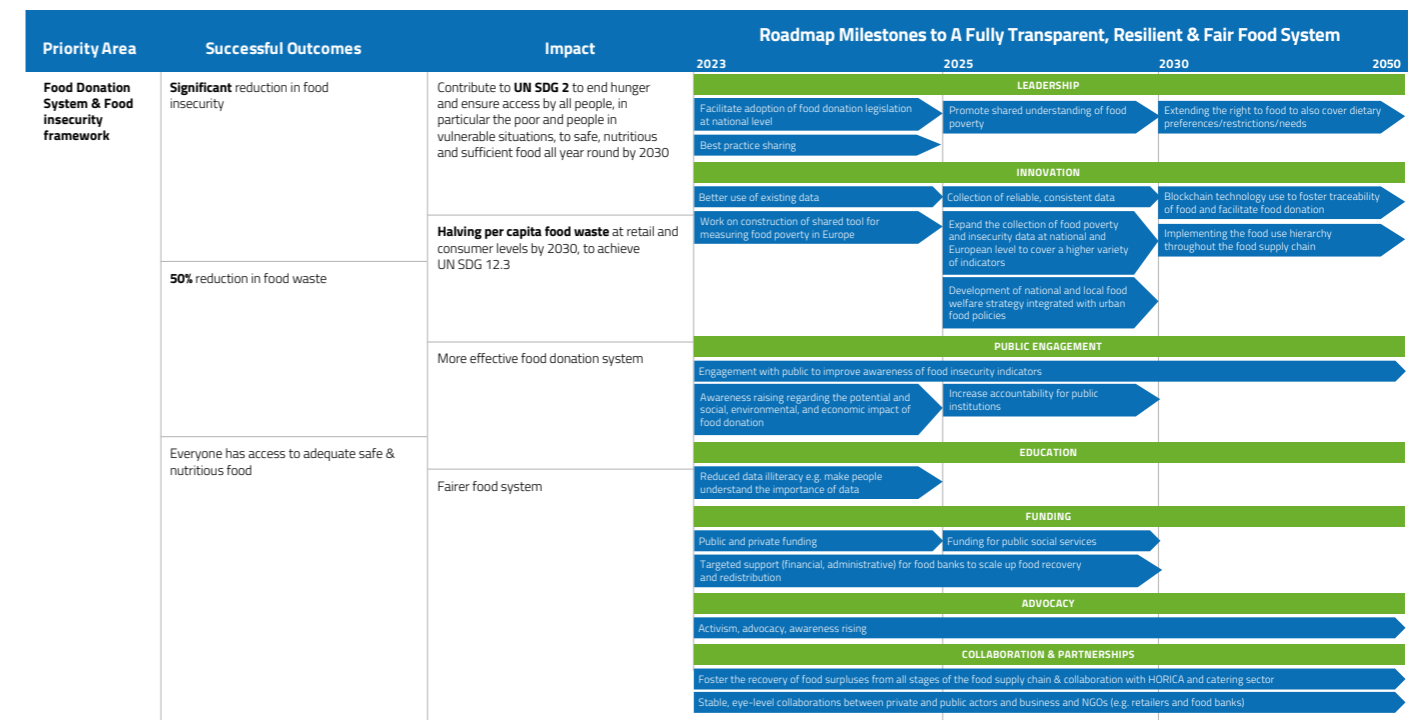


Figure 18: Summary of Food Donation System and Food Insecurity Framework Opportunity



5.4 Synthesis across Priority Areas

The aim of Mission 3 “**A Fully Transparent, Resilient and Fair Food System**” is to deliver an overarching Roadmap for EIT Food that promotes transparency and traceability of food production, provides robustness and adaptability in the face of external disruptions, and ensures equitable access to healthy and affordable food for all. In this Mission, **seven priority opportunities** were proposed based on the roadmapping workshop to achieve more transparency, resilience, and fairness in the food system which are detailed in the previous section.

A combination of these opportunities will help to achieve the target set by this Mission. To better visualise the relationships and cross-linkages between these seven priority opportunities in terms of their trends and drivers, capabilities and enablers, a linking grid was used. This helps to explore where multiple opportunities might act together to address common trends, drivers or market needs, and where certain capabilities and enablers can aid the delivery of multiple opportunities.

5.4.1 Synergies in trends, drivers & market needs across the priority opportunities

10 trends, drivers or market needs were identified as being addressed to some extent by at least four of the seven opportunities. They are listed below (refer to [appendix 4.7](#) to view the linking grid).

- Climate change, weather unpredictability and extreme weather events threaten food production, safety and can directly exacerbate food insecurity
- Intensive, industrialised and unsustainable farming practices to feed the global population and for increased profits
- Climate change is expected to reduce crop yields in regions that are required to produce more in the future, and to increase variability in productivity in other regions
- Food specialisation: A small number of plant and animal species supply 90% of the world's calories
- Poverty, inequality, and social security
- Scarcity of natural resources/land degradation
- Inequity and power imbalance within the food system with dominant actors having power over the food system, where large corporations remain the main stakeholders of beneficiaries of policies and funding
- Sustainable and resource-efficient farming practices
- Alternative proteins to alleviate resource-intensive agriculture
- Addressing pollution (air, soil, and water) is crucial for the health of the whole system

Synergies in capabilities and enablers for priority opportunities

Many of the capabilities and enablers were linked to two different priority areas which can be seen from the linking grid in [appendix 4.7](#). Most notably were “communication strategies” and “Policy must set the stage for transparent, resilient, and fair food systems and to support action aligned with sustainable development”, which were both deemed relevant in the development, deployment, or realisation of 3 of the 7 priority opportunities.



