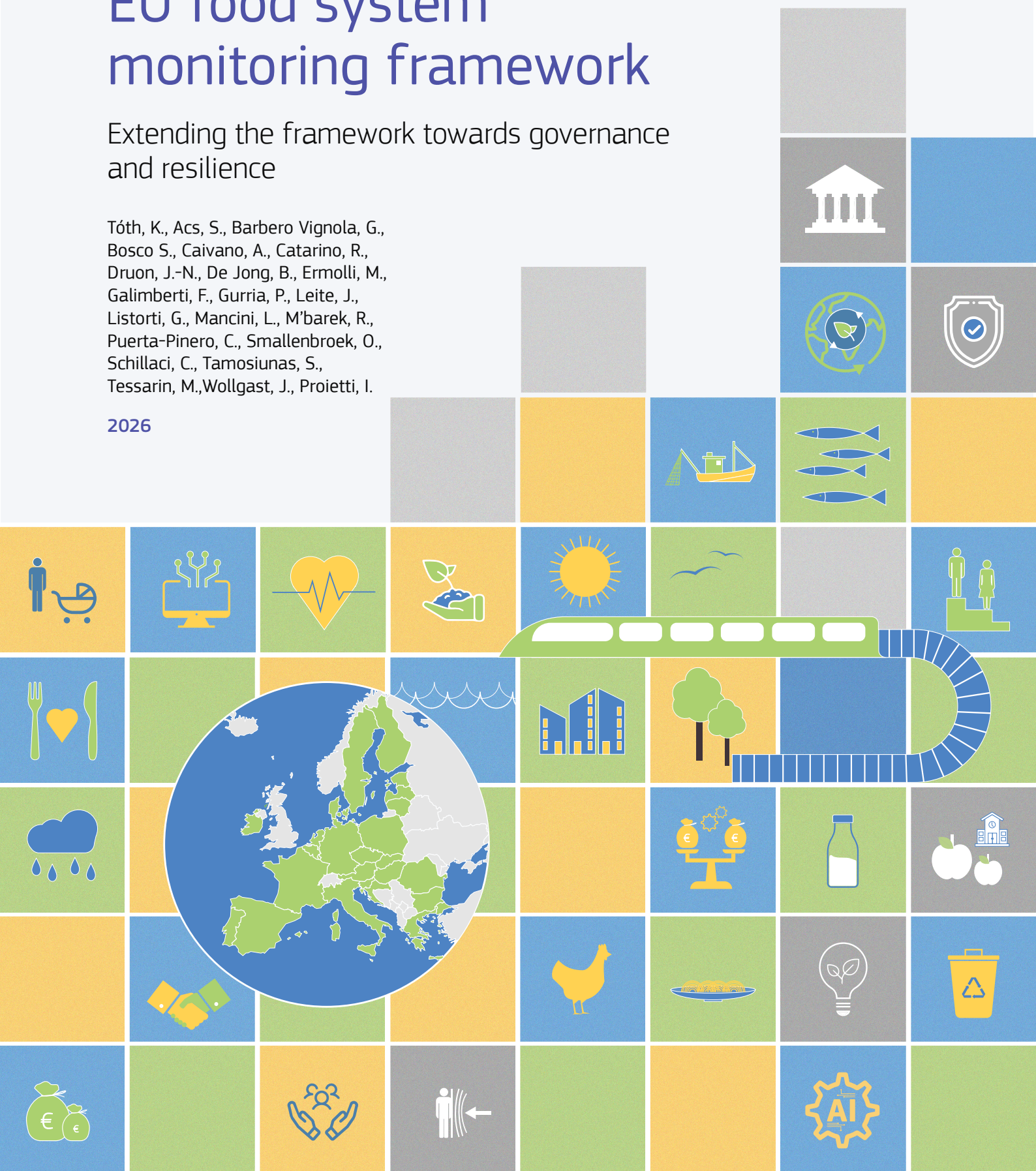


EU food system monitoring framework

Extending the framework towards governance
and resilience

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Abstract

The EU Food System Monitoring Dashboard supports EU initiatives by integrating knowledge on primary production, processing, distribution and consumption, including the health impacts of diets.

The first version of the monitoring framework was released in November 2024 by the Joint Research Centre, the European Commission service providing evidence-based science and knowledge to support EU policies. It provides information on the progress towards a fair, healthy and environmentally friendly food system, built on a set of environmental, economic and social (including health and animal welfare) indicators. Since then, almost 400 datasets have been assessed in terms of their suitability for producing indicators for monitoring, including data from public sector, market research and non-governmental organisations, and scientific results. The selected indicators have been visualised in a monitoring dashboard that was last updated in November 2025.

This report summarises the main steps taken to further develop the system, which targeted three main areas. First, the conceptual framework was extended to develop principles to monitor resilience and governance on a pathway towards sustainability. Second, persisting data gaps were addressed, which resulted in 35 new indicators, mainly in the social dimension and the Governance and Resilience thematic areas. Third, we improved the navigability of the dashboard by grouping the indicators, and we investigated the option of introducing composite indicators.

The data in the dashboard offer policymakers, stakeholders and citizens relevant information about the sustainability of the EU food system. Considering the significant impact of the food system on the EU's economy and citizens, the monitoring tool provides the systemic approach necessary to simultaneously address competitiveness, the environment and health in the EU.

Foreword

The EU Food System Monitoring Dashboard was launched in November 2024, containing 44 headline indicators that track the transition towards a sustainable food system in the EU. It integrates data on primary production, processing, distribution and consumption, including the health impacts of diets. The conceptual framework behind the dashboard also revealed knowledge gaps, thus outlining the direction for further research. In November 2025, the dashboard was upgraded to include an additional 15 indicators, improving the balance between the environmental, economic and social dimensions.

This report describes the developments since the last upgrade of the dashboard, which include the introduction of governance and resilience as new Horizontal thematic areas to strengthen the framework's capacity to interpret cross-cutting drivers and preparedness across the food system.

Readers interested in the details of earlier developments (the food system model, the quality assessment framework used for indicator selection, documentation of the previous indicators) are invited to consult the dashboard and the first ⁽¹⁾ and second ⁽²⁾ technical reports. The dashboard displays the essential metadata of all the indicators, while the two reports provide additional scientific and policy considerations of the indicator selection. To orientate the reader, **Table 22** points to where in the earlier reports the indicators are described in detail.

⁽¹⁾ <https://publications.jrc.ec.europa.eu/repository/handle/JRC137971>.

⁽²⁾ <https://publications.jrc.ec.europa.eu/repository/handle/JRC143237>.

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Executive summary

Policy context

The EU Food System Monitoring Dashboard supports EU initiatives by integrating knowledge on primary production, processing, distribution and consumption, including the health impacts of diets. These EU initiatives include the vision for agriculture and food, the competitiveness compass, the bioeconomy strategy, the European ocean pact, the strategy on European water resilience and efforts to meet biodiversity and climate commitments and promote preventive health via Europe's beating cancer plan and the EU cardiovascular health plan (the safe hearts plan). It reveals interconnections between different EU policies, thereby highlighting their collective impact on food system sustainability. These policies focus partly or mainly on food security, food sovereignty, innovation and competitiveness, environmental sustainability, climate change and resilience, health promotion and integrated governance, which are critical components of a sustainable food system.

By providing policymakers and all stakeholders with evidence-based data, the dashboard underpins science-informed decision-making that is pivotal to achieving EU policy goals and contributing to global ambitions such as the sustainable development goals, given their impact on the EU food system.

Key conclusions

The EU Food System Monitoring Dashboard, launched in November 2024, has quickly become a consolidated resource for stakeholders, with over 16 000 accesses to date ⁽³⁾. The dashboard provides a holistic view of the EU food system's sustainability, encompassing environmental, economic and social dimensions, including health aspects. It also covers the entire food chain, from primary food production to food waste, including food processing, distribution and consumption. By gathering and harmonising data from diverse public and private sources, and the Joint Research Centre's own research, the dashboard currently hosts 99 indicators, which are key to assessing the complex interactions, synergies and trade-offs within the system.

The information technology solutions developed for the dashboard contribute to data interoperability and advanced knowledge sharing and management, enhancing the transparency of food system information, which in turn builds trust and promotes cooperation among stakeholders.

Main findings

The current upgrade of the dashboard addresses the previously identified knowledge gaps and provides a more nuanced understanding of the EU food system. By incorporating innovative approaches, new data sources, updated methodologies (including the horizontal thematic areas) and advanced technologies, such as earth observation and big data processing, the upgraded dashboard offers a more comprehensive picture of the food system. The integration and development of new indicators and novel frameworks, designed to assess the overall resilience and governance of the system, will enable stakeholders to better navigate the complexities of the food system, anticipate potential risks and challenges, and make more effective decisions on policies impacting the EU food system.

⁽³⁾ As of 2 October 2026, the number of accesses was 16 423.

Related and future Joint Research Centre work

The dashboard is the result of transdisciplinary collaboration among nine units across three Joint Research Centre directorates, pooling expertise from the fields of agriculture, fisheries, biodiversity, climate change, economics, nutrition and health, and the social sciences. This integrated approach generated shared knowledge, methodological tools and a unique collection of harmonised data.

In addition to the continuous improvement of the indicator coverage, the main focus of future work will involve analysing the data in the dashboard in order to identify areas for improvement and innovation, leading to more coordinated policymaking and a more sustainable food system.

Quick guide

Following the introduction, which highlights the main features of the EU food system monitoring framework, Chapter 2 describes its new parts: the Governance and Resilience thematic areas. The indicators developed in the second upgrade cycle of the dashboard are described in Chapter 3, explaining their rationale and relevance to food system sustainability. Chapter 4 targets technical readers, discussing the possibility of introducing composite indicators. A statistical analysis of the indicators in the dashboard and a description of the new visualisation methods is included in Chapter 5. The report ends with conclusions about the current development phase. The annexes present additional technical details and an overview of all the indicators, with references to the technical reports where they were first discussed.

1. Introduction

‘Sustaining our quality of life: food security, water and nature’ is among the European Commission’s 2024–2029 priorities, with the goals of building a competitive and resilient agriculture and food system, safeguarding biodiversity and preparing for a changing climate ⁽⁴⁾. To achieve these goals, the Commission published ‘A vision for agriculture and food’ (COM(2025) 75 final), which specifies actions and objectives to make the EU agri-food system, including agriculture, fisheries and other actors in the food supply chain attractive, competitive, sustainable and fair for the current generation and future generations.

The EU’s vision for the agri-food system for 2040 also requires that all policies work together to boost food security and sovereignty, while preserving the natural assets of water, soil and aquatic living resources, rewarding ecosystem services beneficial to the environment, promoting a fair functioning food chain and reducing critical dependencies. Policy coherence is essential to increase the resilience of the sector to not only withstand and recover from shocks but also adapt and transform. The implementation of these policies must duly consider the societal nexus, including social inclusion, the right to food and health.

The European water resilience strategy (COM(2025) 280 final), European ocean pact (COM(2025) 281 final), EU biodiversity strategy for 2030 (COM(2020) 380 final), Nature Restoration Regulation (Regulation (EU) 2024/1991), European Climate Law (Regulation (EU) 2021/1119), zero pollution action plan (COM(2021) 400 final), Habitats Directive (Council Directive 92/43/EEC), Birds Directive (Directive 2009/147/EC), Water Framework Directive (Directive 2000/60/EC), Soil Monitoring Law (Directive (EU) 2025/2360), regulation on deforestation-free products (Regulation (EU) 2023/1115) Nitrates Directive (Council Directive 91/676/EEC), Europe’s beating cancer plan (COM(2021) 44 final) and safe hearts plan (COM(2025) 1024 final), and many other policy instruments, constitute a complex web impacting the EU food system. This complexity is further magnified by the multiplicity of actors, their interactions and their interests. Consequently, no policy decision can be made without assessing its impact on both global and local food systems. However, the relevant information is scattered.

The food 2030 research and innovation policy framework (European Commission: Directorate-General for Research and Innovation, 2017), in line with the life sciences (COM(2025) 525 final) and bioeconomy (COM(2025) 960 final) strategies, also calls for a systemic approach through its 11 implementation pathways, recognising that food is one of the most critical sectors for providing essential services to citizens and achieving environmental, economic and social sustainability. To design, implement and incentivise related strategies and improve knowledge and innovation transfer and adoption, open-source, interoperable digital tools are needed to support real-time monitoring and long-term behavioural changes (European Commission: Directorate-General for Research and Innovation, 2025).

The EU food system monitoring framework (FSMF) and the related dashboard were created to tackle this complexity and provide a single reference point for reliable information. They enable policymakers to develop actions enhancing the sustainability of the EU food system, an imperative prerequisite for food security, competitiveness, strategic sovereignty and resilience. Importantly, indicators generated using data collected from many different sources, including research by the

⁽⁴⁾ https://commission.europa.eu/priorities-2024-2029_en.

Joint Research Centre (JRC), are presented in a harmonised, well-structured way. The indicators may support the enrichment of other knowledge bases, including the EU Agri-food Chain Observatory ⁽⁵⁾, without increasing the reporting burden of the actors in the food supply chain. The new thematic areas and indicators described in this report are an important step in filling the knowledge gaps identified in the previous editions of the dashboard.

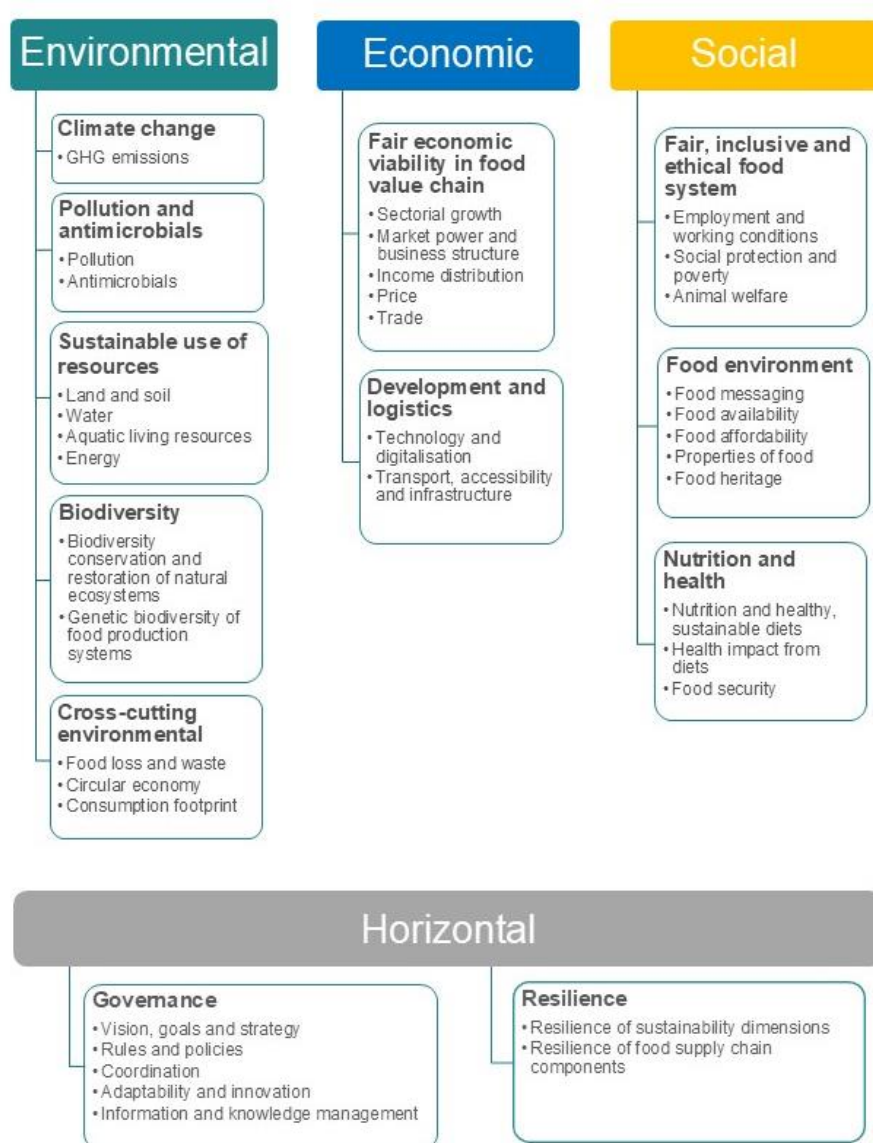
⁽⁵⁾ https://agriculture.ec.europa.eu/common-agricultural-policy/agri-food-supply-chain/afco_en.

2. Revision of the conceptual framework

2.1. Overview

The EU food system conceptual framework, as described in our first technical report, consists of the food system sustainability model and the quality assessment framework that enforces a coherent indicator selection based on harmonised metadata elements and a standardised quality scoring. While the quality assessment framework used to select indicators remained unchanged during the upgrades to the system, the conceptual model was further developed by adding two horizontal thematic areas, Governance and Resilience, and defining their domains. The upgraded model is presented in **Figure 1**.

Figure 1. Overview of the conceptual model of the EU FSMF



NB: GHG, greenhouse gas.

Source: Authors.

A more detailed presentation of the conceptual model in Unified Modelling Language is provided in **Figure 12** in **Annex 1**.

The development of the Governance and Resilience thematic areas was a major step forward that enabled the systematic collection of indicators and made these domains visible in the dashboard. In the following sections, we provide detailed insights on the development of the domains.

2.2. Governance

2.2.1. Methodological approach

As part of the horizontal thematic area, governance is recognised as a cross-cutting theme and a key driver of food system transformation (Acs et al., 2025). Its effective monitoring and evaluation require the development of a dedicated framework that creates a clear and comprehensive structure that fosters a common approach and interpretation.

The framework we have developed builds on the concept of leverage points for systems change, first developed by Meadows (1999) and further explored by Abson et al. (2017), in the context of sustainability transformation. Leverage points refer to the specific areas within a system where targeted interventions can create significant and lasting positive change towards sustainability.

The framework is organised around five domains, inspired by these leverage points, and is guided by six cross-cutting principles, as presented in **Sections 2.2.2** and **2.2.3**.

2.2.2. Domains

The domains of the Governance thematic area are structured to enable consistent tracking of all governance aspects, from overall vision to knowledge sharing, while also hosting the indicators selected for monitoring.

Accordingly, we propose the following domains.

- **Vision, goals and strategies.** Deals with the processes that define the long-term vision, direction and strategic priorities of the food system towards sustainability.
- **Rules and policies.** Refers to the formal and informal rules that govern how the food system operates, including mechanisms that ensure their effective implementation.
- **Coordination.** Describes the structures and mechanisms that enable interaction among actors, sectors and subsystems, aligned with overarching strategies and policies.
- **Adaptivity and innovation.** Aims to measure the capacity of institutions, communities and networks to adapt, innovate and reorganise, in order to drive systemic transformation towards sustainability.
- **Information and knowledge management.** Refers to the structures and processes governing the generation, flow and accessibility of reliable information, data and knowledge within the food system.

2.2.3. Additional criteria for indicator selection

In addition to the domains, the governance framework incorporates cross-cutting evaluation principles that are applicable to every domain. They ensure a homogeneous and systemic approach across the thematic area and help select the indicators.

These principles, based on the literature and refined through consultation with thematic experts, underpin good governance practices and are intended to ensure a coherent, comparable and transformative assessment across all domains. They are as follows.

- **Systems thinking and coherence.** Refers to a holistic approach that ensures coordinated actions across sectors and scales, mainstreaming a food system perspective.
- **Participation and agency.** Deals with stakeholders' involvement and their capacity to shape and influence the food system.
- **Power dynamics.** Describes the dominant formal and informal interests and actors.
- **Equity and social inclusion.** Addresses structural inequalities to ensure that vulnerable and marginalised populations are represented and included.
- **Transparency and accountability.** Focuses on clear and accessible information about decisions, responsibilities and outcomes, to support public understanding and institutional responsibility.
- **Reflectiveness and learning.** Informs about the ability to continuously learn from feedback and adapt accordingly.

The integration of these principles supports a more comprehensive and consistent approach to aid understanding of the transformative impact of governance interventions. The principles are also expected to serve as a foundation to guide stakeholder dialogue in the context of the monitoring and evaluation of actions related to food system sustainability.

This complex matrix of domains and cross-cutting principles arises from the need to deal with the dynamic and multilevel character of governance that is deeply embedded in the political and social contexts, with multilayered processes, actors and relationships. For instance, the way a policy or a strategy is designed, who is involved and how it is implemented can be as relevant as its intended scope. This approach informs not only about the objectives to be achieved, but also about the underlying power dynamics, inclusiveness and capacity for systems thinking.

2.3. Resilience

2.3.1. Context

In food systems analysis, resilience and sustainability are closely related yet conceptually distinct. Resilience describes a food system's capacity to absorb disturbances and adapt or reorganise during change while maintaining core functions (Folke et al., 2010; Walker et al., 2004). In practice, this means continuing to deliver sufficient, appropriate and accessible food over time despite stress or shocks (Tendall et al., 2015). In this sense, resilience supports sustainability by helping preserve food system functions and human well-being within biophysical limits and across generations (Schipanski et al., 2016). However, a key methodological challenge is that there is no single agreed definition of or metric for resilience (Constas et al., 2022). While proxies have been proposed (e.g.