5.4.2 Prioritisation of opportunity areas

Impact & Feasibility of Opportunities

The opportunities which emerged from the roadmap workshop were scored on their potential impact and feasibility based on the seven individual impact pathways (appendix 4.6). Figure 19 shows a consolidated view of the scoring and suggests that all seven opportunities

have good potential to deliver impact and have good feasibility for adoption. The potential to scale for deliverable improvement by 2030 was considered highest for the following three opportunities:

- Resilient and Sustainable Farming Practices
- Urban integration of food
- Food Donation System & Food insecurity framework

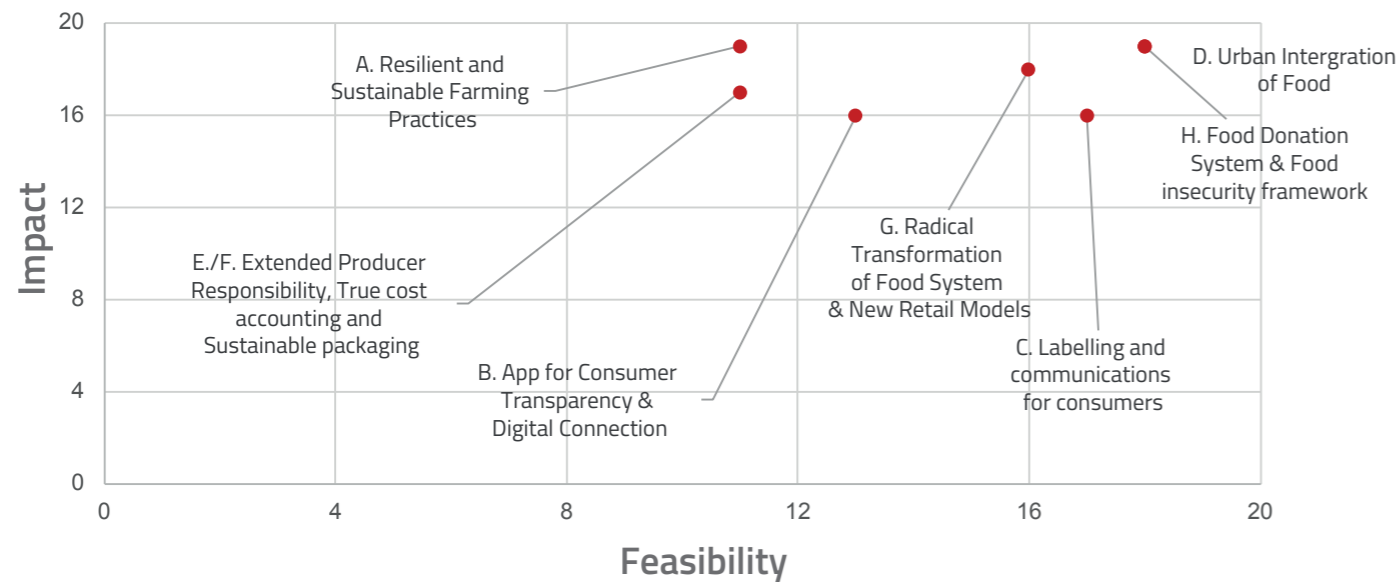


Figure 19: Impact and feasibility graph of the key value creation opportunities



Overarching components of priority opportunities

The importance of data was an overarching component for most opportunities which emerged from the roadmap workshop. It included the availability of data, use of existing data and communication of data along the supply chain and to the consumer. Definitions and standards were of importance also in terms of defining food fraud, indicators of food insecurity and standards for food labelling. Additionally, consumer engagement and communication particularly for the uptake of apps and standardised labels is a key area of importance as uptake is necessary for such opportunities to be successful.

Category indicators

EIT Food has defined three category-based indicators for the transparent, resilient, and fair food system, and these were discussed during the workshop. The work with the delegates shows strong agreement with the existing indicators identified by EIT Food. Many of the opportunities aligned with these indicators:

1. Increasing the number of new digital solutions in use to improve supply chain efficiency, integrity and transparency
2. Reducing the economic burden and occurrence of food insecurity and food safety issues
3. Improvement in trust metrics identified by EIT Food's Trust Report and Trust Tracker data

Additional indicators covering other areas of impact in this Mission were also suggested (further details of this workshop discussion in appendix 4.9).

Figure 20 below shows an overview of the priority opportunities proposed by the stakeholder workshop to achieve a fully transparent, resilient and fair food system:

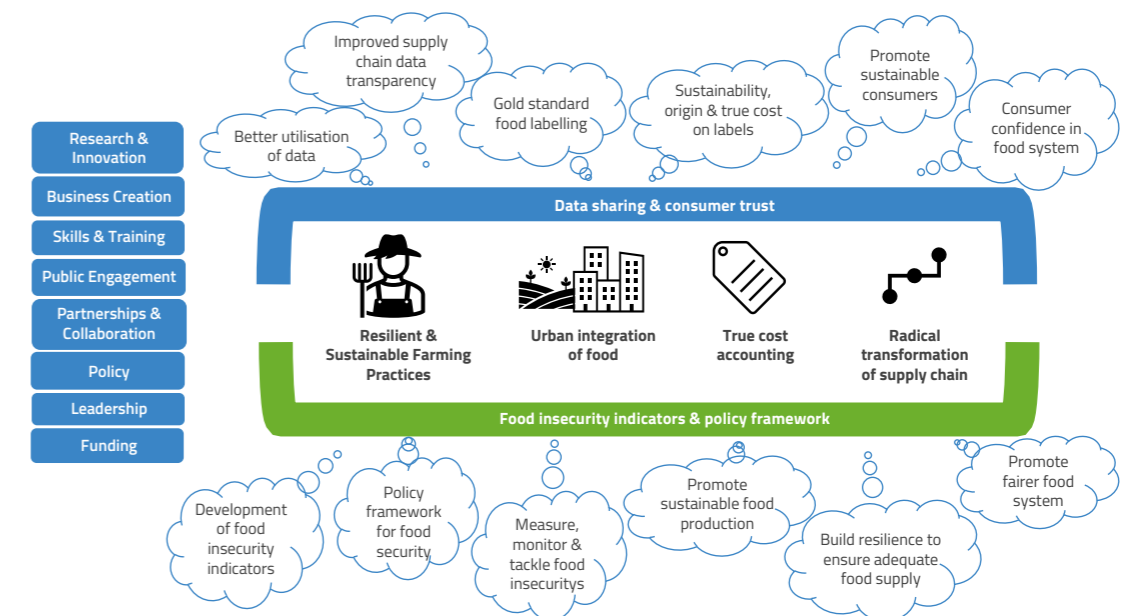


Figure 20: Opportunities to deliver a fully transparent, resilient and fair food system

5.5 Conclusion of priority areas:

After prioritising during the stakeholder workshop, four priority opportunities and two overarching enablers emerged. These are critical in addressing the key questions posed by EIT Food for this Mission of Reducing Risk for a Resilient and Fair Food System. These are:

5.5.1 Priority opportunities:

1. Resilient and sustainable farming practices:

To ensure food availability, improve the integrity and safety of food, build resilience in the food supply chain and enhance food security for primary producers to create a more resilient food system.

More resilient and adaptive farming practices will help to combat the growing challenge faced by food production because of climate change. Climate resilient farming practices may help overcome the risk climate change poses for food safety, which is a key priority area EIT Food should focus on to ensure everyone has access to safe food. Uptake of resource-efficient, diverse and sustainable farming will reduce pressure on land and nature resulting in better grown food providing greater nourishment. Resilient and sustainable farming practices can help combat poverty and social inequalities, one of the main causes of food insecurity. Additionally, more resilient farming practices can improve the resilience of supply chains, enabling better adaptation to unexpected scenarios and continue to supply food in challenging times.

EIT Food can promote more sustainable and resilient farming practices which will have positive implications for the goal of improving integrity of food and combatting food insecurity.

Resilient and sustainable farming practices will feed into two key pillars of this Mission, improving resilience of the supply chain to ensure adequate supply of food and therefore improve fairness within the food system, helping to ensure everyone has access to safe and affordable food.

2. Urban integration of food:

To optimise shorter supply chains, overcome distribution issues, improve self-sufficiency of cities, improve food security of urban populations and resilience of urban food supply chains.

More resilient urban food systems with local, diverse food systems will improve the food belt around cities, improving the food security of urban areas, where populations are increasingly vulnerable to food insecurity. Awareness of the food system among consumers will be increased and more people will be encouraged to seek employment within the food supply chain, adding to the resilience of the food system. The reliance on imports will be reduced, improving the self-sufficiency of urban areas. Through the development of urban food policy, efficient distribution of food will be enabled, which will improve population health and reduce food waste. Agroecological agricultural methods would aim to reduce the carbon footprint within urban areas and supply chains, overcoming negative effects of climate change on food safety and quality.

Through leadership, innovation, education, public engagement, funding, business creation, advocating, collaboration and partnerships, EIT Food can undertake a wide range of activities to facilitate the urban integration of food.

Urban integration of food will feed into the three key pillars of the Mission: improving transparency via shorter supply chains; improving resilience by utilising locally produced food; and improving fairness by reducing food insecurity among urban populations.

3. Radical Transformation of Food System & New Retail Models:

To achieve sustainable food supply and improve resilience of the supply chain.

Transformation of the retail model is proposed, to prioritise sustainable products via indicators on food products, encompassing the sustainability of the food chain from farm to fork. This can result in improved sustainability and resilience of supply chains and greater transparency of practices within the supply chain. More sustainable food production practices will help combat the impact of climate change on food safety and security, while improved transparency will help build consumer trust in the food system.

Through leadership, innovation, public engagement, education, business creation, collaborations, partnerships, advocating and policy, EIT Food can undertake a range of activities to facilitate a radical change of retail models and food systems.

A radical transformation of the food system through new sustainable retail models will feed into all three pillars of this Mission. It can improve transparency of supply chain processes and activities, build supply chain resilience due to improved sustainability which in turn can help combat food insecurity, building a fairer food system.

4. Extended producer responsibility and true cost accounting:

to promote accountability for non-sustainable practices.

Consumer demand for sustainable products can be boosted by placing emphasis on the environmental impact of products, promoting true cost accounting with “cost to the environment” addition to food price labelling. Utilising a fast-paced LCA system, this opportunity can help improve supply chain resilience.

Through leadership, innovation, public engagement, collaboration and partnerships, business creation and advocating and policy involvement, EIT Food can help facilitate extended producer responsibility and true cost accounting for the environmental impacts of food production.

Extended producer responsibility and true cost accounting feeds into the three pillars of the Mission. Primarily it will promote more sustainable, resilient food production practices which will then contribute to improved food security. Additionally, by including environmental impact information on labels for example, it will add to the transparency of the food system.



5.5.2 Overarching enablers to realise opportunities

1. Digitalisation and consumer transparency to build trust: We can use digital technology and improved food labelling to give consumers quick and detailed information about the food they buy. By making sure that food labels are consistent and meet high standards, we can help promote the safety and authenticity of food products, and build trust in the food supply chain. This will create a more transparent food system that benefits everyone.

A circular platform and app used by consumers daily, run by an independent organisation, could change the behaviour of both consumers and food supply chains. This platform of product information can increase consumer demand for more sustainable food products, leading to consumer pressure on food companies to move towards more sustainable, resource efficient practices addressing some of the key factors impacting on food security and safety. Additionally, this digitalisation of food data will massively improve the transparency of food supply chains and build consumer trust and public understanding of the food system.

Food labels following a consistent and independent standard, will allow consumers to make clear choices as consistent and clear product information will empower informed choices. Aiming for a gold standard for labelling can improve consumer confidence in food supply chains, as transparency will be increased, feeding into EIT Food's priority of building consumer trust in the food system. Improved transparency would also enable greater food integrity, another priority area for EIT Food.

Through innovation, education, public engagement, funding, advocating and policy, leadership, business creation, collaboration and partnerships, EIT Food can help improve communication to consumers and build consumer trust in the food system.

Digitalisation of communication and consumer transparency to build trust can feed into the three key pillars of this Mission. Transparency is increased as more data is shared and made available to the consumer, improved resilience due to increasing demand for more sustainable food products and in turn a fairer food system due to a more resilient food system able to meet the food demands of populations.



2. Food insecurity indicators & framework development: To identify consistent indicators of food insecurity across Europe, to measure levels of insecurity and identify vulnerabilities within populations and to tackle the overall issue of food security to create a fairer food system.

Establishing a public policy framework on food insecurity can reduce food waste along the supply chain, and safe and nutritious food will be redistributed to meet the dietary needs of individuals experiencing food insecurity. Indicators to identify and measure food insecurity will help to end food poverty among vulnerable, food insecure populations. Such indicators are of value to EIT Food particularly in tackling the causes of food insecurity and promoting a fair food system, as it aims to ensure that everyone has access to safe and healthy food.

Innovation, education, public engagement, leadership, funding, advocating and policy, collaboration and partnerships are some of the key facilitating roles EIT Food can undertake in order to address this priority opportunity area.

Food insecurity indicators and framework development will feed into the pillar of a fairer food system within this Mission, thereby enabling access to adequate, healthy and safe food is fair among populations.

Each of these priority opportunities and enablers address key challenges in the food system, are considered to have high impact and feasibility, have clear, achievable pathways for impact and areas in which EIT Food can play a role. Therefore, it is believed that these four areas are essential to EIT Food's aim of achieving this Mission resulting in a fully transparent, resilient and fair food system.