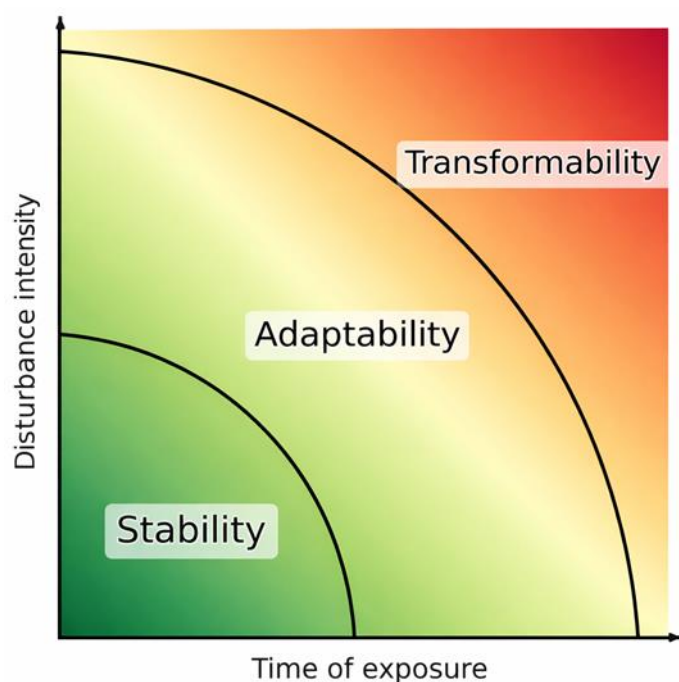
disaster losses or infrastructure-related measures), they tend to capture only partially the multidimensional nature of food system resilience and sustainability (Béné et al., 2023).

In the EU FSMF, resilience is treated as a cross-cutting horizontal thematic area (Acs et al., 2025). A high level of resilience should therefore reinforce systems that promote positive outcomes and support the transformation of systems that generate persistent negative impacts, in the present or future. In practical terms, resilience is interpreted as a set of observable signals of capacity, captured through the resilience properties of indicators included in the EU Food System Monitoring Dashboard. These indicators' properties are assessed throughout the existing FSMF architecture, that is, across the environmental, economic and social dimensions and their thematic areas. Then the results are synthesised in composite indicators (resilience scores), which are presented in the Resilience domain of the framework. This approach follows the literature, which emphasises that resilience is inherently dependent on disturbance intensity and time horizon, and that meaningful monitoring therefore requires tracking underlying mechanisms rather than relying on single proxies (Jones et al., 2021; Zurek et al., 2022).

2.3.2. Resilience property of indicators

We distinguish three core properties through which resilience is assessed: **stability**, **adaptability** and **transformability** (Figure 2). These three properties reflect increasingly profound changes in systems as disturbances become more intense and/or persistent.

Figure 2. Resilience properties across disturbance intensity and time of exposure



NB: Green indicates conditions where system stability dominates, yellow indicates where adaptability is most relevant and orange/red indicates where transformability becomes necessary under more intense and/or prolonged disturbances.

Source: Adapted from Manca et al. (2017).

Stability refers to the food system's ability to continue functioning when facing shorter-term and/or lower-intensity disruptions, such as within-season weather anomalies, short-term market

disturbances or temporary logistical stress (Urruty et al., 2016). Under stable conditions, the system can absorb these shocks while maintaining core functions (e.g. continuity of production flows, distribution and access) through minor, short-term adjustments rather than structural change (Darnhofer, 2014; Meuwissen et al., 2019). Accordingly, indicators mapped to stability should reflect the system's buffering capacity and its ability to maintain performance during short-run disturbances (Jones et al., 2021). Typical indicators would capture how strongly the system fluctuates when conditions suddenly change (e.g. production variability, price volatility, short-term disruptions in supply).

Adaptability captures the capacity to adjust practices, reallocate resources and modify configurations to maintain performance over time, when moderately intense disturbances are recurring or developing (Meuwissen et al., 2019). Adaptation implies a change in how the system operates – at the farm, supply chain or consumer level – while retaining core functions and the overall set-up of the system. This includes adjustments to shifts in agro-climatic conditions or changing consumer preferences, where reorganisation and incremental changes accumulate over periods typically exceeding one year. Indicators mapped to adaptability should reflect flexibility under recurring pressure (Jones et al., 2021). Typical signals include diversification of production systems, gradual shifts in production practices and consumption patterns, and improvements in logistics and coordination.

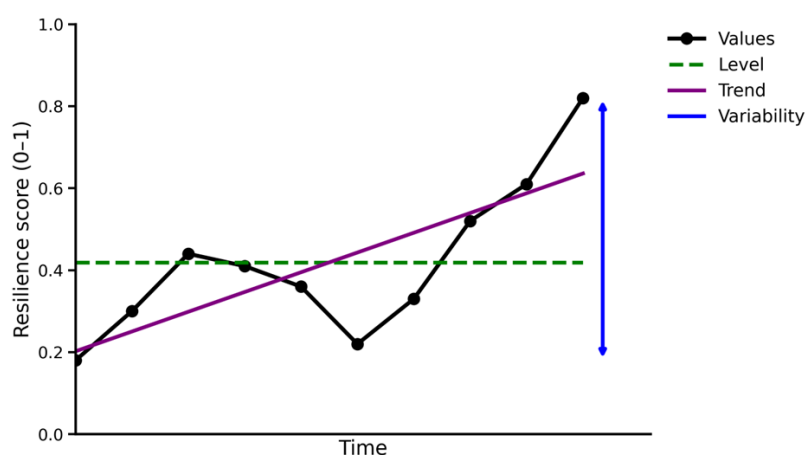
Transformability refers to the ability to fundamentally redesign key properties of the food system in response to deep, persistent challenges that render the current set-up unsustainable or no longer viable (Meuwissen et al., 2019). It involves long-term structural change, such as new production models, land use regimes, market organisation, governance arrangements (Folke et al., 2010; Zurek et al., 2022), or fundamental changes in consumers' behaviour. Transformability is thus not simply 'more adaptation', but a qualitatively different response. When incremental adjustments are insufficient, maintaining resilience may depend on the creation of new pathways under substantially changed conditions (Manca et al., 2017). Indicators mapped to transformability should point to whether the system can move away from pathways that generate negative impacts or lock-ins, towards alternative configurations that can sustain core functions under long-term pressure.

Taken together, these properties provide a structured interpretation of resilience across time horizons and disturbance intensities. To operationalise this concept, each FSMF indicator is mapped to no, one or more than one resilience property. The mapping is based on what the indicator reveals about pre-existing conditions and structural features that shape the capacity of the food system to absorb, adjust and, where needed, fundamentally reconfigure in response to shocks of different types, magnitudes and durations.

2.3.3. Direction of change, capacities and vulnerabilities

Because resilience is not static, it cannot be captured by a single annual score alone. Instead, the annual resilience scores are summarised using three complementary time series metrics – level, trend and variability – to provide a structured interpretation of how resilience develops over time (**Figure 3**). This approach is consistent with quantitative resilience and vulnerability assessments in agricultural and food systems, which characterise resilience through average performance over time, its trajectory and the stability of that trajectory (Dardonville et al., 2021, 2023; Martin et al., 2017).

Figure 3. Illustration of preparedness dynamics over time



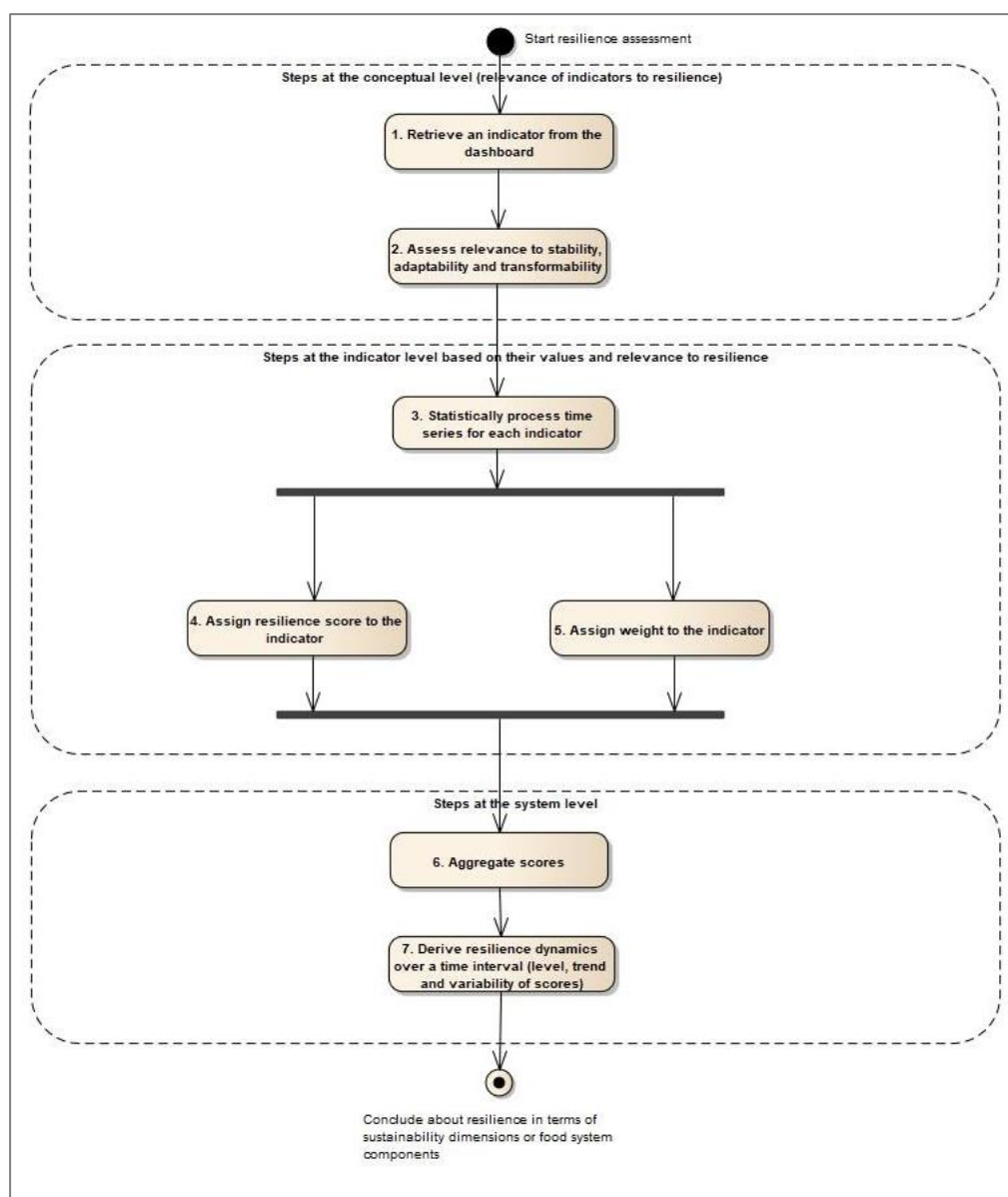
NB: The figure provides a schematic example of resilience dynamics based on annual scores. Values (black line with markers) represent the annual resilience scores for a given reporting group over time. Level (green dashed line) shows the average resilience score over the full study period (overall position). Trend (purple line) shows the linear trend fitted to the annual scores, indicating whether preparedness is strengthening or weakening over time. Variability (blue double arrow) illustrates the annual fluctuation around the average.

Source: Adapted from Dardonville et al. (2023).

2.3.4. Methodological approach

The resilience methodology translates the resilience-relevant FSMF indicators into annual resilience scores and aggregates them into a composite resilience index (0–1) that remains fully consistent with the FSMF structure (dimension → thematic area → domain). The approach preserves the original FSMF architecture and supports the interpretation of resilience as an emergent property of environmental, economic and social conditions and trajectories captured by the framework. Operationally, the methodology is implemented through the steps illustrated in **Figure 4**.

Figure 4. Steps to calculate and analyse resilience indices



Source: Authors.

As shown in the flow chart, calculating resilience scores and assessing the development of resilience of EU Member States involves the following seven steps.

- **Step 1.** Retrieve an indicator from the EU Food System Monitoring Dashboard.
- **Step 2.** Assess the conceptual relevance of the indicator to resilience. To do so, every indicator of the FSMF is mapped to the three resilience properties (stability, adaptability, transformability). FSMF headline and secondary indicators are classified as fit / not fit for each property using expert judgement, and the dataset is cleaned to retain indicators with sufficiently long time series and Member State coverage.

- **Step 3.** Statistically process the values of every indicator to reduce outliers and skewness. Outliers and strongly skewed time series are reduced through winsorisation ⁽⁶⁾ to improve comparability across indicators.
- **Step 4.** Establish a resilience score for every relevant indicator by benchmarking the values of every indicator of each Member State against the EU-27-wide distribution. Annual values are positioned within the historical EU-27 distribution for each indicator (decile based), converted to a 0–1 score and direction aligned so that higher values consistently reflect more desirable (capacity enhancing) conditions.
- **Step 5.** Apply resilience weights based on the number of properties covered. Each indicator receives a weight of 1–3 depending on how many of the resilience properties (stability, adaptability, transformability) it covers, so that indicators informing multiple properties contribute more to the aggregated signal.
- **Step 6.** For each Member State, aggregate resilience scores of all the indicators into resilience indices consistent with the FSMF hierarchy. Weighted scores are aggregated into composite resilience indices, domain → thematic area → dimension → overall, maintaining a consistent 0–1 scale and traceability to the underlying indicators.
- **Step 7.** Derive food system resilience dynamics. Annual resilience scores are summarised using level, trend and variability to describe overall preparedness, direction of change over time and year-to-year stability/volatility over the assessment period.

Overall, the methodology operationalises resilience as a cross-cutting horizontal thematic area in the EU FSMF, enabling consistent annual scoring and aggregation while remaining traceable to the underlying indicator evidence base.

2.3.5. Domains

As explained in Step 5, the aggregated resilience indices follow the hierarchical structure of the food system model. However, aggregation is meaningful only when there are multiple indicators available. Given the number and distribution of the underlying indicators currently available in the EU Food System Monitoring Dashboard, composite scores are provided only at the level of the dimensions and, where feasible, their thematic areas. In the framework, dimension-level scores will be presented as headline indicators, while scores at the thematic area level will be presented as secondary indicators.

Besides calculating the scores along the dimensions, it is possible to assess a system's resilience as a whole, providing an overall index that informs about the preparedness of the system.

⁽⁶⁾ Replacing outlier values with specific percentile values, rather than removing them.

Keeping these considerations in mind, resilience indicators will be presented under the following domains:

- Environmental resilience
- Economic resilience
- Social resilience
- Food System resilience.

The list of implemented resilience indicators is provided in **Table 13**.

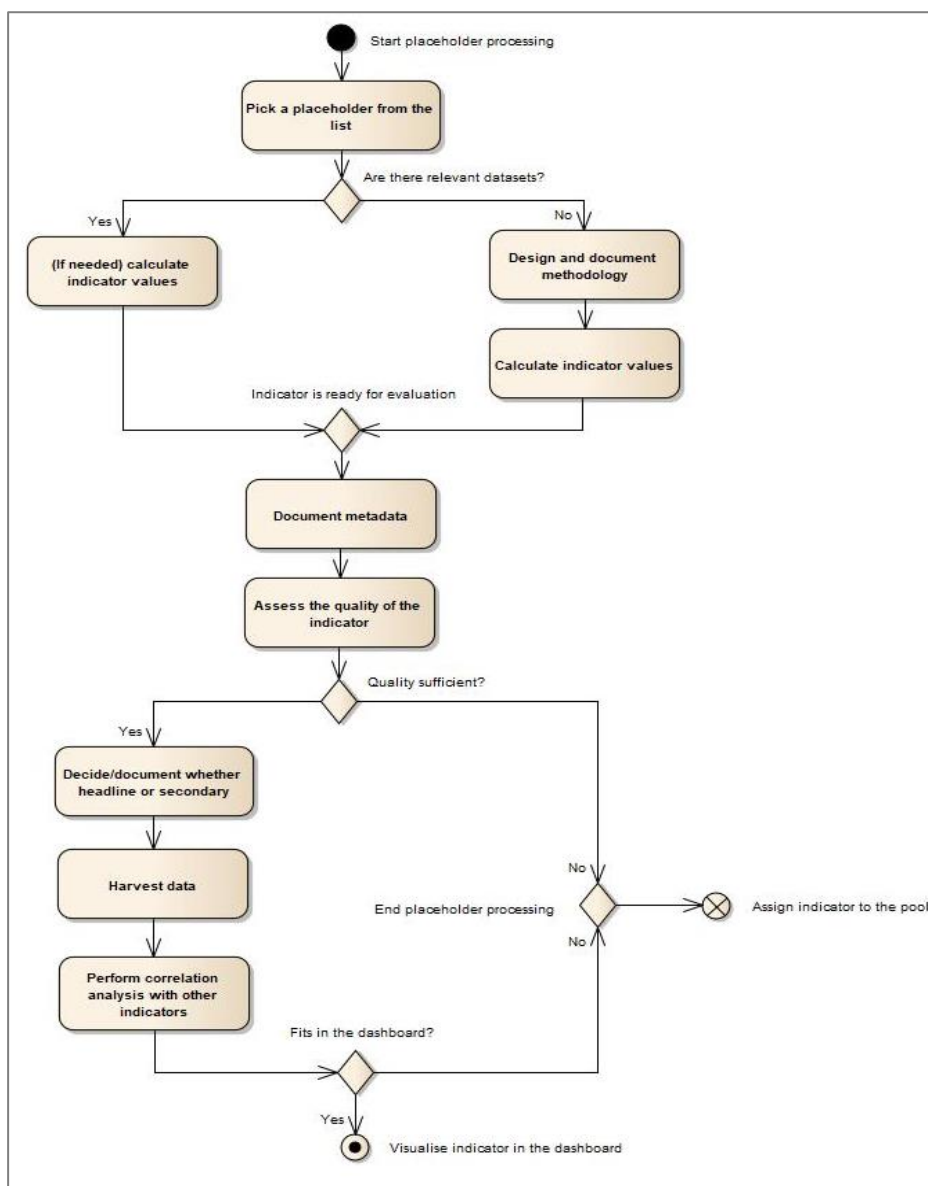
3. Indicators after the second upgrade

3.1. General principles

Since the first release of the dashboard, the methodology has been expanded to incorporate qualitative indicators, although the workflow for indicator development has not changed.

For the Governance thematic area, we have introduced dichotomous qualitative indicators that allow only two possible options: yes or no (e.g. presence or not of a national food system pathway). These new indicators complement the existing quantitative metrics, offering a clearer picture of the existence (or absence) of key governance mechanisms.

Figure 5. Steps of placeholder processing



Source: Authors.

For both quantitative and qualitative indicators, the starting point for indicator development is the set of placeholders that stems from the review of scientific literature, relevant policy documents and the subject-matter expertise of specialists involved in the project. After a feasibility study and the development of metadata, each indicator must pass a quality assessment step.

Central to the indicator selection process is the application of the quality assessment framework, which includes thematic relevance, geographical and temporal coverage and soundness. If temporal coverage cannot be defined (mainly in the case of qualitative indicators), a 'not applicable' option has been added, and this does not affect the overall assessment score.

The major processing steps for indicator development are illustrated in **Figure 5**.

The indicators that passed the quality assessment process were proposed for the dashboard. The gradually increasing number of indicators in the dashboard created the risk of (partial) repetition or losing the focus. To avoid this, an overall correlation analysis between the indicators was added to the workflow, as described in **Section 4.4**. Consequently, all the indicators already in the dashboard and the newly proposed ones were re-assessed, and, when needed, one of the following changes was applied.

- **Adding a new headline or secondary indicator** to the previous editions of the dashboard. A new headline or secondary indicator can result from the development of a previously identified placeholder (that develops into a headline or secondary indicator), the discovery of new indicators during new research or the need to aggregate two or more existing indicators.
- **Downgrading a headline indicator to a secondary indicator.** This action was taken when a newly developed indicator provided broader or more relevant information within the scope of a specific domain.
- **Downgrading an indicator to the pool.** This was applied when a placeholder indicator did not appear implementable or a secondary indicator was able to be replaced with a more robust one based on our quality assessment framework.
- **Extending the scope of an indicator.** This was applied either by adding one or more supply chain components, sectors or commodities (e.g. adding values for the fisheries sector, where only agriculture was covered in the previous version) or by adding a sub-indicator to an existing one.
- **Integrating an indicator.** This action was taken when the main parameters of the indicator (relevance, coverage, methodology) had not changed, but there was a change in the visualisation of an indicator in the dashboard (i.e. when two or more indicators were placed as sub-indicators under a common name). In such cases, the original indicators were put in the pool.
- **Modifying an indicator.** This was applied when the underlying dataset was replaced by a more suitable one or the methodology was revised.

The overview of the changes since the last edition of the dashboard in November 2025 is provided in **Table 21** in **Annex 2**. A recapitulative list of all indicators in the dashboard at the time of the writing of this report is presented in **Table 22** in **Annex 3**.

The indicator selection process also includes a consultation with the policy directorates-general (DGs) relevant to the project followed by a consultation with DG Health and Food Safety's Expert

Group on General Food Law and Sustainability of Food Systems and the Advisory Group on Sustainability of Food Systems. These steps ensure consistency across EU policies and the correction of factual errors as well as building consensus and trust through a transparent process. In this way, some of the proposed indicators can be modified or removed, and suggestions for further developments are recorded.