6. Summary and Recommendations

A transparent food system is one in which information about the production, processing, distribution, and sale of food is easily accessible to all stakeholders, and in easily digestible formats. Accessibility and readability are therefore important. This includes information about the source of the food, how it was grown or raised, and any certifications or labels it may have. A resilient food system is one that can adapt to and recover from disruptions, such as natural disasters, economic downturns, or pandemics. This includes having a diverse array of food production methods and sources, as well as systems in place for emergency food distribution. A fair food system is one in which all members of society have access to healthy and affordable food, regardless of their income or location. This includes addressing issues such as food deserts, food insecurity, and the exploitation of workers in the food industry. Therefore, a transparent, resilient and fair food system is one that promotes transparency and traceability of food production, is robust and adaptable in the face of external disruptions and ensures equitable access to healthy and affordable food for all.



The vision to Reduce Risk for a Resilient and Fair Food System, as identified by this report, must therefore include the following key words to be all encompassing: accessible, affordable, equitable, sustainable, diverse, local, traceable from farm to fork, safe, quality, authentic and meeting dietary needs for everyone.

This EIT Food Mission roadmap exercise aimed to critically analyse and synthesise all of the information collected through the desk-based research (literature reviews, questionnaires, surveys and expert opinions) and roadmapping workshop. The purpose was to provide key recommendations on how EIT Food can make a distinctive and significant progress towards the vision to Reduce Risk for a Resilient and Fair Food System and how EIT Food's impact indicators can be consistently met in the next 3–5 years.

The roadmapping exercise to Reduce Risk for a Resilient and Fair Food System recommended seven priority areas to contribute towards achieving the vision of this Mission. Together, these seven priority impact pathways can address the impact factors outlined by EIT Food. That includes new digital solutions to improve supply chain efficiency, integrity, and transparency. It also means better social return on investment (SROI) such as employment, new businesses created, investment in innovation and startups, development of economic clusters, regional development funding secured, and improvement in trust metrics identified by EIT Food's Trust Report and Trust Tracker data.

The first part of this summary includes the answer to key questions raised by EIT Food, the second part looks in detail at the recommendations identified.

The recommendations took into consideration the objectives as described in the EIT Food Strategy 2021–2027 and the EIT Food Business Plan 2023–2025, with a focus on how EIT Food can meet its impact indicators consistently in the next 3–5 years. Recommendations were explored in line with EIT Food's four pillars: Education, Innovation, Business Creation and Public Engagement. Several cross-cutting priority impact areas and topics emerged in connection with the other EIT Food Missions: "Healthier Lives Through Food" and "A Net Zero Food System".



6.1 Key indicators of food insecurity:

There are many indicators of food insecurity which may be experienced at different intensities by various populations. The literature review; interviews and surveys; and roadmapping workshop identified key indicators of food insecurity which EIT Food should consider. These are highlighted below. However, it is important to note, that a key finding from this roadmapping exercise was the need to identify consistent indicators of food insecurity across Europe to measure levels of food insecurity and identify vulnerabilities within populations. Therefore, more work to consolidate these indicators is necessary.

6.1.1 Access to food

- Market prices of key staple commodities and nutritious food.
- Number of citizens who can afford safe, healthy and nutritious food long-term.
- Number of households deemed low-income, low education levels & unemployment rate.
- Food procurement ability and options for citizens e.g. public transport, proximity to shops, options for food home deliveries.
- Number of people relying on food assistance programs as part of their daily life.
- Household expenditure and share on food expenditure as a proxy of purchasing power.
- Coping score of individuals or households.

6.1.2 Availability of food

- Ability of supply chain to provide adequate food to meet the population's dietary needs.
- Ability to produce nutritious and resilient crops, livestock and wild fisheries able to withstand extremes and variabilities in climate.
- Level of food loss and food waste.

6.1.3 Health of population through diet

- Proportion of the population relying on cheap, ultra-processed food rather than fresh produce.
- Nutrient composition of population diets.
- Nutritional indicators – level of acute and chronic malnutrition and levels of diet-related illness and disease within populations e.g. levels of malnutrition or obesity.

6.1.4 Safety of food

- Incidence of foodborne illness outbreaks.
- Incidence of product recalls due to contamination.
- Shelf life of food products.
- Adherence to food safety regulations along the supply chain.
- Consumer knowledge levels of safe food handling post purchase.



6.2 Populations most at risk of food insecurity indicators:

There are several factors which threaten the food insecurity of populations. These factors affect people at various intensities and therefore put certain populations at greater risk of experiencing food insecurity. The populations at risk of food insecurity are:

6.2.1 Low-income households

- Unemployment can negatively affect a household's food security status, making it more difficult to meet basic household food needs.
- High food prices affect people's ability to buy food and can add further pressure to low-income households.

Improving employment opportunities for low-income households and ensuring fair, affordable food prices are two priority areas to tackle food insecurity.

6.2.2 Minority groups & gender inequalities

- COVID-19 has led to a spike in food insecurity, especially among racial/ethnic minority households.
- Higher rates of food insecurity have been reported for minority groups across the US and also more recently in the UK. Similar research is needed to confirm whether similar differences exist between minority groups in Europe to ensure all European citizens can experience food security.
- Level of education, composition and number of children in the household have been reported as having a significant effect on the risk of food insecurity among European women.

Addressing these factors and providing support for minority groups is necessary to overcome these inequalities between specific groups within society.

6.2.3 Urban populations

- More than 50% of the world's population live in urban areas and this percentage is predicted to increase to over 70% by 2050.
- Urbanisation is directly linked to the changing demand for food that will impact rural areas and agricultural supply chains.
- Poverty, food insecurity, and malnutrition become increasingly urban problems as urban populations expand everywhere.

Enhancing urban social resilience to ensure urban food and nutrition security, and shortening of supply chains, are two approaches that can help transform urban food systems.

6.2.4 Primary producers

- Roughly 500 million smallholder farms produce close to 80% of the global food supply.
- Of the almost 700 million people worldwide who do not get enough food, many are farmers.
- To survive and live a comfortable life, primary producers require fair prices for their work.

Diversification of food production can improve the resilience of primary producers.

6.2.5 Populations in southern regions

- Mediterranean countries and Central and Eastern Europe have significantly lower food security than Western and Northern Europe.
- As a result of climate change, drought frequency is predicted to increase, especially in the Mediterranean region.
- Higher temperatures could also affect the livestock sector in terms of decreased animal health and livestock production.
- Farmland values in southern regions of Europe are expected to decrease by 60%–80% by 2100.

6.3 Key causes of food insecurity:

Many trends and drivers contribute to food insecurity both within and outside of the food system. The main causes of food insecurity which EIT Food should prioritise are:

6.3.1 Scarcity of natural resources & land degradation

- Decline in water availability.
- Decline in availability of productive arable land and nutrients in soils.

6.3.2 Climate change

- Climate change is adding pressure to the food system and can directly exacerbate food insecurity.
- Climate change, weather unpredictability and extreme weather events threaten food production and safety.
- Vulnerabilities due to the limited shelf life of food, and variability in quality and availability of food products are challenged by an increased incidence of extreme weather linked to climate change.

6.3.3 Overproduction, Food Loss and Food waste

- Over 40% of food produced is lost or wasted every year
- The food currently wasted in Europe could feed 200 million people
- The redistribution of surplus food could help to reduce food insecurity faced by many EU citizens
- Food production should be controlled to reduce overproduction and minimise food loss and food waste going to waste

6.3.4 Food safety issues

- Access to safe food is key to food security
- Unsafe food containing harmful bacteria, viruses, parasites or chemical contaminants can cause more than 200 diseases, ranging from diarrhoea to cancers
- An estimated 600 million people around the world (WHO, 2022), fall ill after eating contaminated food each year with vulnerable people including infants, young children, elderly and sick particularly at risk
- There is a need to develop, optimise and implement analytical methods for food safety

6.3.5 Food distribution issues & supply chain ability to react to crisis situations

- Need for fostering regional food distribution networks.
- Food insecurity existed before COVID, worsened during this crisis, and will unfortunately be a persistent phenomenon in the post-COVID world.
- Minimising food insecurity during the next crisis will require coordinated efforts across the system.

6.3.6 Urbanisation

- Urbanisation is directly linked to the changing demand for food that will impact rural areas and agricultural supply chains.
- Population growth in urban settlements is impacting on the sustainability of food systems.
- Urbanisation can result in loss of productive arable land necessary for food production.

6.3.7 Poverty & social inequality

- Food insecurity driven by rising food prices.
- Food assistance programmes address immediate issues but need to address underlying issues of poverty.
- There is a need to prioritise equality among vulnerable minority populations.

6.3.8 Poor dietary choices

- Diets high in sugar and unhealthy fats coupled with low density foods, can result in a low intake of micronutrients and can lead to micronutrient deficiencies.
- Interventions are required to encourage healthier food choices alongside efforts to increase access and availability of healthier foods.

6.4 Key factors contributing to food integrity:

Food integrity incorporates the quality, safety and authenticity of products, processes, data and personnel within the supply chain and transparency of the supply chain. The key factors contributing to food integrity which EIT Food should prioritise in this Mission include:

6.4.1 Food product safety

- Food-borne bacteria, viruses, parasites, toxins and allergens cause about 23 million cases of illness and 5,000 deaths per year in Europe.
- Detecting food contaminants and foodborne illness outbreaks relies on sufficient supply chain transparency.
- Non-compliance with legislation, which can range from mistakenly mislabelled items and misdescription of quality claims through to sophisticated, malicious and dangerous fraud.
- Systems and processes are required at the industrial level for early and rapid detection of non-compliance and link to quality-control systems.

6.4.2 Food fraud mitigation

- Food fraud is an urgent topic due to ongoing global development of the food industry standards & certification requirements.
- Recently, there have been several large scandals, massive economic losses and declines in consumer confidence in many parts of the world.
- Traditional food safety and food defence plans are not considered sufficient to prevent, mitigate, detect, and deter food fraud.
- The food industry requires specific, bespoke plans that focus on food fraud and particularity related to its mitigation and prevention.
- Laws and regulations surrounding food fraud need to be clearly defined and explained, without clarity there will be confusion or conflict between governments and industry.

6.4.3 Transparency from farm to fork

- Food safety incidents and food fraud scandals coupled with increasing awareness of the impact of food production on the environment and contribution to greenhouse gas emissions; animal welfare; human health; and the livelihoods of people who work in the food system, the integrity of the food system is of increasing sectoral, governmental and consumer concern.
- Consumers want improved traceability systems, with clear and accurate information on the sustainability, nutritional content, origin of ingredients and the length of the supply chain; food produced to the highest ethical standards; and fairness across the food system.
- To uphold consumer trust, transparency in the food system; verification of claims; and more attention to personal communication and reassurance for the consumer is important.
- Such transparency in the food system encourages actors in the food sector to produce food based on the principles of integrity i.e. safe, authentic and nutritious food produced to the highest ethical standards using systems that respect the environment and those who work in the industry.

6.5 Consumer-industry relationships to build trust & public understanding:

Consumer trust in the food system is of enormous interest due to its expected influence on consumer confidence and demand for products. There are a range of food system aspects in which consumers may have differing levels of trust in and understanding of:

6.5.1 Transparency of the food supply chain

- Consumer demand for clarity of food product ingredients and origin is on the rise.
- Adulteration incidents negatively affect the food industry and consumer trust.
- It is important that consumers trust and understand the food system in order to make informed choices.
- Higher levels of transparency have led to increased purchases of alternative and sustainable foods.

6.5.2 Awareness of food production processes

- To build trust in the food system it is important that consumers understand the processes within it.
- Improving consumer awareness of farming practices will help people understand where their food comes from. It can change perceptions about the detrimental impact farming has on the environment and animal welfare.
- Understanding the role of primary producers could help consumers understand the need for them to receive a fair price for their work which may be reflected in the price consumers pay.
- Overcoming consumer uncertainty about novel food products or technological innovations by increasing their understanding through education could help consumers make informed decisions and trust such products more.

6.5.3 Clarity of food packaging labels & claims

- To uphold consumer trust, authentication of claims through transparency in the food supply chain and independent labelling is required.
- Consumers have previously expressed distrust in food labelling.
- It is important that consumers are educated on how food labels should be interpreted.
- Additionally, manufacturers should ensure simplicity and clarity of information so that consumers can easily absorb information and make informed choices.
- Food packaging labels should be consistent and accurate to improve consumer trust.
- An independent label, controlled by an independent organisation we help to build consumer trust and support standardisation.