The following sections detail these changes and explain the rationale behind them.

3.2. Indicators of the environmental dimension

3.2.1. Implemented modifications

In the Climate change thematic area, a new indicator was developed for the greenhouse gas **-GHG emissions** domain. The new indicator, *GHG emissions from primary food production*, integrates two previously existing secondary indicators, as shown in **Table 1**. This indicator presents *GHG emissions from primary food production*, disaggregated by emission source as the sum of four sub-indicators, covering the full EU territory between 1990 and 2023.

Table 1. New and updated indicators for the climate change thematic area

Domain	Indicator	PP	FP	FD	FC
GHG emissions	GHG emissions from primary food production				
	GHG emissions from agriculture	↓			
	Net GHG emissions from LULUCF sector	I			

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; green – secondary, brown – pool, ↓ – downgraded, I – integrated.

Source: Authors.

The data for this indicator are based on the GHG inventories of the Member States irrespective of the methodological tier used. Each year, Member States submit their GHG inventories to the European Commission (DG Climate Action) and the European Environment Agency (EEA). The EEA and its European Topic Centre on Climate Change Mitigation perform quality checks, prepare the EU GHG inventory and submit it to the United Nations Framework Convention on Climate Change.

This indicator reports on the total GHG emissions (CO₂, CH₄, N₂O). It includes emissions from different categories of the GHG emission inventory (EEA, 2025a,b; IPCC, 2019):

- energy use in agriculture, forest and fisheries (category 1.A.4.c – CO₂, CH₄ and N₂O emissions);
- livestock, including enteric fermentation (category 3.A – CH₄ emissions) and manure management (category 3.B.1 – CH₄ emissions; and category 3.B.2 – N₂O emissions);
- cultivated soil (categories 3.G, 3.H, 3.I and 3.J – CO₂ emissions; categories 3.C and 3.F – CH₄ emissions; and categories 3.D and 3.F – N₂O emissions);
- land use and land use change of cropland and grassland (categories 4.B and 4.C – CO₂, CH₄ and N₂O emissions).

This indicator is intended to present the complete time series and support the interpretation of long-term trends, rather than short-term or year-to-year variations.

The indicators *Net GHG emissions from LULUCF sector* and *GHG emissions from agriculture* have been downgraded to ‘pool’, as the new indicator, GHG emissions from primary food production, includes this information in a more structured and detailed way.

The headline indicator, *GHG food systems emissions*, which is based on the Emissions Database for Global Atmospheric Research – food (EDGAR-food) dataset⁽⁷⁾, was updated with the most recent data available, for 2023 (published in 2025) and an improved description of the content. EDGAR-food is a global emission inventory of GHGs and air pollutants from food systems, developed by the JRC. EDGAR-food was conceived with the aim of understanding the activities underlying the emissions related to energy demand and use, agriculture and land use change associated with the production, distribution, consumption and disposal of food throughout the various stages and sectors of the composite global food system. Data on land use related to agriculture are from the Food and Agriculture Organization of the United Nations (FAO) database on GHG emissions (Faostat) ⁽⁸⁾. Details regarding the methodology applied are available in Crippa et al. (2021).

In the Pollution and antimicrobials thematic area, within the **Antimicrobials** domain, the methodology underpinning the indicator Sales of antimicrobials for food-producing animals has changed, as indicated in **Table 2**. This follows the transition from the European surveillance of veterinary antimicrobial consumption (ESVAC) reporting system to the European sales and use of antimicrobials for veterinary medicine (ESUAvet) framework under Regulation (EU) 2019/6.

Table 2. Indicator modification in the pollution and antimicrobials thematic area

Domain	Indicator	PP	FP	FD	FC
Antimicrobials	Sales of antimicrobials for food-producing animals	M			

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; blue – headline, M – modified.

Source: Authors.

The headline indicator Sales of antimicrobials for food-producing animals, included in the first version of the dashboard in 2024, provided data up to 2022, in accordance with the specifications of ESVAC (EMA, 2023). ESVAC was a voluntary reporting system that provided harmonised EU-level data from 2010 to 2022. From 2023 onwards, data collection and reporting were replaced by a legally mandated framework established under Regulation (EU) 2019/6. The European Medicines Agency (EMA) receives data from Member States and analyses and publishes these data in the ESUAvet annual surveillance reports and on an interactive dashboard. ESUAvet, therefore, replaced ESVAC as a reference data source from 2023.

For both ESUAvet and ESVAC indicators, the sales figures refer exclusively to substances with antibiotic activity in veterinary medicinal products intended for food-producing animals and that were formulated for systemic, intramammary or intrauterine administration.

(7) https://edgar.jrc.ec.europa.eu/edgar_food.
 (8) <https://www.fao.org/faostat/en/#data/GF>.

ESUAvet applies updated methodologies for the calculation of sales in tonnes (expressed in mg of active substance as numerator) and animal biomass (the denominator) in kilograms. Although the impact of the methodology change is low in the case of the sales numerator, it is high in the case of the biomass denominator. ESUAvet uses updated and more comprehensive food-producing animal biomass as the denominator, incorporating additional species and categories and applying updated animal weights that better align with the indicator used by the World Organisation for Animal Health. As both ESVAC and ESUAvet express animal biomass in kilograms (with 1 population correction unit (PCU) equivalent to 1 kg), these refinements affect only the denominator, resulting in lower mg/kg values under ESUAvet. Consequently, while the underlying sales data remain aligned, indicator values calculated based on ESVAC (mg/PCU) and ESUAvet (mg/kg) are not directly comparable.

EU policy objectives stipulate prudent use of antimicrobials in veterinary medicine ⁽⁹⁾. In 2020, the European Commission set an aspirational target of reducing overall EU sales of antimicrobials for farmed animals and aquaculture by 50 % by 2030 ⁽¹⁰⁾, which was reinforced in the zero pollution action plan (COM(2021) 400 final). The monitoring of the sales of antimicrobials in food-producing animals is also required in the performance monitoring and evaluation framework (PMEF) of the common agricultural policy (indicators I.28 and C.48).

For monitoring the progress towards the EU target, 2018 sales were used as the baseline, based on the ESVAC sales data and expressed in mg/PCU (ESVAC indicator). Under the current data reporting framework, sales of veterinary antimicrobials are expressed in mg/kg (ESUAvet indicator). The EMA publishes new sales data (i.e. from 2023, inclusive) in mg/kg (ESUAvet indicator) and, for the purposes of continuity in monitoring the progress towards the EU target, also in mg/PCU (analysed with the ESVAC methodology) ⁽¹¹⁾.

To ensure transparency and continuity, the EU Food System Monitoring Dashboard presents two separate sub-indicators within the headline indicator sales of antimicrobials for food-producing animals: ESVAC (mg/PCU) and ESUAvet (mg/kg). Note that archived ESVAC data for 2010–2022 remain accessible via the ESVAC dashboard, while ESUAvet data from 2023 (presented with both indicators) are available through the EMA's ESUAvet reports and dashboard.

In addition to the mandatory collection of antimicrobial sales data under Regulation (EU) 2019/6, Member States must also collect and submit to the EMA antimicrobial use data by animal species in accordance with a progressive, three-step approach. These data, which are separate from the sales data and are not part of the sales indicator, will enable greater analytical granularity in future ESUAvet outputs. The phased approach began with the collection of data for cattle, pigs, chickens and turkeys (and their specific animal categories) and will expand to encompass other food-producing species, and ultimately other animals kept or bred, namely dogs, cats and fur animals (minks and foxes).

⁽⁹⁾ https://health.ec.europa.eu/system/files/2020-01/amr_2017_action-plan_0.pdf.

⁽¹⁰⁾ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020SC0376&from=ES>.

⁽¹¹⁾ See Table A9 in EMA, *European sales and use of antimicrobials for veterinary medicine – Annual surveillance report for 2024*, Publications Office of the European Union, Luxembourg, 2024, https://www.ema.europa.eu/en/documents/report/european-sales-use-antimicrobials-veterinary-medicine-annual-surveillance-report-2024_en.pdf.

Table 3. New and updated indicators for the sustainable use of resources thematic area

Domain	Indicator	PP	FP	FD	FC
Land and soil	Global deforestation index due to EU food consumption				
	Gross nutrient balance	I			
	Gross nutrient balance – nitrogen	I			
	Gross nutrient balance – phosphorous	I			
	Soil sealing in agricultural area				
	Consumption of inorganic fertilisers	I			
	Consumption of inorganic fertilisers – nitrogen	I			
	Consumption of inorganic fertilisers – phosphorous	I			
Water	Water-use efficiency				
Aquatic living resources	Number of fish stocks with mortality above/below the level at Maximum Sustainable Yield				
	Fishing pressure relative to maximum sustainable yield	↓			
Energy	Fuel use per fish landings by the EU fleet				
	Fuel use per kg of fish landings by the EU fleet	I			

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; blue – headline, green – secondary, brown – pool, I – integrated, ↓ – downgraded.

Source: Authors.

In the Sustainable use of resources thematic area, a similar integration of indicators took place in the **Land and soil** domain, as shown in **Table 3**. The two indicators on *Gross nutrient balance*, shown separately for nitrogen and phosphorous before, were integrated into one. The same operation was performed for the indicator *Consumption of inorganic fertilisers*. These changes allow for a more compact representation to help users navigate the dashboard.

The headline indicator *Global Deforestation Index due to EU food consumption* provides an estimate of hectares of deforestation associated with net imports used to satisfy EU food demand, thereby complementing existing consumption-based indicators (e.g. consumption footprint) and supporting policy monitoring under the European Green Deal commitments. It is closely aligned with Regulation (EU) 2023/1115 on deforestation-free products, which requires improved transparency and traceability of deforestation risks embedded in EU supply chains. Methodologically, the indicator estimates deforestation occurring outside the EU driven by EU food consumption by combining trade, land use and deforestation attribution models.

Land use changes and forest loss attribution are obtained globally through earth observations and national statistics (from Faostat). Deforestation due to crops, pasture and forest plantation expansion is then obtained by applying the land use balance model (Pendrill et al., 2019). Imported quantities of food products are first translated into embedded land footprints using consumption-

based accounting approaches (De Laurentiis et al., 2024). These footprints are then spatially allocated to producing countries and linked to deforestation dynamics attributing forest loss to commodity production and trade (Patani et al., in press; Pendrill et al., 2019, 2022). This index integrates trade-embodied land demand with country-level deforestation intensities, thereby providing a robust, policy-relevant estimate of the deforestation risk embodied in EU food supply chains and enabling consistent monitoring of the progress towards deforestation-free value chains.

The headline indicator *Soil sealing in agricultural area* informs about the impact of urbanisation, transport network construction, mines and industry change on the landscape, which puts pressure on remaining areas in terms of intensification of agricultural production to maintain food security. This also reflects the growing competition for land between food production and non-agricultural uses, with profound environmental, social and economic consequences. Policy incentives, such as subsidies for development and zoning laws favouring urban growth, often prioritise economic gains over agricultural preservation, exacerbating the loss of arable land.

To develop the indicator Soil sealing in agricultural areas, the imperviousness dynamics within agricultural areas across Member States were calculated using Copernicus Land Monitoring Service high-resolution layer (HRL) data for the years 2006, 2012 and 2018 ⁽¹²⁾.

Imperviousness refers to the proportion of the land surface covered by artificial, impermeable materials such as asphalt and concrete, and buildings that prevent water infiltration into the soil. It is commonly expressed as imperviousness density (%), representing the percentage of sealed surface within a given spatial unit. Imperviousness is widely used in remote sensing and land monitoring as a quantitative proxy for soil sealing, which describes the physical covering of soil by impermeable materials resulting from urbanisation and infrastructure development. Soil sealing leads to the partial or complete loss of soil functions, including water infiltration, gas exchange, biomass production and carbon storage. Consequently, imperviousness datasets, such as the Copernicus HRL imperviousness dataset, are frequently used to quantify the dynamics of soil sealing and assess its contribution to land degradation and land take in environmental monitoring frameworks across the EU.

The HRL imperviousness product provides spatially explicit information on the percentage of sealed surface per pixel at 10 m and 100 m spatial resolution, derived from satellite imagery and harmonised across EU. We used 100 m to keep the resolution the same as the Corine Land Cover product, which is used for delineation of agricultural areas. According to the Corine Land Cover definition, 'agricultural area' (Level 1; Class 2) includes arable land, permanent crops and heterogeneous agricultural areas ⁽¹³⁾.

The indicator was computed as the change in imperviousness density ($\Delta\%$), defined as the percentage difference between each period values within the the area of land cover that according to Corine level 3 classes represent agriculture. A positive $\Delta\%$ indicates an increase in impervious surface coverage, reflecting soil sealing processes and a corresponding reduction in land suitable for agricultural use. Conversely, a negative $\Delta\%$ (rare in practice) would suggest a decrease in imperviousness, potentially indicating de-sealing or land restoration processes that may increase soil availability for agriculture.

⁽¹²⁾ <https://land.copernicus.eu/en/products/high-resolution-layer-imperviousness>.

⁽¹³⁾ <https://land.copernicus.eu/en/products/corine-land-cover/clc2018>.

Soil sealing is widely recognised as one of the most significant forms of land degradation in the EU because it leads to the largely irreversible loss of soil functions, including biomass production, water regulation, carbon storage and biodiversity support (EEA, 2019; Montanarella et al., 2021). The use of harmonised high-resolution imperviousness data therefore provides a robust basis for monitoring agricultural land loss due to sealing across Member States. This indicator was included in the EU Food System Monitoring Dashboard as a secondary indicator.

The Soil Monitoring Law is closely aligned with the objectives of the EU soil strategy for 2030 and broader EU policies aimed at reducing land take and achieving healthy soils by 2050. Within the Soil Monitoring Law, soil sealing represents a key pressure indicator for evaluating soil degradation trends associated with urban expansion, facilities and infrastructure development, and new residential areas.

A new secondary indicator was introduced in the **Water** domain: the *Water-use efficiency* in food and beverage manufacturing. Water is a cross-cutting resource necessary for food production, health, infrastructure, ecosystem protection and the economy as a whole. This central role is recognised by the European Commission's 2024–2029 priority 'sustaining our quality of life', which explicitly links water security to nature and food security ⁽¹⁴⁾, and the Commission's communication on the European water resilience strategy (COM(2025) 280 final). This indicator fills a known gap in the monitoring of the EU's food system; while much attention is traditionally paid to water abstraction in primary agriculture, the manufacturing stage remains a critical, energy-intensive component of the supply chain.

This metric directly supports the goals of the European Green Deal by tracking the decoupling of economic growth from water consumption. Furthermore, it aligns with the circular economy action plan (COM(2020) 98 final) by incentivising the food and beverage industry to adopt principles such as water recycling and reuse. By connecting water use to gross value added, the indicator answers a fundamental question: Are we producing more value with less water?

The indicator is calculated using Eurostat data: the numerator represents total water use by the food and beverage sectors ⁽¹⁵⁾, while the denominator is the sector-specific value added, sourced from Eurostat's structural business statistics ⁽¹⁶⁾.

The **Aquatic living resources** domain was enriched by a new headline indicator, *Number of fish stocks with fishing mortality above/below the level at Maximum Sustainable Yield*. This headline indicator is more relevant to the common fisheries policy ⁽¹⁷⁾ than the former headline indicator, *Fishing pressure relative to maximum sustainable yield*, as it is simpler and easier to understand, and it completely fulfils the objective of the common fisheries policy, which calls for the sustainably of all assessed fish stocks, with a target of 100 %.

In the **Energy** domain, we introduced a new indicator *Fuel use per fish landings by the EU fleet*. it replaces and consolidates the previous *Fuel use of fisheries per Kg of fish landed in ports*, which was integrated as a sub-indicator under this title. To complement the picture, we also calculated the

⁽¹⁴⁾ https://commission.europa.eu/priorities-2024-2029/quality-life_en.

⁽¹⁵⁾ https://ec.europa.eu/eurostat/databrowser/view/env_wat_ind/default/table?lang=en.

⁽¹⁶⁾ https://ec.europa.eu/eurostat/databrowser/view/sbs_na_ind_r2/default/table?lang=en.

⁽¹⁷⁾ https://oceans-and-fisheries.ec.europa.eu/policy/common-fisheries-policy-cfp_en.

fuel use relative to the value of fish landed by the EU fleet. Both sub-indicators monitor the energy efficiency of the fisheries sector, from the environmental and economic perspective, respectively.

To achieve a compact representation of information in the **Consumption footprint** domain of the Cross-cutting environmental thematic area we integrated all former secondary indicators under a modified general indicator, *Consumption footprint – Food*, which also shows the single score of all integrated consumption footprint factors, as shown in **Table 4**.

Table 4. New and updated indicators for the cross-cutting environmental thematic area

Domain	Indicator	PP	FP	FD	FC
Consumption footprint	Consumption Footprint – Food	I	I	I	I
	Consumption Footprint – Food (acidification)	I	I	I	I
	Consumption Footprint – Food (climate change)	I	I	I	I
	Consumption Footprint – Food (eutrophication, freshwater)	I	I	I	I
	Consumption Footprint – Food (eutrophication, marine)	I	I	I	I
	Consumption Footprint – Food (eutrophication, terrestrial)	I	I	I	I
	Consumption Footprint – Food (freshwater ecotoxicity)	I	I	I	I
	Consumption Footprint – Food (human toxicity, cancer)	I	I	I	I
	Consumption Footprint – Food (Human toxicity, non-cancer)	I	I	I	I
	Consumption Footprint – Food (ionising radiation)	I	I	I	I
	Consumption Footprint – Food (land use)	I	I	I	I
	Consumption Footprint – Food (ozone depletion)	I	I	I	I
	Consumption Footprint – Food (particulate matter)	I	I	I	I
	Consumption Footprint – Food (Photochemical ozone formation)	I	I	I	I
	Consumption Footprint – Food (resource use, fossil)	I	I	I	I
	Consumption Footprint – Food (resource use, minerals and metals)	I	I	I	I
	Consumption Footprint – Food (water use)	I	I	I	I

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; blue – headline, brown – pool, I – integrated.

Source: Authors.

The Consumption Footprint model and the related analysis can also be expanded by integrating social indicators, thereby enabling the assessment of social aspects related to food production and consumption across global value chains. This includes indicators related to labour conditions, health and safety, human rights and equality (Mancini et al., 2023).

3.2.2. Areas for future development

Despite the relatively good indicator coverage of the Environmental dimension, we kept several placeholder indicators on our records to respond to new policy priorities and requirements, and to fill some persisting knowledge gaps. These placeholders are listed in **Table 5**.

Table 5. Overview of gaps in the environmental dimension

Thematic area	Domain	Gaps
Pollution and antimicrobials	Pollution	Aggregated total applied toxicity of pesticides
Sustainable use of resources	Water	Water abstraction
	Water	Water storage and rainwater harvesting
	Land and soil	Combined Drought Index
	Land and soil	Combined Stress Index
	Land and soil	Crop diversity
	Land and soil	Share of agricultural land with high-diversity landscape features
	Energy	Renewable energy in the food system
Biodiversity	Biodiversity conservation and restoration of natural ecosystems	By-catch risk of sensitive marine species

Source: Authors.

There are specific areas where our understanding of environmental sustainability is limited, particularly in the Sustainable use of resources thematic area, where several domains require additional information.

In the **Pollution** domain, an indicator that better captures the potential impact of pesticide use on biodiversity is needed. Such a metric would complement the current indicators that focus on regulatory hazard classifications rather than the potential toxicity of active substances for different groups of organisms. The candidate indicator, Aggregated total applied toxicity (ATAT) (Bub et al., 2023; Schulz et al., 2021; Wolfram et al., 2026), combines applied quantities with substance- and taxa-specific toxicity weights to better approximate potential harm to non-targeted organisms than mass-based metrics. ATAT has also been adopted internationally under the Kunming–Montreal global biodiversity framework (GBF) as part of headline indicator 7.2 ⁽¹⁸⁾, supporting target 7(b) on reducing overall pesticide risk ⁽¹⁹⁾. The ATAT methodology is currently at an advanced stage of development, with the final methodology being finalised by the FAO. Once operational, country-level

⁽¹⁸⁾ <https://www.cbd.int/gbf/targets/7>.

⁽¹⁹⁾ <https://gbf-indicators.org/metadata/headline/7-2>.

information is expected to become available through Convention on Biological Diversity reporting mechanisms and the GBF indicator portal, while EU-level estimates could be compiled from Eurostat data.

At the EU level, Directive 2009/128/EC on the sustainable use of pesticides aims to reduce the risks of pesticide use to, and its impact on, human health and the environment and therefore contributes to the objectives of the GBF. In this context, harmonised risk indicators (HRIs) have been established to report on trends under the directive. The HRIs are currently under review, with ongoing work aimed at further improving the characterisation of pesticide hazards and the representativeness of pesticide use patterns, while maintaining a transparent and operational methodology and considering limitations in data availability. In addition, several Member States have developed national indicators tailored to local conditions and policy needs. Consequently, following the developments related to the HRIs is included in plans for future work.

In the **Water** domain, information on alternative sources of irrigation (such as rainwater harvesting, on-farm storage, and the use of reclaimed water) would add value. In this release, the Water domain receives a new secondary indicator (*Water use efficiency* in food and beverage manufacturing) yet would still benefit from complementary indicators capturing direct pressure on water resources and buffering capacity against drought and seasonal variability.