6.5.4 Trust in specific supply chain actors

▪ Farmers

Generally, farmers are perceived by consumers as more trustworthy than other actors within the food supply chain.

▪ Manufacturers

Distrust in food companies has previously been reported by consumers.

Consumers hold manufacturers more accountable than farmers and retailers in terms of transparency.

Some consumers view manufacturers as potentially being money-driven and willing to sacrifice quality for profits.

▪ Retailers

Like farmers, retailers have been considered more trustworthy than manufacturers and authorities within the food supply chain.

Retailers are generally trusted to bring safe products to market but aren't always perceived as caring about healthy/sustainable choices.

▪ Authorities

Trust in the regulatory bodies responsible for ensuring food safety is also important.

Distrust in the governance of genetically modified foods, for instance, has been reported by consumers previously.

Independent inspections to improve safety, quality and sustainability of supply chain could help build trust.

▪ Policymakers (for food assistance)

Public communication strategies are needed to educate the public and policymakers about the challenges of achieving food security and to reduce stigma about receiving food assistance.

Food policy should recognise individuals' dignity and freedom, and convey trust in and respect for food assistance beneficiaries, by enhancing freedom to make individual food choices.

Focusing on this issue may help those in need of food assistance overcome the perceived stigma and build trust in the food assistance programmes available to them.



6.6 Recommendations

The recommendations below reflect the extensive engagement with multiple stakeholders within the food system, including interviews, surveys and expert workshops in addition to desktop research conducted over a three-month period. The recommendations propose how EIT Food can help contribute towards a fully transparent, resilient and fair food system within Europe.

Across this Mission, several recurring issues are seen that EIT Food should try to address. Firstly, is the need for clarity on the definition and goals of a transparent, resilient, and fair food system, and potentially consider including food safety as an additional key element of this Mission. Secondly, is the importance of access to existing data, systematic data gathering, and the need for additional and better data measurement, standardisation, and joined-up reporting systems and protocols to better support decision making, verification, and use of relevant KPIs for the sector. Thirdly, it is clear that public engagement programme initiatives are needed, especially for certain vulnerable groups such as youth and the elderly. These initiatives will be central to the behavioural change needed for the future transparent, resilient, fair, and sustainable food system and should be a focus in future strategic initiatives under the EIT core food objectives. This Mission covers topics that touch on all aspects of the food system, and there are clear interlinkages and overlaps across the topic areas and across the three EIT Food Missions. For example, resilience is closely linked to sustainability; transformation of food system and new retail models will have consequences for all three Missions; and education and behavioural change to nutrition and health. A holistic/systems-based approach to strategy development is therefore essential. Finally, EIT Food can play a key role in influencing and supporting the development of policy and regulatory frameworks to bring about the necessary transition.

In relation to the enablers and opportunities identified in the workshop, here are some of the key recommendations for EIT Food.

6.6.1 Key enablers of a fully transparent, resilient and fair food system

The required enablers of change present significant potential roles for EIT Food spanning all four of EIT Food's core pillars of innovation, entrepreneurship, education and public engagement:

- EIT Food to establish a leadership position in the development of food security and food resilience definitions and indicators; encouraging complex systems thinking approaches; and providing policy with robust scientific evidence for informed decision making.
- Engage with policymakers is seen as key in shaping policy & legislation to support a fully transparent, resilient and fair food system.
- Forge collaboration & partnerships between government, academia, NGOs, social enterprises and industry from the big brands down to the small-scale farmers.
- Develop knowledge & skills among the farming communities and among society, particularly young people to enable the future transparent, resilient, and fair food system. Technologies and methodologies do already exist, but adoption will require a new generation of farmers willing and able to work differently.
- Develop resources and infrastructure and the technological innovation needed to scale up solutions and drive down costs to make solutions economically attractive and affordable for consumers.
- Facilitate a supportive funding landscape for innovation and entrepreneurship to drive experimentation in new production methods, products, services, and innovative new business models. New models for use of food waste will be particularly important.
- Engage the public, particularly with young people to inform on food systems and raise awareness and increase consumer acceptance of innovative new solutions such as protein diversification.

Here are some more specific details on areas of interest for EIT Food in terms of enablers and capabilities.

Collaboration, Partnerships and Leadership

1. Prioritise collaborative action between all food system actors to achieve the Mission aims within the next 3 years.
2. Establish think tanks and work groups in each of the four priority areas to establish, exploit and scale existing knowledge and innovation for impact; identify gaps in knowledge; and translate knowledge and disseminate scientifically robust knowledge to key stakeholders.
3. Engage with government, academia, NGOs, startups, social enterprises, industry and society to overcome the barriers to a fully transparent, resilient and fair food system.
4. Engage and support producer organisations to increase power of farmers and contribute to a more equitable system.

Policy, Strategies & Advocacy

5. Provide policy and advocacy advice to governments for matters relating to improving transparency, resilience, and fairness within the food system.
6. Encourage complex systems thinking approaches; and provide policy with robust scientific evidence for informed decision making.
7. Encourage participatory policy processes which listens to different perspectives, considers essential needs, embraces compassion, enabling co-learning, help share ownership and promote innovation capacity.
8. Advocate for effective food assistance programmes providing healthy food to combat food insecurity.
9. Advocate for affordable food prices for low-income households to improve social equality and minimise food insecurity among vulnerable groups.

10. Advocate for fair profit sharing along the food supply chain especially for small-scale farmers, to ensure fairness among supply chain actors.
11. Advocate for skills to enter the policy debate of policy makers.
12. Support the implementation of consistent and strictly controlled policies and regulations for food fraud mitigation within the next 5 years.
13. Support incentives for self-sufficient, local supply chains, within the next 3–5 years.

Research & Innovation

14. Support & drive Research and Innovation within the next 3–5 years relating to a fully transparent, resilient and fair food system.
15. Provide key opportunities and support for startups to implement these innovations.
16. Support research and practical testing of climate-resistant crops within the next 3–5 years to overcome the impact of climate change on food production
17. Support research into technologies with low energy consumption, friendly to environment and require low human work – to achieve more sustainable and resilient food systems within the next 3–5 years.
18. Support development of new technologies in the next 3–5 years to provide safe, clean, fresh water to effectively manage water resources and improve crop production and livestock raising.
19. Establish more accurate and speedy measurement of contaminants and adulterants in food products, in the next 3–5 years, to ensure food safety and integrity
20. Help develop technology to improve the nutritional quality of food, to promote the health of populations within the next 5 years.
21. Support the development of new technologies within the next 5 years, for long-term storage and preservation of safe food, to prolong the shelf life of food and reduce the risk of foodborne, illness or contamination.

Business Creation

22. Scout for innovations which could transform the food system and address market needs, with a particular focus on innovations that can support the priority opportunities identified in this mission.
23. Support social enterprises which can deliver impact towards food security, transparency, resilience and fairness, helping them to launch, accelerate and scale.
24. Support the pathway for European startups with innovative technologies that could transform the food system and Reduce Risk for a Fair and Resilient Food System, underpinned by IP, to launch, scale and accelerate.
25. Establish regulatory expertise to provide support for agrifood startups and better partnerships with policy makers.
26. Provide startups with access to technical experts, Intellectual Property support and advice, pilot facilities and farms and support them in accelerating from lab to commercial scale.
27. Provide access to a rich ecosystem of corporates, funders and investors with the same vision and interest in innovations for the food system.
28. Leverage the consumer observatory lab as a tool for the market discovery journey of startups and entrepreneurs and to help understand trust in new technologies.

Education

29. Prioritise the education of consumers on the need for a transparent, resilient & fair food system.
30. Provide more education for consumers on how food is produced to raise awareness of food system processes.
31. Provide education and support for primary producers and true cost accounting along food supply chains.

32. Provide education on farming, agriculture and agroecology to food supply chain actors and the wider public to improve awareness of the need for sustainable and resilient farming practices.
33. Skills forecasting exercises to develop insights and identify skills gaps in the agrifood system and what will happen if we do not have them.
34. Collaborate on the European Commission Pact for Skills, to up-skill and re-skill people in agrifood, with a particular focus on the skills identified and needed to deliver the four priority impact opportunities and two priority enabling pathways.
35. Play a key role in the next 3–5 years in educating and attracting future food system actors, to improve the transparency, resiliency, and fairness of the system.
36. Collaborate on The Deep Tech Talent initiative to skill one million people in deep tech fields over the next three years.
37. Develop state-of-the-art deep tech education programmes to build a skilled labour force which can leverage new technologies for green and digital transition of the food system.
38. Provide policy and advocacy advice to governments for matters relating to improving transparency, resilience and fairness within the food system.
39. Advanced entrepreneurship, innovation and food systems programmes to educate STEM students and future innovators of food system.

Public Engagement

40. Engage with consumers and promote more sustainable practices to help achieve the aims of this Mission.
41. Leverage Consumer Observatory labs to identify trends and gather consumer insights on food choices, perceptions related to the objectives of each of the four-priority opportunity areas.

42. Facilitate Consumer-industry relationships to build trust and public understanding in the food system including farmers, manufacturers, retailers, brand owners and regulatory bodies and authorities.
43. Use and extend social media and other digital platforms (e.g. Food Unfolded) to engage with citizens across the globe and disseminate scientifically robust information.
44. Deliver events and interventions to engage with citizens and disseminate scientific evidence about the food system to build awareness and trust and which can shift citizens from passive recipients to informed and active change agents.
45. Build upon the Youth Mission, targeted at primary and secondary school audiences to build interest in the food system, on responsible food choices when grocery shopping and attract the future talents into the food system.
46. Deliver campaigns to showcase farming and agriculture or aquaculture as a desirable occupation to attract young talents.
47. Build a network of ambassadors across the food system which different stakeholders can relate to and trust.
48. Apply expertise from social sciences for interventions which drive behaviour change in different demographics.
49. Measure impact of public engagement interventions to understand what has the greatest impact.

Supply chain traceability

50. Support the use of blockchain technology to foster traceability of food supply chains within the next 3–5 years to improve transparency within the food system and build consumer trust.

51. Investigate other technologies to improve the traceability of food supply chains, improve distributions and make the tracing of contamination or product recalls easier such as artificial intelligence, cloud storage and the digitalisation of all supply chain data.

Measuring, Verifying and Reporting

52. Help establish Life Cycle Analysis (LCA) of food supply chains within the next 5 years to improve transparency, resilience and fairness.
53. Conduct stress testing for supply chain resilience, by identifying and measuring factors which indicate resilience in the food system.
54. Run an initiative to sample and measure any risks of fraud in the food system (Similar to FIIN in UK) in the next 3–5 years. This can ensure food integrity, mitigate food fraud and improve consumer confidence in the food system.
55. Develop of risk-based network of feed and food companies working together to measure & evaluate fraud risk in supply chains (Food Fortress Ireland), to protect the food system from incidents of fraud.
56. Prioritise the effective reporting & use of food supply chain data.

Food Donation System & Food insecurity framework

57. Take a leadership role within the next 3–5 years to facilitate the adoption of food donation legislation at national and European levels.
58. Develop a shared tool for measuring food poverty within Europe with the development of consistent food insecurity indicators in order to identify individuals experiencing or at increased risk of food insecurity.
59. Expand the collection of food poverty and insecurity data at national and European level, in order to measure and address food insecurity.

- 60. Help develop, within the next 3–5 years, national and local food welfare strategy integrated with urban food policies to tackle food insecurity and reduce the number of people experiencing food insecurity across Europe.
- 61. Work to increase the accountability of public institutions to tackle food poverty.
- 62. Develop and deliver education programmes to reduce data illiteracy i.e. to make people understand the importance of data and its use in measuring food poverty.
- 63. Fund social services and food donation activities to improve access to food for vulnerable populations.
- 64. Provide targeted support, both financial and administrative for food banks to scale up food recovery and redistribution, to reduce food waste and minimise food insecurity.
- 65. Prioritise advocacy and awareness raising activities relating to food poverty and food donation to tackle the issue of food insecurity.
- 66. Collaborate with HORICA and the catering sector, to improve food assistance programmes and reduce food waste.
- 67. Work on food waste systematically, collaborating with the entire food system to reduce food waste at each stage of the food supply chain. Food waste can wipe out any progress made in other areas.
- 68. Prioritise the redistribution of surplus food to minimise waste while simultaneously feeding food insecure individuals.
- 69. Develop of incentives for reductions in food waste, both within the food system and among consumers.
- 70. Provide leadership in the improvement of food distribution systems, to prevent food supply disruptions, minimise transport times for food and promote shorter supply chains.
- 71. Prioritise circular food systems within the next 3–5 years.