In this context, two candidate indicators could be implemented in the future:

- water abstraction for agriculture/irrigation, providing a direct signal of withdrawals (groundwater and surface water) and strengthening interpretation of the Water Exploitation Index plus (WEI+) by clarifying whether exploitation trends are driven by resource availability, returns or withdrawal dynamics;
- water storage and rainwater harvesting, capturing uptake/capacity of on-farm storage (ponds, reservoirs, cisterns) and harvesting systems that increase buffering against rainfall variability and drought, and thus reflecting preparedness and adaptive capacity rather than pressure.

At present, neither indicator can be implemented. For water abstraction, comparability of time series across Member States remains weak, as they compile and report abstraction data using different sources and methods. For water storage and harvesting, there is no harmonised EU dataset that consistently reports storage capacity, uptake and operational linkage to irrigation use across Member States. Future implementation would require harmonised definitions, improved completeness and comparability of sectoral abstraction data (with transparent treatment of gaps and inconsistencies), and a routine mechanism to collect and publish storage/harvesting information in a consistent way across Member States.

In the **Land and soil** domain, indicators that better capture climate-driven shocks to agricultural production and cropping system diversification are needed, as they condition resilience and the delivery of ecosystem services. The following four candidate indicators could potentially address these gaps:

- Combined Drought Index, an operational early-warning signal of agricultural drought and associated vegetation/crop stress used by the Copernicus European Drought Observatory (Cammalleri et al., 2021). The index is produced as gridded data ⁽²⁰⁾ of drought classes at 5 km spatial resolution, so turning it into a national indicator requires aggregation rules that have not yet been agreed (Cammalleri et al., 2021; Fioravanti et al., 2025).
- Combined Stress Index, a weather-based indicator that quantifies the extent to which interannual yield anomalies, relative to an expected baseline, are associated with climate hazards. It was originally developed to combine heat and water stress in order to explain annual anomalies beyond mean yield levels (Zampieri et al., 2017, 2019). The implementation of this indicator requires a standardised protocol for detrending, hazard selection and consistent spatial matching between meteorological inputs and production statistics (Zampieri et al., 2019).
- Crop diversity, already formalised in the CAP PMEF (C.22 and I.22), could be complemented in the FSMF with an earth-observation-enabled diversity signal with higher spatial granularity and stronger agroecological meaning, building on a recent EU-wide 10 m crop type mapping and multiscale diversity metrics (Machefer et al., 2024). The Copernicus HRL ‘croplands’ already provides annual 10 m crop type and cropping pattern data since 2017. However, operational integration still requires validated diversity metrics and an aggregation protocol (Machefer et al., 2024). Once these methodological elements are in place, the FSMF would gain a clearer, policy-relevant view of climate shock exposure/impacts and structural diversification, improving interpretation of land and soil pressures.
- Share of agricultural land with high-diversity landscape features is a mandatory monitoring/restoration indicator under the Nature Restoration Regulation (Regulation (EU) 2024/1991). An indicator on landscape features would enhance our understanding of the sustainability of agricultural and aquacultural production. Landscape features, including both natural (trees, ponds) and structural (hedgerows, stone walls) elements, are crucial for biodiversity and provision of ecosystem services, as they provide habitat for different species, manage water retention and contribute to preventing soil erosion. According to the EU biodiversity strategy for 2030, their share in agricultural areas must reach 10 % by 2030. As landscape features are part of PMEF indicators (I.21), the resulting data could be fed directly into the EU FSMF and dashboard. To quantify share of landscape features in accordance with the guidance of the Commission (C/2025/980, 2025), different approaches are under investigation, including earth observation (e.g. Copernicus products, such as small woody features) and the Land Use/Cover Area Frame Survey.

Energy is a fundamental element for the sustainability goal, which can be achieved by coordinated and complementary efforts in two main areas (Tóth et al., 2024), namely by:

- enhancing green energy production along the food chain;
- adopting energy-efficient solutions along the whole supply chain.

There are two indicators on energy consumption in the EU Food System Monitoring Dashboard; however, they are not stratified based on the source. Currently, such a dataset at the EU level is not

⁽²⁰⁾ Data values (drought classes) are linked to an array of regular grid cells of size 5 × 5 km.

available. In the context of the absolute GHG emission reduction targets for 2030 and 2050, companies obliged under the directive on corporate sustainability reporting (Directive (EU) 2022/2464) should describe the progress towards these targets and provide scientific evidence of their fulfilment. As GHG reduction can be achieved by an increased share of renewables in companies' energy mix, reporting under the directive may make such data available'. Furthermore, remote sensing techniques could be used in the future to map photovoltaic installations on agricultural land and possibly on the roofs of buildings in rural settings.

The indicator *Bycatch risk of sensitive marine species* is needed to assess the potential integrated risk, and not the actual impact, of incidental capture (by-catch) of sensitive species linked to seafood products in EU seas. Avoiding or limiting by-catch contributes to healthy and high-biodiversity ecosystems, sustainability in fisheries and resilience to climate change. Sensitive groups of species impacted by accidental capture include marine mammals, sea turtles, seabirds and threatened Chondrichthyes (e.g. sharks, rays and chimaeras) that are listed as prohibited by the EU or classified as vulnerable, endangered or critically endangered by the International Union for Conservation of Nature.

Due to limited data and uncertainties related to population status, by-catch rates and mortality, the indicator would focus on integrating the potential risk over time based on a productivity–susceptibility analysis in a given region or using particular fishing gear, rather than measuring actual impact at the population level. Data on by-catch may be available from International Council for the Exploration of the Sea ⁽²¹⁾ and will be thoroughly reviewed by regional experts.

3.3. Indicators of the economic dimension

3.3.1. Implemented modifications

In the economic dimension, the modifications took place in four domains of the Fair economic viability in the food value chain thematic area and in one domain of the Development and logistics thematic area, as indicated in **Table 6** and **Table 7**.

Table 6. New and updated indicators for the Fair economic viability in the food value chain thematic area

Domain	Indicator	PP	FP	FD	FC
Market power and business structure	Share of intermediate costs total agricultural output				
	Gross fixed capital formation in agriculture	↓			
	Market concentration ratio				
Income distribution	Farmers' income from agriculture compared with average wages in the general economy	↓E			

⁽²¹⁾ <https://www.ices.dk/Pages/default.aspx>.

	Labour costs in the fisheries and aquaculture value chain				
Price	Share of household spending on food and non-alcoholic beverages	E			
Trade	Import dependency				
	Balassa Index (Revealed Comparative Advantage)				

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; blue – headline, green – secondary, ↓ – downgraded from headline to secondary, E – extended.

Source: Authors.

In the **Market Power and Business Structure** domain, we introduced a new headline indicator, *Market concentration ratio*. This indicator replaced the previous headline indicator, *Gross fixed capital formation in agriculture*, now categorised as a secondary indicator. The former headline indicator was limited to the agriculture sector, while the new market concentration indicator, even if limited to the retail sector for now, will also cover other components of the food supply chain. Market concentration in food distribution is calculated as the share of retail sales of the four largest food retailers in each Member State and the EU (excluding Cyprus, Luxembourg and Malta, for which data were not available).

Data used to calculate this indicator are sourced from Euromonitor International, an independent provider of global market intelligence. The data are generated through a combination of primary, on-the-ground research and secondary analysis. Euromonitor provides comprehensive data and insights on industries, economies and consumer behaviour worldwide ⁽²²⁾. Sales data from Euromonitor are used to calculate the percentage of sales of the top four retailers of each Member State.

We also introduced *Share of intermediate costs* relative to total agricultural output as a new secondary indicator. This indicator measures the weight of intermediate costs relative to the value of agricultural output. It reflects the share of output value allocated to the purchase of external inputs used in farming, excluding wages, rent and interest. This indicator is of importance, as these intermediate costs (e.g. maintenance of machinery and buildings, and other agricultural inputs) have been on the rise. While in 2004 these expenses accounted for 18 % of total agricultural production value, by 2020 the share had risen to more than 20 % (Mubareka et al., 2025).

In the **Income distribution** domain, we added a secondary indicator: *Labour costs in the fisheries and aquaculture value chain*. It represents the ratio of the marine living resources sector labour cost (in full time equivalents) compared with the national annual average labour cost. In the same domain, we modified the indicator *Farmers' income from agriculture compared with average wages in the general economy*. As a result of stakeholder feedback, we decided to report on two different types of income for farmers. Consequently, this indicator is now shown as the following two options, which can be selected from a dropdown menu.

⁽²²⁾ <https://www.euromonitor.com/solutions/passport>.

- Agricultural entrepreneurial income per annual work unit compared with average wages in the general economy. Agricultural entrepreneurial income measures the income derived from agricultural activities that can be used for the remuneration of own production factors, that is, non-salaried (i.e. family) labour, land belonging to the agricultural holding and own capital, per unpaid (non-salaried) annual work unit. It is obtained by deducting wages, rent and interest payments from agricultural factor income.
- Agricultural entrepreneurial income plus compensation of employees per annual work unit compared with average wages in the general economy. It represents the compensation of all work (salaried and non-salaried) performed in the agriculture sector.

We have downgraded the headline indicator *Farmers' income from agriculture compared with average wages in the general economy* to a secondary indicator. This indicator offers similar insights to those of the indicator *Average salary per sector* but is limited to the primary sector in agriculture.

In the **Price** domain, we extended the coverage of the indicator *Share of household spending on food* to include non-alcoholic beverages and renamed the indicator *Share of household spending on food and non-alcoholic beverages*.

In the **Trade** domain, two new indicators were added, *Balassa Index (Revealed Comparative Advantage)* and *Import dependency*, both as secondary indicators. The Balassa Index is an indicator used to measure the degree of specialisation in a country's export structure. Based on the idea that trade patterns reflect differences in relative productivity, the index infers these differences indirectly from observed trade data. It identifies products that a country exports more intensively than the global average, thereby signalling areas of relative export strength ⁽²³⁾.

The Balassa Index is an important indicator of the competitiveness of the EU's food chain. Import dependency measures the EU's dependency on imports of key food and agricultural products. It helps assess the competitiveness and resilience of the food supply chain. The recent report of the Commission on the strengths and weaknesses of the single market and competitiveness also underscores the importance of reducing dependencies as shifts in global trade patterns reveal both the weaknesses and the strategic dependencies embedded in EU supply chains (COM(2026) 46 final).

In the **Technology and digitalisation** domain, we introduced a new indicator *Patent application in the agri-food sectors*, as a headline indicator (see **Table 7**). It provides insights into innovation dynamics within the EU, offering an overview of the patent landscape in the EU, its sectoral structure and trends. The indicator can be displayed as (1) the share of food and beverage patents out of all patents in a Member State; (2) the number of food and beverage patents; and (3) the number of food and beverage patents per population (expressed in M persons).

⁽²³⁾ <https://unctadstat.unctad.org/EN/RcaRadar.html>.

Table 7. New indicator in the Development and logistics thematic area

Domain	Indicator	PP	FP	FD	FC
Technology and digitalisation	Patent applications in the agri-food sector				

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; blue – headline indicator.

Source: Authors.

In the domain of **Transport, accessibility and infrastructure**, there have been no changes.

3.3.2. Areas for further development

As shown in **Table 8**, we plan to publish an indicator on fertiliser self-sufficiency, as it is a key indicator for security in our food systems. Introducing such an indicator would be directly aligned with the Commission’s fertiliser action plan (COM(2026) 310 final), adopted to strengthen the availability, affordability and strategic autonomy of fertilisers in the EU. However, it is challenging to find data to provide estimates of the fertiliser self-sufficiency rate.

In addition, the market concentration ratio is currently estimated only for the retail sector. We plan to extend the coverage in the future to include food manufacturing and providers of key inputs for food production. We will also perform an evaluation of the indicators in the technology and digitalisation area. This area is in constant development, and new relevant indicators may have appeared, while others may have become obsolete since the first version of the dashboard.

Table 8. Overview of gaps in the economic dimension

Thematic area	Domain	Gaps
Fair economic viability in the food value chain	Market power and business structure	Market concentration ratio for food manufacturing
	Trade	Fertiliser self-sufficiency rate

Source: Authors.

3.4. Indicators of the social dimension

The social dimension of the EU FSMF encompasses three thematic areas: Fair, inclusive and ethical food system, the Food environment, and Nutrition and health. Within this dimension, modifications have been implemented in all the thematic areas.

3.4.1. Implemented modifications

In the Fair, inclusive and ethical food system thematic area, we updated the **Employment** domain by introducing new indicators and grouping several existing ones, as shown in **Table 9**.

Table 9. New and updated indicators for the Fair, inclusive and ethical food system thematic area

Domain	Indicator	PP	FP	FD	FC
Employment	Young farmers and fishers				
	Young farm managers in agriculture	I			
	Young fishers	I			
	Employment by gender				
	Informal employment in agriculture, forestry and fisheries				
	Gender employment gap in the food sector	↓	↓	↓	↓
Social protection and poverty	People receiving food support				
	Inability to afford a proper meal				
	Assistance from food banks				
	Share of children receiving school meals				

PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; blue – headline, green – secondary, brown – pool, I – integrated, ↓ – downgraded.

Source: Authors.

In the **Employment** domain, we introduced a headline and a new secondary indicator, and upgraded one former placeholder to a secondary indicator.

The new headline indicator, *Young farmers and fishers*, replaces and consolidates the two items that were already on the dashboard: *Young farm managers in agriculture* and *Young fishers*. These two indicators became sub-indicators and were complemented by young employees in fish processing, to provide more information on the presence of young professionals across the food system. This indicator directly responds to the need to monitor the structural imbalance of the workforce that persists in the agriculture, fisheries and aquaculture sectors, which threatens long-term food security, the EU's strategic autonomy in food production and the future of EUs farming landscapes (COM(2025) 872 final).

The 2021 United Nations Food Systems Summit underscored the vital importance of creating gender-inclusive food systems, as empowering women is crucial for addressing the triple challenge faced by food systems: ensuring food security and nutrition for a growing population, supporting the livelihoods of millions in the food supply chain and achieving environmental sustainability (OECD, 2022).

The Organisation for Economic Co-operation and Development (OECD), in its 2022 report on gender and food systems, emphasises that applying a gender lens and improving sex-disaggregated evidence in food systems helps make women's contributions as workers, entrepreneurs and consumers more visible and allows policymakers to better identify and address gender inequalities across food system value chains (OECD, 2022). The report also shows that, even in OECD countries where women are active across the food system, their roles and the barriers they face are difficult to measure without better data, which limits effective policy design to advance gender equality in food systems.

Gender equality is relevant for EU food system sustainability, as it helps reveal structural inequalities across the food value chain, including differences in roles, decision-making and access to opportunities, that persist even in high-income contexts (European Commission, 2025; OECD, 2022).

The related new secondary indicator, *Employment by gender*, is an integrated indicator that incorporates the previously existing secondary indicator already in the dashboard: *Gender employment gap in the food sector*. In addition to the existing information (Crop and animal production and Manufacture of food products and beverages and related service activities), this new indicator includes data on fishing, aquaculture and fish processing. Thus, the new indicator provides a comprehensive view of gender employment statistics throughout the different sectors of the food chain.

Finally, the former placeholder, *Informal employment in agriculture, forestry and fisheries*, was promoted to a secondary indicator. This indicator measures the proportion of individuals working in agriculture, forestry and fisheries whose employment is classified as informal. Informal employment refers to working arrangements that, in practice or by law, are not subject to national labour legislation, income taxation or entitlement to social protection or other employment-related guarantees.

The European Pillar of Social Rights ⁽²⁴⁾ emphasises the need to protect workers, particularly those in precarious, seasonal and undeclared forms of employment. The indicator *Informal employment in agriculture, forestry and fisheries* aligns with the employment and social sustainability dimensions of the food system by capturing the extent of informal work in the primary sector. Informal employment can be particularly prevalent in agriculture, forestry and fisheries, where low wages and seasonal labour demand may incentivise unregistered work arrangements. From a social sustainability perspective, lower values of this indicator are desirable, as they signal stronger protection of workers' rights, improved working conditions, enhanced access to social protection and greater social inclusion.

The data source is the International Labour Organization's Ilostat database ⁽²⁵⁾. The indicator corresponds to sustainable development goal (SDG) indicator 8.3.1, Proportion of informal employment in total employment, by sex and sector (as defined by the 19th International Conference of Labour Statisticians), ensuring international comparability and methodological consistency across countries.

The **Social protection and poverty** domain appears for the first time in the dashboard, after having populated it with the first indicators. *People receiving food support* and *Inability to afford a proper meal* were selected as headline indicators, while *Assistance from food banks* and *Share of children receiving school meals* became secondary indicators.

The headline indicator, *People receiving food support*, shows the number of individuals receiving food support through EU-funded social inclusion programmes: the Fund for European Aid to the Most Deprived (FEAD) (2014–2020) and the European Social Fund Plus (ESF+) (2021–2027). Established in 2014, FEAD sought to alleviate severe forms of poverty within the EU and enhance

⁽²⁴⁾ https://employment-social-affairs.ec.europa.eu/policies-and-activities/european-pillar-social-rights-building-fairer-and-more-inclusive-european-union/european-pillar-social-rights-20-principles_en.

⁽²⁵⁾ https://ilostat ilo.org/data/?cat_mode=subject.

the social inclusion of its most deprived citizens. It offered material support and social inclusion initiatives targeted at groups identified at the national level (European Commission: Directorate-General for Employment, Social Affairs and Inclusion et al., 2022).

Since 2021, FEAD has been integrated into the ESF+ to streamline and enhance the effectiveness of social inclusion and poverty reduction efforts within the EU ⁽²⁶⁾. The ESF+ is currently the EU's primary tool for investing in people and enforcing the European Pillar of Social Rights during the 2021–2027 programming period. It supports policies to achieve full employment, enhance work quality and productivity, boost worker mobility across the Union, improve education and training, and promote social inclusion and health. Within the ESF+ monitoring framework, output indicators are measured at the level of supported people, entities, distributed food and goods, and services delivered (European Commission, 2021).

In the context of our dashboard, we focused on the number of people receiving food assistance through the programmes. The food may be provided directly (food parcels or ready-to-eat meals) or indirectly (vouchers or cards). The indicator provides absolute numbers, disaggregated by vulnerable categories of people, such as children (< 16 years for FEAD and < 18 years for ESF+), young people, the elderly (65+ years), women, migrants (plus minorities for FEAD), disabled people and homeless people, and the total number for each of these programmes.

The other new headline indicator, *Inability to afford a proper meal*, highlights dietary quality and access to key nutrients, providing insights into the broader social and economic conditions affecting health and well-being. It measures the extent to which households face financial constraints that prevent them from securing proper nutrition on a regular basis. It reflects economic hardship and food insecurity, capturing the proportion of the population unable to include meat, fish or protein-rich vegetarian equivalent in their diet every other day.

This indicator provides valuable data for assessing the effectiveness of EU initiatives such as the European Pillar of Social Rights and the European Green Deal. By offering insights into nutritional adequacy and financial constraints, it supports the development of targeted interventions that can improve food security and overall well-being, contributing to the EU's goals of building a more inclusive and equitable society, aligned with the EU's CAP and the United Nations' SDGs.

Household food insecurity is experienced by significant numbers in high-income countries and is a serious concern for health and well-being (Loopstra, 2018). According to Eurostat, in 2023, 9.5 % of the EU population was unable to afford a meal containing meat, fish or a vegetarian equivalent every second day, 1.2 percentage points higher than in 2022 (8.3 %) ⁽²⁷⁾. Social protection is central to reducing inequalities and ensuring that the most vulnerable have access to healthy, nutritious food, in line with the principles of the European Pillar of Social Rights. Direct food assistance is a critical safety net that addresses immediate food insecurity and reduces social inequalities, serving as a fundamental pillar of a fair food system.

Even though addressing household food insecurity requires targeted social policies (Loopstra, 2018; Rivera et al., 2023), addressing the challenge of household food insecurity with community-based food interventions is becoming increasingly important. Food banks connect donors with beneficiaries through their extended networks of volunteers and charities. While doing so, they also combat food

⁽²⁶⁾ <https://european-social-fund-plus.ec.europa.eu/en/news/evaluation-confirms-strong-impact-fead-support>.

⁽²⁷⁾ <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240712-1>.

waste by recovering surplus food from actors in the food supply chain, including food services and stores. This is why we decided to integrate *Assistance from food banks* as an indicator in the Social protection and poverty domain.

Food Banks may also redistribute food financed through the EU (through initiatives such as FEAD, ESF+ and the recovery assistance for cohesion and the territories of Europe); therefore, there is a partial overlap with the indicator People receiving food support. However, in 2024, EU funding covered only 6.6 % of the activities of the members of the European Food Banks Federation (FEBA) (FEBA, 2025); therefore, this indicator provides insight on an important additional aspect of the domain. The data underpinning this indicator come directly from FEBA, and the indicator values are aggregated at the EU level. However, further collaboration with FEBA may yield stratified data at the Member State level.

The other secondary indicator, *Share of children receiving school meals*, shows the percentage of children enrolled in preschool, primary school and secondary school who benefit from school-based meals programmes (UNESCO Institute for Statistics, 2025). This includes full meals, snacks and food-related support (e.g. take-home rations, vouchers or cash), regardless of whether it is provided for free or paid for. This indicator directly measures the implementation of policies aimed at improving public health and social cohesion, which are central to the European Green Deal and broader social inclusion agendas.