Improve consumer trust in the food system

- 72. Advocate for independent, reliable, accurate & clear food labels for consumers to improve trust in the food system and its actors.
- 73. Help establish EU-wide labels that are used by all the producers, which are regularly controlled, to improve label integrity and consumer trust.
- 74. Develop an app and online platform to provide detailed information of food products for consumers including database creation, platform and app development, set up and testing.
- 75. Facilitate gap analysis and integration of existing data relating to food products in order to combine and relay the information in a consumer-friendly manner.
- 76. Promote “app ambassadors” to influence consumers to engage with platform & app.
- 77. Form collaborations with independent organisations to create app standards & quality stamp in order to improve the integrity of the data and build consumer confidence in the information they receive.
- 78. Scope all available data relating to food products, within the next three years, to assess and compare current legal standards surrounding food labels in order to capture best practice.
- 79. Develop facilitated programmes of consultations and workshops for food businesses for adherence to labelling standards.
- 80. Inform consumers on potential new standards and interpretation of food labels, to improve consumer confidence in assessing food product labels to make informed choices.
- 81. Consider consumer engagement, advocacy and trust testing in relation to these potential new labelling standards and through consumer observatories could assess consumer response to new labelling and its influence on decision making.

6.6.2 Key opportunity areas for a fully transparent, resilient and fair food system

The recommendations below are based on the four priority areas of opportunity identified in the roadmapping workshop. They reflect the potential ways EIT Food can contribute to the achieving these opportunities, many of which will be enabled by the previous recommendations made based on the key enablers of a fully transparent, resilient and fair food system.

Resilient & sustainable farming practices

- 82. Prioritise providing practice orientated education and training for farmers to enable them to perform sustainably within the next 3 years.
- 83. Facilitate youth connection and education to promote interest in and uptake of farming jobs, in the next 3–5 years, to increase the labour and skills availability within the food system and promote resilience.
- 84. Engage with consumers to connect rural and urban consumers to farming within the next 1–2 years.
- 85. Support industry front runner demonstrations for resilient and sustainable farming, promoting role models for the adoption of best practices and promote further uptake among farmers to achieve more resilience and sustainability in the food supply chain.
- 86. Provide funding support for Living Labs and sustainable practice demonstrations for farmers in the next 3–5 years to improve the implementation of sustainable and resilient practices.
- 87. Undertake science-based lobbying for sustainable & resilient practices, to build awareness of their need and increase uptake of such practices.
- 88. Develop better forecasting models, in the next 3–5 years, to determine the optimum type of plants or animals on specific areas/soil/weather and focus on new agronomic systems. This will assist farmers with their production and ensure efficient practices to promote continued food supply.
- 89. Promote/support precision farming to reduce chemicals to land and improve soil quality, helping to ensure food production and availability.
- 90. Promote alternative protein sources, to reduce the reliance on resource intensive farming practices and ensure more sustainable food production.
- 91. Promote diversified farming systems among primary producers, in the next 3–5 years, to reduce their reliance on a small number of products and help improve the resilience of primary producers.
- 92. Diversify company structures and get more players involved to destroy monopolies over farmers, to improve their income and resilience.
- 93. Encourage the use of waste resources on farm, and improved water management, to improve the sustainability of farming, over the next 3–5 years. This is extremely important.
- 94. Engage widely with partners involved with alternative energy sources, in particular on farms. It should facilitate information sharing tools and building of community with the possibility of farms being able to self-supply energy, building their resilience in times of power outages for example.

Urban integration of food

95. Support geo-mapping of food in urban areas, over the next 3–5 years, to identify potential urban integration of food supply chains.
96. Support the procurement of data on current urban integration activities to identify best practices and promote adoption across Europe.
97. Run public engagement events within cities and on farm community events to engage the public in the urban integration of food.
98. Provide business creation and entrepreneurship support for farmers making the transition to urban/local food production supply chains within the next 5 years.
99. Advocate to increase political interest and commitment to the need for urban integration of food.
100. Facilitate collaboration with professional changemaking organisations (e.g. NGOs) to structure projects on Living Labs and have them piloted within 10 different cities within the next 5–10 years.
101. Facilitate the formation of co-operatives for farmers, production and distribution actors to ensure consistent and effective implementation of urban integration activities.
102. Support for city councils in adopting agendas and joining food councils within the next 5 years.

Extended producer responsibility, true cost accounting and sustainable packaging

103. Consider defining EPR (extended producer responsibility) and linking this to data sharing along the supply chain within the next 3–5 years.
104. Facilitate the detailed mapping of all supply chain open data sources, to improve transparency along the supply chain and identify areas in which sustainability and resilience can be improved.
105. Help develop an open and accurate database for LCA and automation LCA along the supply chain within the next 5 years.
106. Support innovation for the integration of IT systems, tested and evaluated within the supply chain, to improve supply chain traceability and transparency.
107. Develop of new sensors along the supply chain and facilitate the agreement of new accounting models globally, over the next 3–5 years.
108. Run public engagement initiatives to improve awareness of extended producer responsibility and true cost accounting, what this means for them as consumers and the food system, over the next 3 years.
109. Collaborate with tech experts for big data management and formulate a work partnership with B Corp within the next 5 years.
110. Advocate with the EU Commission and WEF to increase awareness of the importance of EPR and true cost accounting and the benefits of its implementation within the food system.
111. Advocate for the adoption of true cost accounting model into policy to increase its implementation by food businesses.
112. Lead in promoting extended producer responsibility as a compulsory element of food production.

Radical Transformation of Food System & New Retail Models

113. Identify and set maximum sustainability indicator levels to provide an overview of the sustainability of food products, within the next 5 years.
114. Promote role model food companies for implementation of sustainability labelling, to provide guidance on how to implement sustainable practices along the supply chain.
115. Support innovation for new and upgraded technologies to produce food sustainably, to assist with improving the overall sustainability of food products and supply chains, within the next 5 years.
116. Support innovation in the use of artificial intelligence models for measuring sustainability impact of supply chains, to help improve the reliability of sustainability indicator levels.
117. Facilitate collaboration between the energy sector and food production sector, to improve sustainability within the food supply chain, within the next 5 years.
118. Advocate for mandatory sustainability labelling to improve transparency along the supply chain and help consumers make informed choices based on the sustainability of food products.

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Appendices

All appendices can be downloaded from <https://www.eitfood.eu/download-reports/fair-resilient-systems>

1. Literature review
2. Questionnaire
3. Interviews
4. Roadmap
5. Relevant case studies for mission

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