Free or subsidised school meals have long been considered not only a health but also a social inclusion and protection intervention, directly supporting policies like the European child guarantee ⁽²⁸⁾ by buffering the impact of poverty and thus the inability to afford healthy and nutritionally adequate meals for children from low-income families. In addition, on a global scale, this indicator is formally part of the SDG 4 monitoring framework (SDG indicator 4.a.4) and is tracked and reported to the World Food Programme and the United Nations Educational, Scientific and Cultural Organization to assess progress in access to school meals as a component of inclusive and equitable education (GCNF, 2024; UNESCO Institute for Statistics, 2025).

In the Food environment thematic area (see **Table 10**), we updated the **Food affordability** domain with a new indicator. In addition, we produced two indicators for monitoring **Food messaging** and one indicator for assessing the **Properties of Food**.

⁽²⁸⁾ https://employment-social-affairs.ec.europa.eu/policies-and-activities/social-protection-social-inclusion/addressing-poverty-and-supporting-social-inclusion/investing-children/european-child-guarantee_en.

Table 10. New indicators for the Food environment thematic area

Domain	Indicator	PP	FP	FD	FC
Food affordability	Cost of a healthy diet				
Food messaging	Share of food products with a sustainability claim				
	Share of food products with a front-of-pack nutrition label				
Properties of food	Share of food products eligible for marketing to children				

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; blue – headline indicator.

Source: Authors.

In the **Food affordability** domain, we added the indicator *Cost of a healthy diet* to complement the existing indicators. This indicator is updated by the FAO in collaboration with the World Bank, to monitor progress on people’s economic access to healthy diets that meet the dietary needs for an active and healthy life, one of the core principles embedded in the definition of food security. Therefore, the cost of a healthy diet is an important economic component of the food environment, which affects how individuals make their food choices. This indicator measures the cost of purchasing the least expensive locally available foods to meet energy requirements and food-based dietary guidelines. It is calculated for a representative person based on an energy target of 2 330 kcal/day. The data are published in the annual flagship report *The state of food security and nutrition in the world* ⁽²⁹⁾, co-authored by the FAO, the International Fund for Agricultural Development, the World Food Programme, the World Health Organization (WHO) and the United Nations Children’s Fund.

In the **Food messaging** domain, we added two headline indicators: *Share of food products with a sustainability claim* and *Share of food products with a front-of-pack nutrition label*. These indicators track the share of new food products featuring sustainability-related claims and nutrition labelling systems on the front of food packages, respectively. Together, they enable consumers to make more sustainable and healthier food choices (Cook et al., 2023; Nohlen et al., 2022; Sanye Mengual et al., 2024). They also signal how the food industry is innovating in the context of providing food information to consumers.

Both indicators were developed by the JRC using the Global New Products Database (GNPD), which includes market research data from Mintel ⁽³⁰⁾. It provides up-to-date information on newly launched food products such as information on packaging, nutrients and different types of claims. Accessing detailed information on new products enables the tracking of food innovation trends. As these data cannot capture their actual market shares or the life cycle of the products, the related indicators cannot track all products on the market but can be used as proxy metrics for trends.

To estimate the *Share of food products with a front-of-pack nutrition label*, we assessed the uptake of relevant Front-of-pack (FoP) labels among total food product launches. The JRC developed the indicator based on the typology proposed by Julia et al. (2017) and searched for labelling

⁽²⁹⁾ <https://www.fao.org/publications/fao-flagship-publications/the-state-of-food-security-and-nutrition-in-the-world/en>.

⁽³⁰⁾ <https://www.mintel.com/>.

schemes⁽³¹⁾. Several types of front-of-pack labels were considered during the development of this indicator:

- graded labels (e.g. Nutri-Score),
- colour-coded labels (e.g. the traffic light scheme),
- endorsement labels (e.g. the keyhole logo, Croatia's 'healthy living' logo, Slovenia's 'little heart' logo and Finland's heart symbol).

However, it was not possible to collect data on the uptake of numerical labels (e.g. reference intake labels, Italy's 'NutriInform battery'), as this information is not available in the GNPD dataset.

In the **Properties of Food** domain, we added the new headline indicator *Share of food products eligible for marketing to children*. This is a proxy indicator to track progress on the nutritional quality of the food offer. Properties of food refer to the characteristics of food products, including safety, sensory properties, convenience and nutritional quality. More recently, sustainability properties (the environmental and social impact associated with a food item) has been suggested as another relevant element. All these aspects of the food environment influence consumers' food choices (Downs et al., 2020; Fanzo et al., 2021) and are critical for fostering a healthier and more sustainable food environment.

The concept of product eligibility for marketing to children is based on the nutrient profile model (NPM) of the WHO (WHO, 2023). The WHO-NPM is a scientific tool used by Member States to classify food products based on their nutritional composition, with the primary purpose of restricting the marketing of unhealthy food to children. It provides thresholds for total and saturated fat, sugar and sodium across multiple food categories, indicating whether the nutrient composition of food items permits their marketing to children. We selected those categories that were previously highlighted as a priority for food reformulation. These include bread and bread products; breakfast cereals; milk-based drinks (referred to as dairy milk drinks in the WHO-NPM); juices; plant-based drinks (referred to as plant-based milks in the WHO-NPM); processed meat, poultry, fish and similar foods; savoury plant-based foods; soft drinks, bottled waters and other drinks; and yogurt, soured milk and cream, and similar foods. For juices, no product was permitted under the NPM; therefore, this category was excluded from the set of indicators.

This new indicator can support monitoring of the nutritional quality of the food offer, which is particularly relevant in the context of food reformulation and improving nutritional quality. To implement this indicator, we used the GNPD dataset comprising information on new product launches. While these data can inform about food innovation trends in the market, they do not capture the actual market shares.

In the Nutrition and health thematic area, we updated the **Nutrition and healthy, sustainable diets** domain with new indicators: *Dietary choices* and *Prevalence of infants breastfed at age 6 months* indicator. We have also made some updates to the indicators on *Prevalence of overweight and obesity* as summarised in **Table 11**.

⁽³¹⁾ https://food.ec.europa.eu/food-safety/labelling-and-nutrition/food-information-consumers-legislation/nutrition-labelling_en.

Table 11. New and updated indicators for the Nutrition and health thematic area

Domain	Indicator	PP	FP	FD	FC
Nutrition and healthy, sustainable diets	Dietary choices				
	Prevalence of infants breastfed at age 6 months				
Health impacts of diets	Prevalence of overweight and obesity				
	Prevalence of overweight and obesity among adults				I
	Prevalence of overweight and obesity among children (aged 6 to 9 years)				I
	Prevalence of overweight and obesity among children (<5 years)				I

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; blue – headline, green – secondary, brown – pool, I – integrated.

Source: Authors.

To better characterise consumers' behaviour concerning nutrition and health, the indicator *Dietary choices* was introduced. From an environmental sustainability point of view, a shift to healthy diets can lead to a reduction in GHG emissions, mitigate eutrophication and optimise land use (Garnett, 2014; Mubareka et al., 2025). Diets with reduced animal-based foods and an increase in plant-based foods also have known health benefits (Andrews et al., 2025). Adopting a plant-based diet can significantly improve health by boosting fibre and essential vitamin and mineral intake, while reducing saturated fat consumption can prevent obesity and obesity-related diseases and promote cardiovascular health.

The data provided in the EU food system dashboard come from the global consumer insights compiled by Statista ⁽³²⁾. From these data we extracted the main dietary choices (vegan, vegetarian, pescatarian and flexitarian) that are accepted to be more sustainable than meat diets (Gibbs et al., 2022; Philippidis et al., 2021).

The indicator *Prevalence of infants breastfed at age 6 months* is critical for assessing infant nutrition and health and for evaluating public health initiatives aimed at promoting breastfeeding (Kopcsó et al., 2022). It reflects the proportion of infants who continue to be breastfed at six months of age, regardless of whether they are exclusively breastfed or receive complementary foods. Continued breastfeeding supports optimal infant and young child feeding practices, in line with the WHO recommendation to exclusively breastfeed for the first six months and to continue breastfeeding up to two years or beyond, alongside feeding your child nutritionally adequate and safe complementary foods. Breastfeeding supports the achievement of SDG 2 (zero hunger) by improving nutrition and helping to eliminate hunger, and SDG 3 (good health and well-being), as it promotes healthy lives and well-being for infants and reduces child mortality. Higher rates of

⁽³²⁾ https://www.statista.com/download/Statista_Consumer_Insights_Methodology_EN.pdf.

breastfeeding at six months are associated with better health outcomes for infants (Patnode et al., 2025) and can cut healthcare costs ⁽³³⁾; thus, a positive indicator direction is desirable.

In the **Health impacts of diets** domain, we updated the indicator *Prevalence of overweight and obesity among children* (aged 6 to 9 years) with new data from the latest round (2022–2024) of the WHO European childhood obesity surveillance initiative (WHO, 2024). To make better use of the data collected and provide wider timelines, we included data for boys and girls reported in previous rounds. In addition, the three former indicators on obesity and overweight have been integrated into a single indicator, *Prevalence of overweight and obesity*. This is now an aggregated indicator with three sub-indicators, showing the percentage of impacted population across age groups (adults, children aged less than five years, children aged six to nine years). The methodology and the data content of this integrated indicator have not changed since the previous edition of the dashboard.

3.4.2. Areas for further development

The areas for further development in the social dimension are summarised in **Table 12**.

Table 12. Overview of gaps in the social dimension

Thematic area	Domain	Gaps
Fair, inclusive and ethical food system	Animal welfare	Animal welfare (on the farm, during transport and at slaughter)
Food environment	Properties of food	Sales of specific food groups
Nutrition and health	Health impacts of diets	Non-communicable diseases associated with diets
	Nutrition and healthy, sustainable diets	Consumption of fruit and vegetables by sex, age and income quintile

Source: Authors.

An early recognised but long-standing gap of the EU FSMF is related to the **Animal welfare** domain. The EU identifies animals as sentient beings, and EU citizens are increasingly concerned about the well-being of food-producing animals. Establishing the actual state of the welfare of animals is complex, as it depends on factors such as their health, environment and ability to express natural behaviour (The Royal (Dick) School of Veterinary Studies, 2017). During previous consultations, stakeholders recommended several datasets to support the development of indicators related to animal welfare. However, the majority of these suggestions referred to animal health databases (currently not in the scope of our framework) or to initiatives that have not yet been launched.

In the absence of directly reported animal welfare data, proxy indicators provide an alternative approach. We explored whether compliance with animal welfare legislation (Council Directive 98/58/EC; Council Directive 1999/74/EC; Council Directive 2007/43/EC; Council Directive 2008/120/EC; Council Directive 2008/119/EC; Council Regulation (EC) No 1/2005; and Council Regulation (EC) No 1099/2009) and official controls legislation (Regulation (EU) 2017/625 and Regulation (EU) 2019/723) would be fit for this purpose. Since animal welfare controls by Member

⁽³³⁾ <https://www.unicef.org/eca/reports/breastfeeding-europe-and-central-asia>.

States are based on risk-based sampling, the reported data are not suitable for establishing a sound methodology to extrapolate the results for the total animal population.

In addition, using compliance as an indicator would implicitly assume that current EU animal welfare legislation fully captures the desired level of welfare. However, considering the latest scientific evidence, this assumption is not valid (Di Concetto, 2025; Mc Loughlin, 2026). The ongoing modernisation of EU animal welfare legislation⁽³⁴⁾, which includes animal welfare indicators as part of the measures assessed, and the forthcoming reporting of integrated farm statistics (module 3 – animal housing) under Regulation (EU) 2024/2914 have the potential to improve the current situation when scarcity of data prevails.

Access to data and knowledge for systematic monitoring of the **Food environment** remains a challenge. Addressing current knowledge gaps is an opportunity for the JRC and for research and innovation initiatives to enhance progress in this area. Work could potentially be developed in the context of the properties of food domain, regarding sales or retail value of specific food groups (e.g. ultra-processed, vegan/vegetarian). The share of new products with vegan/vegetarian claims could also be a proxy for how innovation is focusing on the development of new products suitable for more environmentally sustainable dietary patterns. The JRC is continuing to explore new methods to provide metrics of the affordability of healthy diets more suited to the EU context.

Some additional indicators in the Thematic Area of **Nutrition and health** could be related to non-communicable disease metrics, as unhealthy diets are among their main modifiable risk factors.

To further develop the **Nutrition and healthy, sustainable diets** domain, data from EU Statistics on Income and Living Conditions⁽³⁵⁾ could be considered. It collects self-reported data on the frequency of consumption of fruit and vegetables. While national dietary surveys are the preferred source of information on food consumption, the indicator daily consumption of fruit and vegetables by sex, age, and income quintile could provide insights on inequalities in the consumption of these specific food groups. These candidate indicators, if developed, would probably be considered secondary indicators.

3.5. Indicators of the horizontal thematic areas

Two thematic areas, Governance and Resilience, were classified as horizontal, as they encompass all the sustainability dimensions of the food system. After defining the domains and the specific indicator selection methods described in **Section 2.3.3**, the indicators were either chosen from existing ones or explicitly developed and calculated for the EU FSMF.

3.5.1. Implemented developments

After developing the conceptual framework for Governance, we started the indicator development in this thematic area. Even though the criteria for indicator selection, especially in the **Rules and policies** domain, still require further refinement, a strategic decision was made to include at least

⁽³⁴⁾ https://food.ec.europa.eu/animals/animal-welfare/evaluations-and-impact-assessment/revision-eu-animal-welfare-legislation_en.

⁽³⁵⁾ [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_statistics_on_income_and_living_conditions_\(EU-SILC\)_methodology_-_introduction](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=EU_statistics_on_income_and_living_conditions_(EU-SILC)_methodology_-_introduction).

one indicator in each domain. This approach ensures comprehensive thematic representation within the current dashboard. Consequently, the indicators included in **Table 13**, and particularly their category (headline or secondary), may change as the framework continues to develop.

Table 13. New indicators for the Governance thematic area

Domain	Indicator	PP	FP	FD	FC
Vision, goals, and strategies	Presence of a national food system pathway				
Rules and policies	School fruit, vegetables and milk schemes				
Coordination	Number of local action groups				
Adaptability and innovation	EIC-funded innovation in the agri-food sector				
	Food banks in the EU				
Information and knowledge management	Open data inventory score				
	Active EIP- Operational Groups				

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; EIC, European Innovation Council; EIP-agri, European Innovation Partnership for Agricultural Productivity and Sustainability; blue – headline, green – secondary.

Source: Authors.

Within the **Vision, goals, and strategies** domain, the indicator *Presence of a national food system pathway* has been inserted as a headline indicator. It refers to the existence of an officially adopted, government-led pathway document that sets out a country's long-term vision and measurable targets for transforming its entire food system. It is based on the general overview of the themes and means of implementation reported by countries to the United Nations Food Systems Coordination Hub.

An effective pathway document establishes clear priorities and accountability of actors, guiding governance in alignment with global objectives. Such a framework directs strategic efforts to nourish all people through healthy diets, boost nature-based solutions for sustainable production and advance equitable livelihoods for all stakeholders. By building systemic resilience against shocks and strengthening the means of implementation, including finance, data and innovation, the process translates these thematic priorities into a unified and actionable national policy (UN Food Systems Coordination Hub, 2025).

According to our analysis, the **Rules and policies** domain is one of the most difficult domains to monitor, due to the multiplicity of policy areas that impact the sustainability of the food system. In principle, every thematic indicator could be coupled with one or more related policy indicators. However, including too many indicators in this domain would create more noise than clarity. Therefore, we should focus on policies that lever systemic change towards sustainability. This approach requires a detailed analysis of the policy landscape to distil objective criteria for selecting those policies that are the most transversal and impactful. This work is ongoing, applying the cross-cutting assessment principles described in **Section 2.3.3**. Therefore, the current edition of the dashboard and this technical report cannot give a comprehensive overview of the domain. Nevertheless, to start with, we selected the indicator *School fruit, vegetables and milk schemes*, as it is a transversal policy measure that is implemented in the EU, as stipulated by EU law.

It is well known that the food environment during childhood plays a role in shaping eating preferences (Meshkovska et al., 2024). For the past two decades, the percentage of European

children who consume fruit daily has remained at around 40 % (Williams et al., 2020; Zolfaghari et al., 2022). Schools have been identified as an important setting in influencing children's health and eating habits, leading to various nutrition interventions (Jourdan et al., 2021; Meshkovska et al., 2024; Sawyer et al., 2021). The EU school scheme aims to support viable food production and promote healthy eating habits among children by encouraging the consumption of fruit and vegetables, milk and certain milk products in schools. The scheme supports the distribution of food products and the provision of information and education on healthy eating from nursery to secondary school. The food products distributed respond to the nutritional needs of the children, in line with their local availability and seasonality. The participating Member States draw up a strategy, at the national or regional level, covering a period of six years, and may allocate funds in addition to those received from the EU.

The indicator *School fruit, vegetables and milk scheme* monitors the budgetary allocations for a transversal policy implementation that aligns objectives of the CAP (market stability of primary producers), promoting healthier diets for children and their social protection. In addition to the short-term objectives, it is an investment in the future through the educative features of the programme.

In the **Coordination** domain, we included the indicator *Number of Local Action Groups* (LAGs). LAGs are partnerships formed within the framework of the LEADER approach ⁽³⁶⁾, which is part of the EU's rural development policy within the CAP. This indicator is pivotal to monitoring how 'bottom-up' governance drives the transition towards sustainable food systems. LAGs facilitate short supply chains of local food, promote bioeconomy initiatives and ensure social inclusion, making them indispensable for making food systems more sustainable and inclusive at the local level ⁽³⁷⁾. This indicator measures the number of LAGs at the national level, which are cross-sector partnerships that empower communities to lead their own development. By bridging the gap between local government, the private sector and civil society, these groups ensure a 'bottom-up' approach to rural growth. Mapping LAGs enables assessment of community engagement and the decentralisation of funding across a Member State's rural and coastal areas.

In the **Adaptability and innovation thematic area**, we included the headline indicator *EIC-funded innovation in the agri-food sector* and the secondary indicator *Food banks in the EU*.

The headline indicator *EIC-funded innovation in the agri-food sector* tracks the number and value of projects funded by the EIC ⁽³⁸⁾. Under Horizon Europe, these projects are categorised into the three core programmes of the EIC: the EIC pathfinder programme for early-stage visionary research, the EIC transition programme to bridge the gap from laboratory results to business applications, and the EIC accelerator programme, which provides blended finance for start-ups and small and medium-sized enterprises to scale up breakthrough innovations to the market. The EIC offers funding to a diverse range of participants, including universities, research institutes, public bodies and private companies like start-ups and small and medium-sized enterprises. Currently, the indicator reports on the total number of projects and the amount of funding per Member State, but we aim to add more details in the next upgrade, including a disaggregation by agri-food sector.

The secondary indicator *Food banks in the EU* informs about the activities of the Food banks across the EU. Food banks are non-profit, charitable organisations that connect donors and needy people

⁽³⁶⁾ Leader is an acronym derived from the French phrase *liaison entre actions de développement de l'économie rurale*, meaning 'links between activities (or actions) for the development of rural economy'.

⁽³⁷⁾ https://eu-cap-network.ec.europa.eu/publications/local-networks-lasting-impact-how-leader-builds-social-capital_en.

⁽³⁸⁾ https://eic.ec.europa.eu/index_en.

by mobilising volunteers, running the necessary facilities and organising the logistics. They are one of the social innovations associated mitigating with food loss and waste, and the delivery of food to underserved groups (Indrawan et al., 2025). Food banks contribute to the adaptability of society by offering a viable approach to tackling a transversal issue (food waste and the associated pressures in terms of climate and land use). They promote active citizenship and highlight the paradox⁽³⁹⁾ of co-existing food surplus and food insecurity in high-income countries. This way of involving and organising the work of thousands of volunteers and mobilising donors represents an innovative bottom-up approach to improving collaboration among various actors and raising awareness of the value of food.

The indicator *Open Data Inventory*⁽⁴⁰⁾ (ODIN) score, provided by Open Data Watch⁽⁴¹⁾, assesses the coverage and openness of official statistics (or equivalent datasets of public authorities) to identify gaps, promote open data policies, improve access, and encourage dialogue between data providers and users. It was picked as secondary indicator for the **Information and knowledge management** domain. Out of the 22 data categories of the ODIN score assessed, we selected food security and nutrition and agriculture and land use, as they directly match the scope of our dashboard.

The ODIN score is composed of two sub-scores; one measures the temporal and geographical coverage of data, while the other, the openness score, measures the following⁽⁴²⁾:

- downloadability in machine-readable and non-proprietary formats;
- existence of metadata;
- availability of bulk download, user-selection or application programming interfaces;
- indication of open terms of use or an open data licence.

This indicator synthesises in single scores the values of the most important technical metadata elements, which are crucial for locating and accessing the data needed for the implementation of our dashboard. It is extremely useful to describe the general technical and legal (licences) environment of collecting the data within the scope of the dashboard. Without this score, these conditions remain hidden. The team working on the EU Food System Monitoring Dashboard invested a lot of effort in overcoming the related issues. In the dashboard we display the openness and coverage sub-scores and the elements they are composed of.

The second indicator in the Information and knowledge management domain, the *Active EIP-AGRI Operational Groups*, measures the annual number of operational groups under the European Innovation Partnership (EIP) for agricultural productivity and sustainability⁽⁴³⁾ in a given Member State. Operational Groups are formal multi-actor partnerships under the CAP to promote interactive innovation and structured knowledge exchange among farmers, advisors, researchers and other relevant actors within the food system. They are instrumental in involving users in co-innovation in agriculture, forestry and related value chains (Fieldsend et al., 2021).

⁽³⁹⁾ <https://www.eurofoodbank.org/overview/>.

⁽⁴⁰⁾ <https://odin.opendatawatch.com/>.

⁽⁴¹⁾ <https://opendatawatch.com/>.

⁽⁴²⁾ <https://docs.google.com/document/d/1q9QGI5svEY6RRmi7jkgQtX1Sjms3sznH/edit#heading=h.gjdqxs>.

⁽⁴³⁾ https://eu-cap-network.ec.europa.eu/index_en.

Active EIP-AGRI Operational Groups represent a key governance instrument under the CAP for institutionalising participatory and multi-actor approaches to knowledge creation and exchange. The indicator serves as a proxy for monitoring governance-related aspects of information and knowledge management across Member States, reflecting the presence, intensity and use of formalised collaborative arrangements within national food system governance. It is closely linked to the Agricultural Knowledge and Innovation System (AKIS), as Operational Groups are a core mechanism for operationalising the principles of this system.

Data on *Active EIP-AGRI Operational Groups* are collected and maintained by DG Agriculture and Rural Development through the EU CAP network, ensuring consistency, comparability and alignment with CAP implementation and monitoring frameworks across Member States.

In the EU FSMF, the Resilience horizontal thematic area is designed as a cross-cutting lens that draws on information from multiple domains and dimensions, rather than as a stand-alone pillar with a self-contained indicator set. For this reason, the Resilience thematic area does not follow the usual FSMF indicator-by-indicator format. Instead, resilience is analysed in a way that mirrors the conceptual structure of the FSMF architecture (dimensions and their respective thematic areas). Accordingly, resilience metrics are computed for each dimension and, where feasible, for each thematic area, that is, when the underlying data provide sufficient coverage and time series consistency to support a robust assessment.

The first step of the workflow (see **Section 2.3.4**), assessing whether an indicator is relevant for resilience assessment, was performed by the thematic expert groups of the JRC's food system monitoring team. The initial mapping of the indicators to the resilience properties (stability, adaptability, transformability) was exposed to an independent quality screening, based on experts' explanations. As a result, 76 out of the 99 FSMF indicators were retained as relevant to resilience (i.e. fit for at least one resilience property). This provides sufficiently broad and policy-relevant coverage across the environmental, economic and social dimensions, while preserving transparency on how each indicator contributes to the three resilience properties (stability, adaptability, transformability). The resilience indicators retained for the EU FSMF are presented in **Table 14**.

Table 14. New indicators for the Resilience thematic area

Domain	Indicator	PP	FP	FD	FC
Resilience according to sustainability dimensions	Environmental resilience				
	Economic resilience				
	Social resilience				
Resilience of food system components	Food System resilience				

NB: PP – primary production, FP – food processing, FD – food distribution, FC – food consumption; blue – headline indicator.

Source: Authors.

Currently, the resilience of the EU food system is provided as scores for environmental, economic and social resilience at the level of the MS and the EU. The EU values represent the median of the MS scores for each year. The resilience scores are composite indicators inserted in the **Resilience according to sustainability dimensions** domain. For the sake of transparency, in **Annex 4**, we provide the list of indicators that were used as inputs for calculating resilience indices based on the food system dimensions. It should be noted that the resilience scores are calculated until 2023, as

the data coverage in the subsequent years is not sufficient to calculate reliable and comparable values.

In the future, resilience may also be assessed at the level of the thematic areas, provided that the number of indicators is sufficient to calculate meaningful scores. The limited number of indicators is the reason why calculating the resilience of the domains of the EU food system is not planned.

In the **Resilience of food system components** domain, we calculate the overall resilience of the system, including all resilience-relevant indicators in the calculation. All the currently proposed indicators are classified as headline indicators.

3.5.2. Areas for further development

As the development of indicators for the Governance and Resilience thematic areas has just started, we expect a gradual extension of these thematic areas. **Table 15** presents areas for future action.

Table 15. Overview of gaps in the horizontal thematic areas

Thematic area	Domain	Gaps
Governance	Coordination	Share of urban population living in MUFPP signatory cities
Governance	Adaptivity and innovation	Financial support for knowledge and innovation in the agri-food system
Governance	Information and knowledge management	FS related public data sharing

Source: Authors.

The food system monitoring team is planning to introduce additional indicators in the Governance thematic area.

In the **Coordination** domain, we are implementing an indicator to track the *Share of urban population living in MUFPP signatory cities*. This indicator measures the proportion of the urban population in Member States living in cities that have joined the MUFPP, an international agreement among cities all over the world committed to ‘developing sustainable food systems that are inclusive, resilient, safe, and diverse’ ⁽⁴⁴⁾. The MUFPP is a strategic tool that enables cities to harmonise food policies and share best practices while aligning local actions with international sustainability goals. By providing a structured monitoring framework with shared indicators, it fosters the institutional coordination necessary to bridge the gap between national policy and urban implementation.

The indicator will be calculated by dividing the total population of MUFPP signatory cities by the Member State’s overall urban population. Although the methodology is clearly defined, this indicator is currently listed among the areas for further development, as the data sources for both the numerator and the denominator are still incomplete.

Within the **Adaptivity and innovation** domain, we plan to include an indicator tracking CAP financial support for the specific objective of knowledge and innovation. This indicator will monitor financial support for knowledge and innovation within the agri-food system, serving as a key proxy

⁽⁴⁴⁾ <https://www.milanurbanfoodpolicypact.org/>.

for governance and political commitment to these strategic pillars. By tracking budgetary allocations within the CAP strategic plans, it will assess the capacity of Member States to create an enabling environment for the transition towards more sustainable and resilient food systems. To ensure unified and reliable data across the EU, data will be sourced from the Agri-food Data Portal, the official platform for implementation data, reflecting actual budgetary implementation at the national level.

In the **Information and knowledge management** domain, an indicator provisionally called *FS public data sharing* is in the pipeline. This indicator would measure the degree of data sharing in the context of our dashboard, by calculating the ratio of the number of data points provided by the data owners to the total number of data points that should have been provided due to the reporting obligations of the bodies or international organisations. This indicator would also characterise the commitment of public authorities to food-system-related data sharing, as it would also include voluntarily reported data categories and data points. As the definition suggests, indicators from scientific research, non-governmental organisations (NGOs) or market intelligence would not be included in its calculation. While calculating the ratio based on the indicators displayed in the dashboard is quite straightforward, a further assessment is needed – whether to include those indicators in the assessment that were not included in the dashboard due to the data quality, in most cases because of a lack of spatial and/or geographical coverage.

In addition to the indicators listed in **Table 15**, for which we already have a nearly complete file, we have outlined several research areas for developing additional indicators. As public procurement of food is an essential element in addressing the environmental, social, health and economic aspects of sustainability (Garcia Herrero et al., 2025), the adoption of sustainability criteria in public food procurement could be a means for institutions to offer healthy and sustainable food and to reward sustainability efforts by EU farmers, the food industry and service providers.

Additionally, we will analyse the presence of national health-related food economic policies, such as taxes and subsidies, to evaluate how fiscal tools are used to steer consumer behaviour towards healthier diets.

We will also investigate the inclusion of an indicator assessing the existence of animal welfare policies and the level of investment in, or the total number of, food living labs, which serve as co-creation spaces for territorial innovation and stakeholder collaboration.

4. Exploring possibilities for composite indicators

4.1. Overview

While providing a more nuanced understanding of the EU food system requires detailed information, the growing number of indicators makes it difficult to obtain a general overview of the situation. This may be critical when decisions must be taken under time pressure or when interlinkages between overlapping fields must be duly considered. A key strength of composite indicators lies in their easily interpretable nature, enhancing the ability of policymakers and stakeholders to make decisions. Moreover, composite indicators do not require the inclusion of all possible metrics; instead, a well-curated selection can effectively act as a comprehensive summary, balancing simplicity with analytical rigour. We intend here to explore the possibilities of composite indicators to suitably and reliably inform about the various dimensions of the European Green Deal framework, carefully taking into account the related expert judgement.

The following sections examine whether the EU food system monitoring indicators and their underpinning data meet the statistical criteria for constructing composite indicators. However, domain expertise and contextual insights will be required to assess any composite indicator's substantive interpretation.

The JRC's Competence Centre on Composite Indicators and Scoreboards (COIN) guidelines ensure composite indicators are statistically coherent, trustworthy and faithfully aggregate underlying data (OECD et al., 2008). The guidelines include guidance on data quality, timeliness, outlier treatment, denomination, normalisation, imputation and aggregation.

According to the COIN handbook, for a composite indicator to be reliable and robust, it must meet several critical requirements. First, it requires a clear denominator to ensure meaningful comparisons across units of analysis. Denominators ensure that values reflect the intensity of an indicator relative to the scale of the system being measured. Second, data coverage must be comprehensive and timely, to prevent biases and ensure the indicator reflects current realities. Finally, the correlation structure between indicators must be carefully examined; excessively high correlations can skew results by double-counting overlapping information, while weak correlations may signal a lack of coherence, leading to loss of information. Meeting these requirements strengthens the composite indicator's ability to accurately summarise information. The following sections detail the main steps of feasibility assessment of composite indicators in the EU Food System Monitoring Dashboard and the results.

4.2. Selection process

We evaluated all indicators in the dashboard on their suitability for aggregation based only on statistical properties of the data, coverage and timeliness.

First, the JRC COIN team checked whether indicators were denominated. An indicator should be denominated (i.e. expressed in standardised units, such as per capita, kilograms per hectare, or as a percentage) to ensure comparability across time and regions. Failure to denominate risks misleading interpretations, as unadjusted figures reflect scale, rather than performance or efficiencies. In absence of denomination, larger economies naturally have higher absolute values.

Second, we employed a rigorous twofold criterion: data availability and temporal coverage. Initially, the JRC COIN team prioritised indicators with comprehensive geographical coverage, ensuring they

were available for all or most of the Member States to enable meaningful comparisons. This means that indicators providing aggregated values at the EU level were excluded from the analysis. Additionally, we focused on indicators offering a data series, as changes over time are of interest in tracking the sustainability of the food system.

Third, we identified instances where multiple indicators represented disaggregated components of a broader, aggregated value. This step was essential to avoid double-counting and ensure the composite indicator remained parsimonious ⁽⁴⁵⁾ and non-redundant. For instance, within the Economic dimension under the Trade domain, several indicators detail the Self-sufficiency rates of commodities (e.g. dairy, fruit and vegetables, cereal). If such a total aggregate indicator exists, it consolidates all the subcategories into a single metric. To prevent overrepresentation of the same underlying phenomenon, we opted to include either the subcategories or the total. In **Annex 4**, we present the finalised set of indicators selected for the analysis and the related assessments of data availability, temporal coverage, correlation analysis and aggregation principles.

4.3. Data processing

The selected indicators were screened for outliers and normalised to a common scale. Outlying EU values can compress the values that other EU countries take to a very small range. This in turn limits the ability of the indicator to pass on information. Outlier treatment ensures that each indicator can utilise the full range of normalised values. Therefore, the first three outliers are winsorised. If the indicator is still skewed, the log function is applied. Out of the 66 indicators that were available at the time of this study, 15 were treated with winsorisation. In the cases of 13 indicators, only 1 value was winsorised; however, the indicators Food losses and Water exploitation index, plus (WEI+) indicators needed the winsorisation of 3 values.

For the normalisation, JRC COIN used the 'min.-max.' formula. The transformation maps indicator values to the 0–10 range. This enables each indicator to have a more equal impact on the composite. Missing data were not imputed at this time. Pending input from experts, data may be imputed in missing time series using linear extrapolation or other suitable methods.

4.4. Correlation analysis

To determine whether multiple indicators can be consolidated effectively into a smaller set of composite indicators without significant loss of information, it is essential to first calculate their pairwise correlations.

Correlation analysis is used to evaluate how well the observed indicator data align with the established conceptual framework. Ideally, correlations among variables at each level of the index should be positive and statistically significant, and, following JRC COIN guidance, ideally lie between 0.30 and 0.90. Meeting this criterion helps ensure that the final index scores properly represent the underlying indicator values, meaning that sufficient information is transmitted from the individual indicators through the aggregates. Highly correlated indicators (i.e. greater than 0.90) measure the same information and can lead to double-counting.

⁽⁴⁵⁾ Providing the highest explanatory power using the fewest possible parameters.

To ensure the indicators were aligned, the JRC COIN team used a data-driven approach to grouping three or more indicators into coherent aggregates, which we named pillars. The pillars loosely correspond to the areas or domains in the dashboard. However, in several cases, indicators were reorganised to maximise the correlations between indicators within a pillar. After defining the pillars, we built up a hierarchical structure for indicator aggregation as follows:

- Level 1 = indicator,
- Level 2 = pillar,
- Level 3 = dimension,
- Level 4 = index (system/dashboard level).

For example, within the Economic dimension (Level 3), there are eight pillars (Level 2), each of which has several indicators – such as Trade, with seven indicators, and Price, which has four (see **Table 24** in **Annex 4**). Level 4 represents the index itself, which aggregates all the indicators in the dashboard.

The degree of interdependence between indicators across the Environmental, Economic and Social dimensions was calculated using the Pearson correlation coefficient. Coefficients greater than 0.30 and lower than 0.90 were considered strong, while correlations with values below 0.30 were classified as weak correlations. Correlations with a meaningful negative value (here, below –0.30), when present, were also highlighted for further analysis of a negative correlation. The calculated correlation coefficients within the three dimensions are included in **Figure 13**, **Figure 14** and **Figure 15** in **Annex 5**, respectively.

Results of the correlation analysis at Level 2 are summarised in **Table 16**.

Table 16. Results of correlation analysis at Level 2 (pillar)

Indicator/dimension	Total	Strong correlation	Weak correlation
Environmental	17	17	0
Economic	38	35	3
Social	11	10	1

Source: Authors.

Overall, as seen in **Table 16**, most correlations are within the range for being considered strong, showing a robust correlation structure within its pillars. This means that introducing composite indicators at the pillar level is statistically sound.

However, the coherence does not extend to Levels 3 (dimension) and 4 (index), as **Tables 17** and **18** show.

Table 17. Results of correlation analysis at Level 3 (dimension)

Indicator/dimension	Total	Strong correlation	Weak correlation	Negative	Meaningful negative
Environmental	17	10	3	4	0
Economic	38	18	13	6	2
Social	11	8	1	2	0

Source: Authors.

Table 18. Results of correlation analysis at Level 4 (system index)

Indicator/dimension	Total	Strong correlation	Weak correlation	Negative	Meaningful negative
Environmental	17	7	3	7	0
Economic	38	16	9	11	2
Social	11	7	2	2	0

Source: Authors.

In addition to strong and weak correlation values, the analysis at Levels 3 and 4 also exhibited negative correlation values. These occur when two variables move in opposite directions. Forcing such indicators into a single composite score could distort information, as improvements in one will hide declines in another from the user.

At Level 3 (dimension), the analysis reveals weak or inconsistent correlations, making the introduction of composite indicators statistically unsound. The lack of strong interrelationships means that any attempted grouping would fail to tell a coherent story, undermining the reliability and interpretability of the resulting composite. At Level 4, the majority of indicators exhibit a weak correlation, rendering the calculation of a reliable composite indicator unfeasible due to the lack of a shared underlying pattern.

As an overall result, we found that the construction of composite indicators based on the pillars of the EU FSMS is statistically robust. Furthermore, within its pillars, the indicators have a good and sufficient level of correlation.

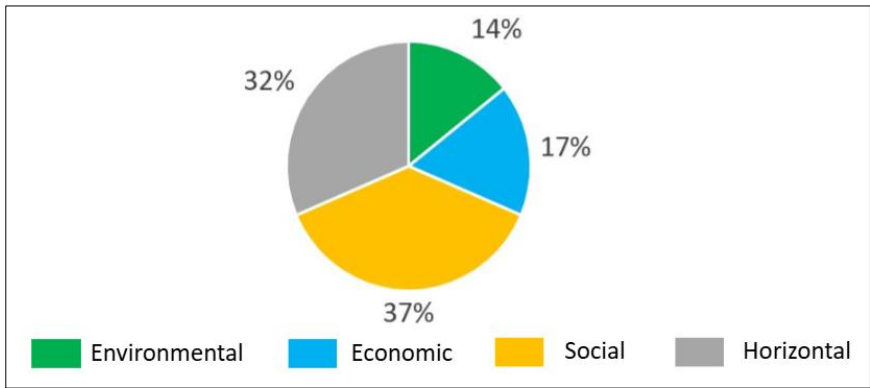
However, it is not advisable to develop a composite indicator at the dimension or unique index level (Level 3 or 4), as the correlations at these levels are not within the recommended standard.

The JRC COIN team understands the considerable challenges involved in creating statistically coherent indices. As the statistical analysis is mostly based on correlations, the correspondence of every composite indicator to a real-world phenomenon needs to be critically addressed by the thematic experts. As this work is ongoing, and considering that other indicators were under development at the time of this analysis, the JRC's EU food system development team decided to postpone any calculations of composite indicators.

5. The EU Food System Monitoring Dashboard after the second upgrade

The original edition (November 2024) of the EU Food System Monitoring Dashboard included 44 headline indicators. After the first upgrade in November 2025, the dashboard contained 90 indicators, out of which 31 were secondary indicators ⁽⁴⁶⁾ developed in the initial phase of the project and 15 new indicators specifically developed for the first upgrade. The current, second upgrade cycle yielded another 35 new indicators. Their distribution between the dimensions is shown in **Figure 6**.

Figure 6. Proportions of new indicators across the dimensions



Source: Authors.

With this, the total number of indicators become rather high, which can make user navigation of the dashboard difficult.

We also performed a statistical analysis of the dashboard after the first upgrade, which concluded that the granularities of data presentation across the sustainability dimensions were not similar. While the economic and social dimensions frequently used sub-indicators to group similar data under the same title, the practice of the environmental dimension was different – every piece of information was presented as a separate indicator. Furthermore, the correlation analysis and principal component analysis of the domains and thematic areas revealed that there were opportunities to merge or split information.

After introducing the new indicators (also including those in the horizontal thematic areas) and performing a reorganisation of all entries, the number of indicators changed, as presented in **Table 19**.

⁽⁴⁶⁾ These secondary indicators were described in the accompanying technical report, but were not included in the dashboard to provide a balanced view of the three sustainability dimensions.

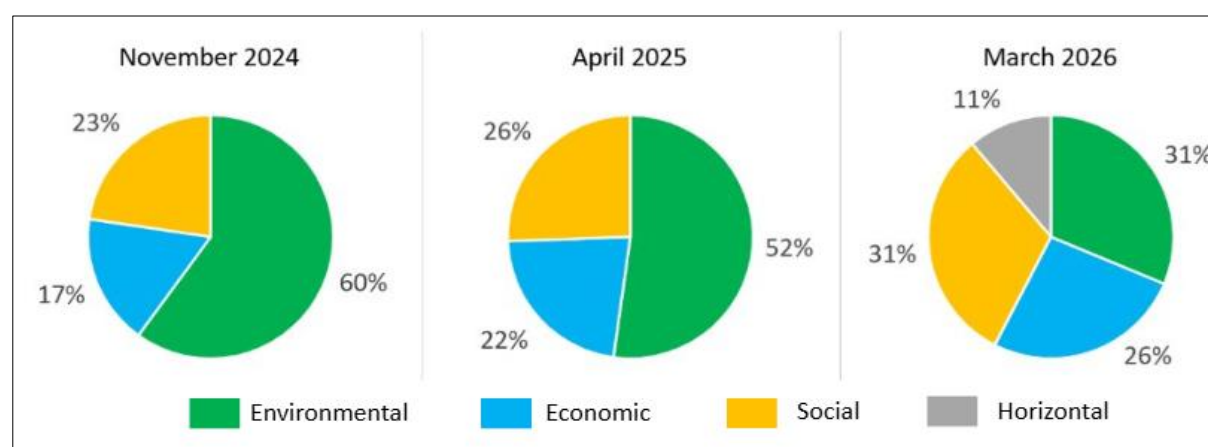
Table 19. Changes in indicator numbers within the sustainability dimensions of the dashboard

Dimension	Original version	First upgrade	Second upgrade
Environmental	45	47	31
Economic	13	20	26
Social	17	23	31
Horizontal	0	0	11
Total	75	90	99

Source: Authors.

After the current, second upgrade, the composition of the dashboard across the dimensions is as presented in **Figure 7**.

Figure 7. Proportions of the sustainability dimensions in the dashboard



Source: Authors.

As seen in **Figure 7**, the introduction of new indicators and reorganisation of the dashboard has improved the balance between the sustainability dimensions.

In terms of the components of the food supply chain, the number of indicators has changed, as presented in **Table 20**.

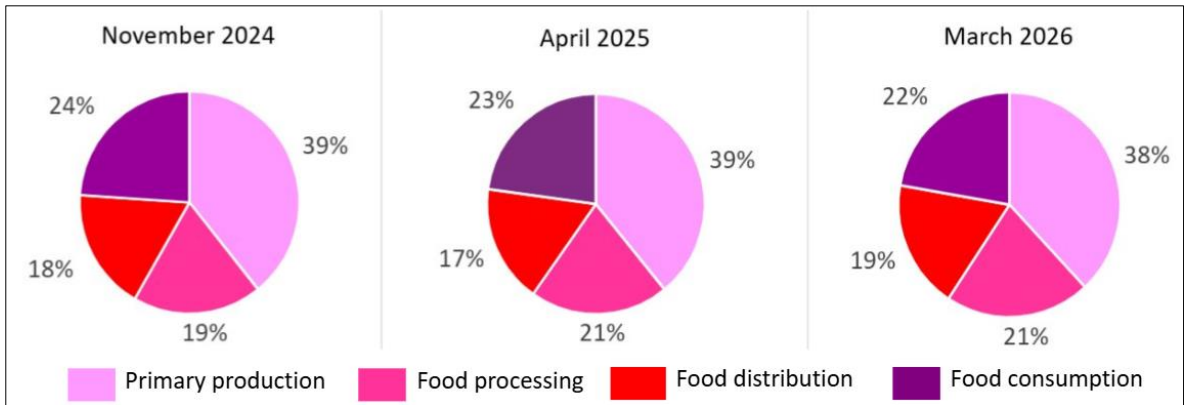
Table 20. Changes in indicator numbers within the supply chain components of the dashboard

Supply chain component	Original version	First upgrade	Second upgrade
Primary production	64	72	72
Food processing	31	38	40
Food distribution	29	32	35
Food consumption	39	42	42
Total	163	184	189

NB: The total number of indicators is not equal to that in **Table 19**, as an indicator can be linked to more than one component of the food supply chain.

Source: Authors.

Figure 8. Proportion of food supply chain components in the dashboard

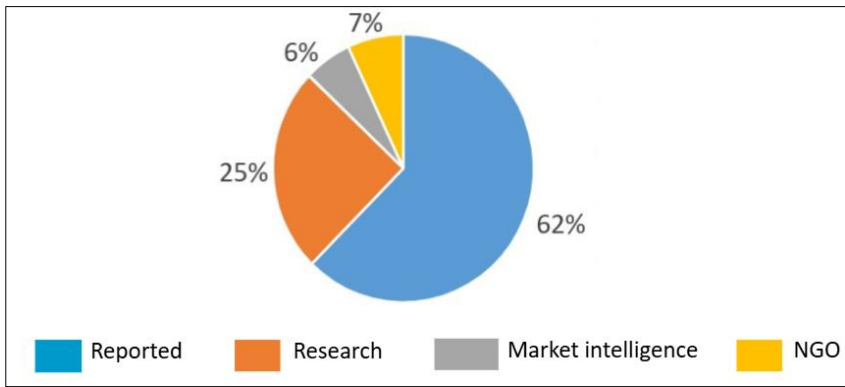


Source: Authors.

The proportion of indicators in the dashboard relating to the food supply change components has changed, as illustrated in **Figure 8**.

The primary data sources of the first two editions of the dashboard were the datasets reported by Member States to Eurostat, DGs of the European Commission, EU agencies (e.g. EMA, EEA, the European Food Safety Authority) and other international organisations. To fill the knowledge gaps, the JRC increasingly used its own research, market intelligence and datasets of NGOs. To guarantee the same data quality, we rigorously applied our quality assessment framework to all the datasets and the derived indicators. **Figure 9** shows the composition of the dashboard in terms of the main categories of data sources.

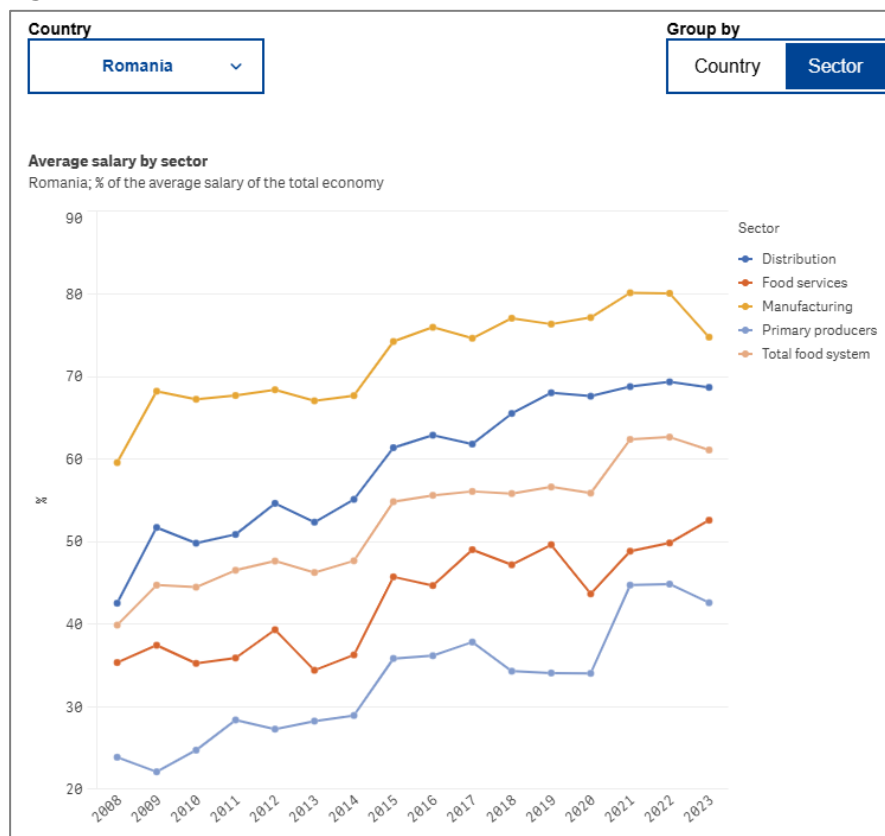
Figure 9. Composition of the dashboard by data source



Source: Authors.

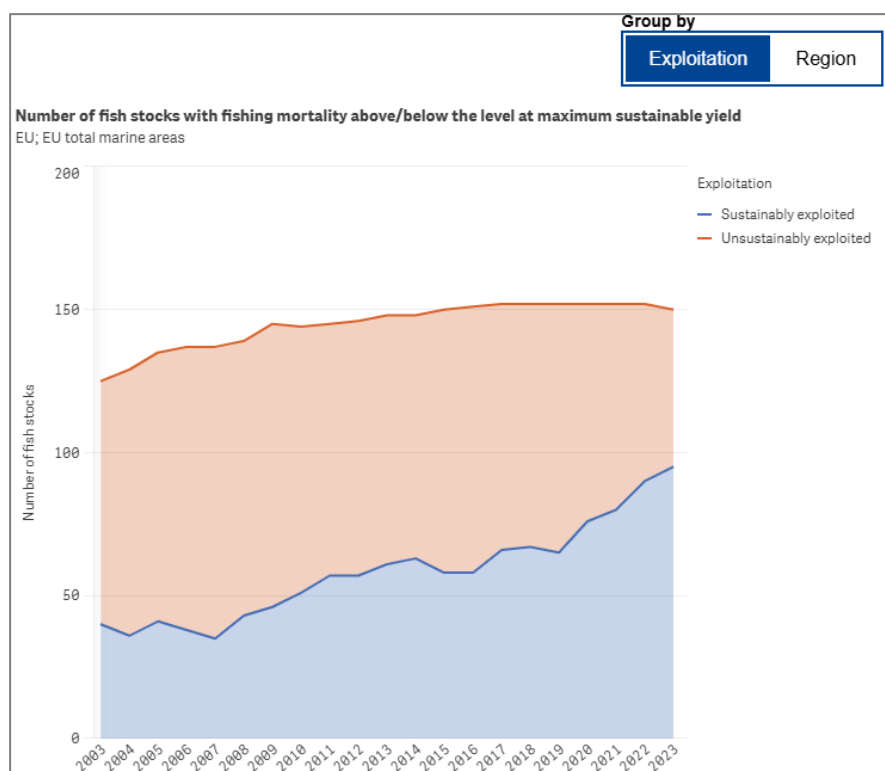
To support the visualisation of sub-indicators, a new functionality was introduced in the timeline visualisation mode of the dashboard accessible from the EU overview tab. In addition to an average (**Figure 10**) or a total (**Figure 11**) value, it is possible to visualise the values of the sub-indicators separately.

Figure 10. Example of sectoral disaggregation in the dashboard



Source: Authors

Figure 11. Representation of value distributions of sub-indicators in the dashboard



Source: Authors.

6. Conclusions

The work on the EU FSMF and dashboard started under the European Green Deal, following the publication of the farm-to-fork strategy. The changing political landscape, along with broader societal, environmental, security and economic challenges, have shifted the priorities of the Commission for 2024–2029, which range from defence and security to sustainable prosperity, democracy and social fairness. The objectives of the seven key priorities, especially ‘sustaining our quality of life: food security, water and nature’, set challenges that directly impact the EU food system through the vision for agriculture and food, climate adaptation and preparedness goals, the European water resilience strategy and the European ocean pact.

At the same time, the objectives of other key priorities, such as creating a more circular and resilient economy, boosting digital technologies, conducting research and innovation for competitiveness, tackling inequalities and responding together to public health crises, represent further challenges that require keeping the EU food system on a sustainable track.

Despite the diversification of the policy framework, the core elements of food policies are still valid. To achieve the objectives of food security, strategic autonomy in food commodities and production input, mitigating the diet-related burden of non-communicable diseases, preserving and protecting natural resources and maintaining them over time, inherently requires the sustainability of the food system.

To deal with the complexity of interdependent sectoral policies, a systemic approach is needed more than ever. The EU FSMF and the dashboard provide a centralised and harmonised data source not only to drive the EU food system towards sustainability but also to cross-check the interdependencies and impact of sectoral policies.

To provide a full range of information as outlined in the EU food system conceptual model, the JRC team introduced new indicators, prioritising the social and economic dimensions and the middle of the supply chain. For this, we included new data sources like market intelligence data, surveys and reports from NGOs, provided that these sources passed the quality expectations of our system. Strengthening the collaboration with policy DGs revealed several datasets that were fit to fill a number of long-standing knowledge gaps, mainly in the social protection, innovation and governance domains. Last but not least, the JRC’s own research based on earth observation data opened new pathways to assessing the sustainability of the food system.

An important step forward was the development of the governance domain, which fully acknowledges the interplay of various actors, the role of social innovation, and policy coherence in a framework of strategic systems thinking. Governance indicators may help empower policymakers to reflect on the current development pathways and drive the change towards sustainability with wider societal support for sustainable food production and consumption. Sustainability is a key prerequisite for the long-term resilience of the system and thus for food security. The novel approach of addressing the resilience of the food system with overarching indices and an interpretation framework is expected to provide policymakers with a quick way to assess where to act.

Despite the growing number of indicators, some knowledge gaps persist, which represent areas for future indicator development. This growing number of indicators also requires making it easier for users to find the necessary information. Grouping indicators within the domains was an important but insufficient step. The statistical analysis of the data included in the dashboard suggested the possibility of introducing composite indicators, which will be implemented in the next phase of the project.

The EU FSMF is part of the changing landscape and intrinsically connected to complementary initiatives. Food 2040 (COM(2026) 453 final), the research and innovation agenda, which aims to foster the development of competitive, sustainable and resilient food systems solutions. It is seen as an important driver for improving the overall performance of the EU food system, including its competitiveness and resilience. In the context of current Horizon Europe activities, the ongoing work on the Food Systems Observatory⁴⁷ co-funded by the FutureFoodS Partnership could provide specific information to complement the EU FSMF.

The micro-level benchmarking of the planned on-farm sustainability compass could potentially be connected to the macro-level indicator framework of EU food system monitoring, as envisaged in the vision for agriculture and food.

From the health perspective, the upcoming monitoring of Europe's beating cancer plan (COM(2021) 44 final) and safe hearts plan (COM(2025) 1024 final) could share relevant indicators, thus guaranteeing coherence between different metrics.

The wealth of data present in the dashboard that have passed a rigorous selection process and have been endorsed by the stakeholders (inter-service, expert and advisory groups) is well appreciated by users. The dashboard is the flagship of the JRC's data modelling platform and since its launch in November 2026, is one of its most visited sections' ⁽⁴⁸⁾. Its usefulness is also recognised by the Commission ⁽⁴⁹⁾ and has been referenced by the European Parliament ⁽⁵⁰⁾. To better serve users' needs, the development of factsheets, policy briefs and deeper, multi-criteria analyses is among future tasks. The extensible conceptual framework, together with its flexible implementation in a database, provide a solid base to fulfil these objectives.

⁽⁴⁷⁾ <https://www.futurefoodpartnership.eu/observatory-for-food-system-transition>

⁽⁴⁸⁾ https://datam.jrc.ec.europa.eu/datam/mashup/DATAM_USAGE_STATISTICS/.

⁽⁴⁹⁾ https://environment.ec.europa.eu/document/download/c5a15594-3513-441c-978d-e5bc4bc26b53_en?filename=SWD_2026_66_1_EN_document_travail_service_part1_FINAL.pdf.

⁽⁵⁰⁾ [https://www.europarl.europa.eu/RegData/etudes/IDAN/2025/765803/EPRS_IDA\(2025\)765803_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2025/765803/EPRS_IDA(2025)765803_EN.pdf).

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Legislation and other documents

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Commission Implementing Regulation (EU) 2024/2914 of 25 November 2024 on the data to be provided for the reference year 2026 pursuant to Regulation (EU) 2018/1091 of the European Parliament and of the Council on integrated farm statistics as regards the list of variables and their description (OJ L, 2024/2914, 26.11.2024, ELI: http://data.europa.eu/eli/reg_impl/2024/2914/oj).

Commission notice – Guidance on a framework for developing methodologies to monitor high-diversity landscape features pursuant to Article 14(7) of the Nature Restoration Regulation (Regulation (EU) 2024/1991) (C/2025/783, OJ C, C/2025/980, 14.2.2025, ELI: <http://data.europa.eu/eli/C/2025/980/oj>).

Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions – The European Green Deal, COM(2019) 640 final of 11 December 2019, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52019DC0640>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A new circular economy action plan for a cleaner and more competitive Europe, COM(2020) 98 final of 11 March 2020, <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – EU biodiversity strategy for 2030: Bringing nature back into our lives, COM(2020) 380 final of 20 May 2020, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0380>.

Communication from the Commission to the European Parliament and the Council – Europe's beating cancer plan, COM(2021) 44 final of 3 February 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0044>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Pathway to a healthy planet for all EU action plan: 'Towards zero pollution for air, water and soil', COM(2021) 400 final of 12 May 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52021DC0400>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A vision for agriculture and food shaping together an attractive farming and agri-food sector for future generations, COM(2025) 75 final of 19 February 2025, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0075>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – European water resilience strategy, COM(2025) 280 final of 4 June 2025, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0280>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – The European ocean pact, COM(2025) 281 final of 5 June 2025, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0281>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Choose Europe for life sciences: A strategy to position the EU as the world's most attractive place for life sciences by 2030, COM(2025) 525 final of 2 July 2025, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0525>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Strategy for generational renewal in agriculture, COM(2025) 872 final of 21 October 2025, <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52025DC0872>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A strategic framework for a competitive and sustainable EU bioeconomy, COM(2025) 960 final of 27 November 2025, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC0960>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on an EU cardiovascular health plan: The safe hearts plan, COM(2025) 1024 final of 16 December 2025, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52025DC1024>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – The 2026 annual single market and competitiveness report, COM(2026) 46 final of 30 January 2026, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52026DC0046>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Fertiliser action plan: Partnership for ensuring the availability, affordability and strategic autonomy in home-grown EU fertilisers, COM(2026) 310 final of 19 May 2026, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2026:310:FIN#document2>.

Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – New Strategic Approach to Research and Innovation for competitive, resilient and sustainable agriculture, forestry, rural areas and food systems Future-proofing EU agri-food through AgRI 2040 and Food 2040, COM(2026) 453 final of 8 September 2026, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2026:453:FIN>.

Consolidated text: Council Directive of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC) (ELI: <http://data.europa.eu/eli/dir/1991/676/2008-12-11>).

Consolidated text: Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (ELI: <http://data.europa.eu/eli/dir/1992/43/2013-07-01>).

Council Regulation (EC) No 1/2005 of 22 December 2004 on the protection of animals during transport and related operations and amending Directives 64/432/EEC and 93/119/EC and Regulation (EC) No 1255/97 (OJ L 3, 5.1.2005, p. 1, ELI: <http://data.europa.eu/eli/reg/2005/1/oj>).

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2000, p. 1, ELI: <http://data.europa.eu/eli/dir/2000/60/oj>).

Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides (OJ L 309, 24.11.2009, p. 71, ELI: <http://data.europa.eu/eli/dir/2009/128/oj>).

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (OJ L 20, 26.1.2010, p. 7, ELI: <http://data.europa.eu/eli/dir/2009/147/oj>).

Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting (OJ L 322, 16.12.2022, p. 7, ELI: <http://data.europa.eu/eli/dir/2022/2464/oj>).

Directive (EU) 2025/2360 of the European Parliament and of the Council of 12 November 2025 on soil monitoring and resilience (Soil Monitoring Law) (OJ L, 2025/2360, 26.11.2025, ELI: <http://data.europa.eu/eli/dir/2025/2360/oj>).

Regulation (EU) 2017/625 of the European Parliament and of the Council of 15 March 2017 on official controls and other official activities performed to ensure the application of food and feed law, rules on animal health and welfare, plant health and plant protection products, amending Regulations (EC) No 999/2001, (EC) No 396/2005, (EC) No 1069/2009, (EC) No 1107/2009, (EU) No 1151/2012, (EU) No 652/2014, (EU) 2016/429 and (EU) 2016/2031 of the European Parliament and of the Council, Council Regulations (EC) No 1/2005 and (EC) No 1099/2009 and Council Directives 98/58/EC, 1999/74/EC, 2007/43/EC, 2008/119/EC and 2008/120/EC, and repealing Regulations (EC) No 854/2004 and (EC) No 882/2004 of the European Parliament and of the Council, Council Directives 89/608/EEC, 89/662/EEC, 90/425/EEC, 91/496/EEC, 96/23/EC, 96/93/EC and 97/78/EC and Council Decision 92/438/EEC (Official Controls Regulation) (OJ L 95, 7.4.2017, p. 1, ELI: <http://data.europa.eu/eli/reg/2017/625/oj>).

Regulation (EU) 2019/6 of the European Parliament and of the Council of 11 December 2018 on veterinary medicinal products and repealing Directive 2001/82/EC (OJ L 4, 7.1.2019, p. 43, ELI: <http://data.europa.eu/eli/reg/2019/6/oj>).

Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law') (OJ L 243, 9.7.2021, p. 1, ELI: <http://data.europa.eu/eli/reg/2021/1119/oj>).

Regulation (EU) 2023/1115 of the European Parliament and of the Council of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010 (OJ L 150, 9.6.2023, p. 206, ELI: <http://data.europa.eu/eli/reg/2023/1115/oj>).

Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869 (OJ L, 2024/1991, 29.7.2024, ELI: <http://data.europa.eu/eli/reg/2024/1991/oj>).

List of abbreviations

Abbreviation	Definition
ATAT	aggregated total applied toxicity
CAP	common agricultural policy
COIN	Competence Centre on Composite Indicators and Scoreboards
DG	directorate-general
EEA	European Environment Agency
EIC	European Innovation Council
EIP-agri	European Innovation Partnership for Agricultural Productivity and Sustainability
EMA	European Medicines Agency
ESF+	European Social Fund Plus
ESUAvet	European sales and use of antimicrobials for veterinary medicine
ESVAC	European surveillance of veterinary antimicrobial consumption
FAO	Food and Agriculture Organization of the United Nations
FEAD	Fund for European Aid to the Most Deprived
FEBA	European Food Banks Federation
FSMF	food system monitoring framework
GBF	global biodiversity framework
GHG	greenhouse gas
GNPD	Global New Products Database
HRI	harmonised risk indicator
HRL	high-resolution layer

Abbreviation	Definition
JRC	Joint Research Centre
LAG	local action group
NGO	non-governmental organisation
NPM	nutrient profile model
ODIN	open data inventory
PCU	population correction unit
PMEF	performance monitoring and evaluation framework
SDG	sustainable development goal

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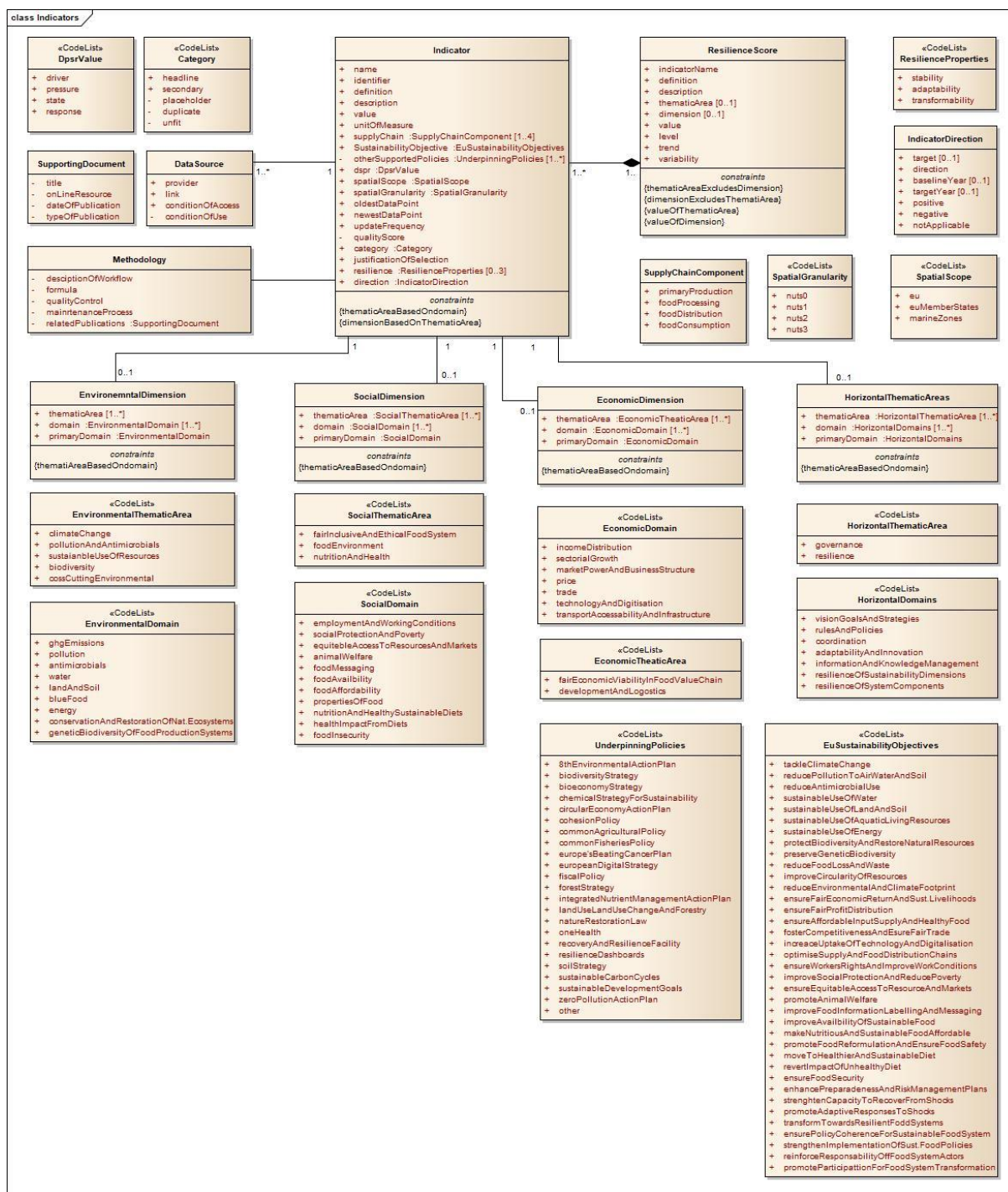
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Annexes

Annex 1. Unified Modelling Language model of the EU food system monitoring framework

Figure 12. Unified Modelling Language class diagram of the conceptual model



Source: Authors.

Annex 2. Summary of changes in the second upgrade of the EU Food System Monitoring Dashboard

Table 21. List of new and modified indicators in the second upgrade

Indicator	Domain	Category (and change)
Newly introduced indicators		
GHG emissions from primary food production	GHG emissions	New (contains new and old indicators integrated together)
Soil sealing	Land and soil	New addition
Global Deforestation Index due to EU food consumption	Land and soil	New addition
Water use efficiency	Water	New addition
Number of fish stocks with fishing mortality above/below the level at maximum sustainable yield	Aquatic living resources	New addition
Share of intermediate costs on total agricultural output	Market power and business structure	New addition
Market concentration	Market power and business structure	New addition
Labour costs in fisheries and aquaculture	Income distribution	New addition
Import dependency	Trade	New addition
Balassa Index	Trade	New addition
Patent application in the agri-food sector	Technology and digitalisation	New addition
Informal employment in agriculture, forestry and fisheries	Employment	New addition
Young farmers and fishers	Employment	New (contains new and old indicators integrated together)
Employment by gender	Employment	New (contains new and old indicators integrated together)
People receiving food support	Social protection and poverty	New addition
Share of children receiving school meals	Social protection and poverty	New addition

Inability to afford a proper meal	Social protection and poverty	New addition
Assistance from food banks	Social protection and poverty	New addition
Cost of a healthy diet	Food affordability	New addition
Share of food products with a sustainability claim	Food messaging	New addition
Share of food products with a front-of-pack nutrition label	Food messaging	New addition
Share of food products eligible for marketing to children	Properties of food	New addition
Dietary choices	Nutrition and healthy, sustainable diets	New addition
Prevalence of infants breastfed at age 6 months	Nutrition and healthy, sustainable diets	New addition
Environmental resilience	Resilience of sustainability dimensions	New addition
Economic resilience	Resilience of sustainability dimensions	New addition
Social resilience	Resilience of sustainability dimensions	New addition
Food system resilience	Resilience of food system components	New addition
Open data inventory score	Information and knowledge management	New addition
Active EIP-AGRI Operational Groups	Information and knowledge management	New addition
Presence of a national food system pathway	Vision, goals, and strategies	New addition
School fruit, vegetables and milk schemes	Rules and policies	New addition
Number of Local Action Groups	Coordination	New addition
EIC-funded innovation in the agri-food sector	Adaptability and innovation	New addition
Adaptability and innovation	Food banks in the EU	New addition
Downgraded indicators		
GHG emissions from agriculture	GHG emissions	Downgraded to pool due to replacement
Farmers' income from agriculture compared with average wages in the general economy	Income distribution	Downgraded to secondary due to new headline indicator

Net GHG emissions from LULUCF sector	GHG emissions	Downgraded to pool due to replacement
Extended indicators		
Fuel use per fish landings by the EU fleet	Energy	The scope is extended to Fuel use of fisheries per value of fish landed in port
Farmers' income from agriculture compared with average wages in the general economy	Income distribution	The scope is extended to compensation of all work (entrepreneurial and employees)
Share of household spending on food and non-alcoholic beverages	Price	The scope is extended to non-alcoholic beverages (in addition to food)
Integrated indicators		
Gross nutrient balance - phosphorous	Land and soil	Integrated into the secondary indicator Gross nutrient balance
Gross nutrient balance - nitrogen	Land and soil	Integrated into the secondary indicator Gross nutrient balance
Gross nutrient balance	Land and soil	Container of integrated indicators
Consumption of inorganic fertilisers	Land and soil	Container of integrated indicators
Consumption of inorganic fertilisers – nitrogen	Land and soil	Integrated into the new headline indicator Consumption of inorganic fertiliser
Consumption of inorganic fertilisers – phosphorous	Land and soil	Integrated into the new headline indicator Consumption of inorganic fertiliser
Consumption Footprint	Consumption footprint	Integrated with sub-indicators
Consumption Footprint – Food (acidification)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (climate change)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (eutrophication, freshwater)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (eutrophication, marine)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (eutrophication, terrestrial)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (freshwater ecotoxicity)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint

Consumption Footprint – Food (human toxicity, cancer)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (Human toxicity, non-cancer)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (ionising radiation)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (land use)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (ozone depletion)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (particulate matter)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (Photochemical ozone formation)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (resource use, fossil)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (resource use, minerals and metals)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Consumption Footprint – Food (water use)	Consumption footprint	Integrated into the existing headline indicator Consumption Footprint
Fuel use of fisheries per Kg of fish landed in ports	Energy	Integrated into the new secondary indicator Fuel use per fish landings by the EU fleet
Gender employment gap in the food sector	Employment	Integrated into the new secondary indicator Employment by gender
Women employed in fisheries	Employment	Integrated into the new secondary indicator Employment by gender
Employment by gender	Employment	Container of integrated indicators
Young farmers and fishers	Employment	Container of integrated indicators
Young farm managers in agriculture	Employment	Integrated into the new headline indicator Young farmers and fishers
Young fishers	Employment	Integrated into the new headline indicator Young farmers and fishers
Prevalence of overweight and obesity	Health impacts of diets	Container of integrated indicators
Prevalence of overweight and obesity among adults	Health impact from diets	Integrated into the new secondary indicator Prevalence of overweight and obesity

Prevalence of overweight and obesity among children (aged 6 to 9 years)	Health impact from diets	Integrated into the new secondary indicator Prevalence of overweight and obesity
Prevalence of overweight and obesity among children (<5 years)	Health impact from diets	Integrated into the new secondary indicator Prevalence of overweight and obesity
Modified indicators		
Sales of antimicrobials for food producing animals	Antimicrobials	Modified due to methodology change
Farmers' income from agriculture compared with average wages in the general economy	Income distribution	Modified to integrate sub-indicators
Share of household spending on food and non-alcoholic beverages	Price	Modified due to the change of the dataset used

NB: Two or more modifications may be applied to the same indicators. Such indicators are listed under each type of modification.

Source: Authors.

Annex 3. Recapitulative list of indicators in the EU Food System Monitoring Dashboard

Table 22 lists all the indicators included in the EU Food System Monitoring Dashboard with references to the technical reports where they are described. If more than one report is indicated, the corresponding indicator has undergone one of the change types indicated in **Section 3.1**. Please note that a slight modification of the name of the indicator (e.g. in the case of grouping similar ones) may have taken place from one release to another. The page numbers point to the summary tables in these reports; detailed explanations of the indicators follow the table indicated. The reports referred to are:

- R1 – the report related to the first version of the dashboard in November 2024 (<https://publications.jrc.ec.europa.eu/repository/handle/JRC137971>);
- R2 – the report related to the first upgrade of the dashboard in November 2025 (<https://publications.jrc.ec.europa.eu/repository/handle/JRC143237>);
- R3 – the current report, related to the second upgrade of the dashboard in October 2026.

Table 22. List of all the indicators in the dashboard with references to the technical reports, sorted alphabetically by thematic area

	Thematic area	Domain	Indicator	Page in the reports		
				R1	R2	R3
	Biodiversity	Biodiversity conservation and restoration of natural ecosystems	Common farmland birds indicator	67		
			Consumption Footprint – Food (biodiversity loss)	67		

			Grassland butterfly Index	67		
		Genetic biodiversity of food production systems	Number of genetic resources for food production secured in either medium- or long-term conservation facilities	67		
	Climate change	GHG emissions	CO2 emissions per kg of landed fish	59		
			GHG emissions from primary food production	59		21
			GHG food system emissions	59		
	Cross-cutting environmental	Circular economy	Generation and use of by-products		15	
		Consumption Footprint	Consumption Footprint – Food	70		27
		Food loss and waste	Direct agricultural loss attributed to disasters	69		
			Food losses		15	
			Food waste	69	15	
	Pollution and antimicrobials	Antimicrobials	Sales of antimicrobials for food-producing animals	60		24
		Pollution	Ammonia emissions from agriculture	60		
			Use and risk of chemical pesticides	60		
			Use of the more hazardous pesticides	60		
			Water quality – Nitrates in groundwater	60		
	Sustainable use of resources	Aquatic living resources	Fish stock biomass relative to biomass in 2003	63		
			Number of fish stocks with mortality by fishing above/below the level at Maximum Sustainable Yield	63		24
		Energy	Final energy consumption in agriculture, forestry and the food industry	63		
			Fuel use per fish landings by the EU fleet	63		
			Production of renewable energy from agriculture and forestry	63		
		Land and soil	Consumption of inorganic fertilisers	62		24
			Global deforestation index due to EU food consumption			24
			Gross nutrient balance	62		24
			Share of agricultural area under organic farming	62		
			Share of the top three crops in the total agricultural area	63		
			Soil organic carbon in agricultural land	62		
			Soil sealing in agricultural area			24

		Water	Water exploitation index, plus (WEI+)	63		
			Water-use efficiency			24
	Development and logistics	Technology and digitalisation	Agricultural training of farm managers	74	20	
			Digital intensity in food manufacturing enterprises		20	
			Digital skills of the labour force in the agriculture, forestry or fishing sectors		20	
			Patent application in the agri-food sectors			34
			Rural Next Generation Access broadband coverage	74	20	
			Use of Artificial Intelligence in the food manufacturing sector		20	
			Use of Internet of Things in the food manufacturing sector		20	
		Transport, accessibility and infrastructure	Annual road freight transport by distance class	74		
	Fair economic viability in the food value chain	Income distribution	Average salary by sector		19	
			Employee earnings ratio		19	
			Farmers' income from agriculture compared with average wages in the general economy	71		31
			Labour costs in the fisheries and aquaculture value chain			32
			Labour income share		19	
		Market power and business structure	Fish landings of the EU small-scale fisheries	71		
			Gross fixed capital formation in agriculture	71		31
			Share of intermediate costs on total agricultural output			31
			Market concentration ratio			31
		Price	Consumer food inflation	71		
			Price indices of agricultural inputs	71		
			Share of household spending on food and non-alcoholic beverages	71		32
		Sectoral growth	Labour productivity in the food chain	71		
			Value added along the food chain	71	19	
		Trade	Balassa Index (Revealed Comparative Advantage)			32

			Import dependency			32
			Self-sufficiency rates of agricultural commodities	71		
			Trade balance	71		
	Fair, inclusive and ethical food system	Animal welfare	Organic production of aquaculture products	75		
			Share of laying hens by farming method	75		
		Employment	Accidents at work	74		
			Employment by economic activity	74		
			Employment by gender		22	35
			Informal employment in agriculture, forestry and fisheries			35
			Job vacancies in the agrifood sector		22	
			Number of fishers in the EU small-scale fisheries (passive gears)	74		
			Young farmers and fishers	74		35
		Social protection and poverty	Assistance from food banks			35
			Inability to afford a proper meal			35
			People receiving food support			35
			Share of children receiving school meals			35
	Food environment	Food affordability	Affordability of a healthy diet: ratio of cost to food expenditures	77		
			Cost of a healthy diet			39
			Share of the population unable to afford a healthy diet	77		
		Food availability	Ratio plant to total protein supply	77		
			Supply by food group	77		
		Food heritage	Number of products under EU quality schemes	77		
		Food messaging	Share of food products with a front-of-pack nutrition label			39
			Share of food products with a sustainability claim			39
		Properties of food	Share of food products eligible for marketing to children			39
	Nutrition and Health	Food security	Prevalence of moderate or severe food insecurity in the population	78		
		Health impact from diets	Burden of disease attributable to dietary risk factors	78		

			Prevalence of overweight and obesity	78		
		Nutrition and healthy, sustainable diets	Alcohol consumption		24	
			Dietary choices			41
			Food consumption by food category		24	
			Prevalence of infants breastfed at age 6 months			41
			Salt intake		24	
			Wholegrains consumption		24	
	Governance	Vision, goals and strategies	Presence of a national food system pathway			44
		Rules and policies	School fruit, vegetables and milk schemes			44
		Coordination	Number of Local Action Groups			44
		Adaptivity and innovation	EIC-funded innovation in the agri-food sector			44
			Food banks in the EU			44
		Information and knowledge management	Open data inventory score			44
			Active EIP-AGRI Operational Groups			44
	Resilience	Resilience according to sustainability dimensions	Environmental resilience			47
			Economic resilience			47
			Social resilience			47
		Food System resilience	Food System resilience			47

NB: Blue – headline, green – secondary. If two columns are filled next to an indicator, it means that it was modified during an upgrade that may have involved a change to the category of the indicator (i.e. downgraded from headline to secondary).

Source: Authors.

Annex 4. Indicators used to calculate the resilience indices

Table 23 lists the environmental indicators used for calculating the environmental resilience of the food system. These indicators also provided input for calculating the overall resilience of the food system. The conceptual relevance of these indicators was assessed in terms of stability, adaptability and transformability of the system. The last column of the table indicates the weight of the indicators, that is, the number of applicable resilience properties.

Table 23. Indicators that make up the Environmental resilience index of the food system

Thematic aArea	Domain	Indicator	S	A	T	Weight
Biodiversity	Biodiversity conservation and restoration of natural ecosystems	Common farmland birds indicator	X		X	2
		Grassland butterfly Index	X	X	X	3
		Consumption Footprint – Food (biodiversity loss)	X		X	2
	Genetic biodiversity of food production systems	Number of genetic resources for food production secured in either medium- or long-term conservation facilities	X		X	2
Climate change	GHG emissions	GHG food system emissions		X	X	2
		CO2 emissions per kg of landed fish	X	X	X	3
		GHG emissions from primary food production		X	X	2
Cross-cutting environmental	Circular economy	Generation and use of by-products	X	X	X	3
	Consumption Footprint	Consumption Footprint – Food	X		X	2
	Food loss and waste	Direct agricultural loss attributed to disasters	X		X	2
		Food waste	X		X	2
		Food losses	X		X	2
Pollution and antimicrobials	Antimicrobials	Sales of antimicrobials for food producing animals			X	1
	Pollution	Use of the more hazardous pesticides		X		1
	Pollution	Water quality – Nitrates in groundwater	X	X		2
	Pollution	Use and risk of chemical pesticides		X		1

	Pollution	Ammonia emissions from agriculture			X	1
Sustainable use of resources	Aquatic living resources	Fish stock biomass relative to biomass in 2003	X			1
		Number of fish stocks with fishing mortality above/below the level at maximum sustainable yield	X	X	X	1
	Energy	Final energy consumption in agriculture, forestry and the food industry	X		X	2
		Production of renewable energy from agriculture and forestry	X	X	X	3
		Fuel use per fish landings by the EU fleet			X	1
	Land and soil	Share of agricultural area under organic farming	X		X	2
		Soil organic carbon in agricultural land	X		X	2
		Share of the top three crops in the total agricultural area	X	X	X	3
		Global deforestation index due to EU food consumption			X	1
		Soil sealing in agricultural area	X	X		2
		Gross nutrient balance	X		X	2
		Consumption of inorganic fertilisers	X		X	2
	Water	Water-use efficiency	X	X		2
		Water exploitation index, plus (WEI+)	X	X	X	3

NB: S – stability, A – adaptability, T – transformability.

Source: Authors.

Table 24 lists the economic indicators used for calculating the economic resilience of the food system. These indicators also provided input for calculating the overall resilience of the food system. The conceptual relevance of these indicators was assessed in terms of stability, adaptability and transformability of the system. The last column of the table indicates the weight of the indicators, that is, the number of applicable resilience properties. A weight of 0 means that the indicator is not relevant to resilience and was not used to calculate the aggregated resilience score of the system.

Table 24. Indicators that make up the Economic resilience index of the food system

Thematic area	Domain	Indicator	S	A	T	Weight
Development and logistics	Technology and digitalisation	Agricultural training of farm managers	X		X	2
		Rural Next Generation Access broadband coverage	X		X	2
		Use of Internet of Things in the food manufacturing sector	X		X	2
		Use of Artificial Intelligence in the food manufacturing sector	X		X	2
		Digital skills of the labour force in the agriculture, forestry or fishing sectors	X		X	1
		Digital intensity in food manufacturing enterprises	X		X	2
		Patent application in the agri-food sectors	X	X	X	3
	Transport, accessibility and infrastructure	Annual road freight transport by distance class	X			1
Fair economic viability in the food value chain	Income distribution	Farmers' income from agriculture compared with average wages in the general economy		X		1
		Labour income share				0
		Average salary by sector	X	X	X	3
		Employee earnings ratio				0
		Labour costs in the fisheries and aquaculture value chain		X	X	2
	Market power and business structure	Gross fixed capital formation in agriculture	X		X	2
		Fish landings of the EU small-scale fisheries	X		X	2
		Market concentration ratio				0
		Share of intermediate costs on total agricultural output	X	X	X	3
	Price	Price indices of agricultural inputs	X		X	2
		Consumer food inflation	X	X	X	3
		Share of household spending on food and non-alcoholic beverages		X		1
	Sectoral growth	Value added along the food chain		X		1
		Labour productivity in the food chain	X	X	X	3
	Trade	Trade balance		X		1
		Self-sufficiency rates of agricultural commodities	X		X	2

		Import dependency	X		X	2
		Balassa Index (Revealed Comparative Advantage)	X	X	X	3

NB: S – stability, A – adaptability, T – transformability.

Source: Authors.

Table 25 lists the indicators used for calculating the social resilience of the food system. These indicators also provided input for calculating the overall resilience of the food system. The conceptual relevance of these indicators was assessed in terms of stability, adaptability and transformability of the system. The last column of the table indicates the weight of the indicators, that is, the number of applicable resilience properties. A weight of 0 means that the indicator is not relevant to resilience and was not used to calculate the aggregated resilience score of the system.

Table 25. Indicators that make up the Social resilience index of the food system

Thematic area	Domain	Indicator	S	A	T	Weight
Fair, inclusive and ethical food system	Animal welfare	Organic production of aquaculture products	X		X	2
		Share of laying hens by farming method			X	1
	Employment	Accidents at work				0
		Employment by economic activity	X	X		2
		Number of fishers in the EU small-scale fisheries (passive gears)	X		X	2
		Job vacancies in the agrifood sector	X	X		2
		Informal employment in agriculture, forestry and fisheries	X		X	2
		Employment by gender	X		X	2
		Young farmers and fishers	X		X	2
	Social protection and poverty	Share of children receiving school meals	X	X		2
		People receiving food support	X	X		2
		Assistance from food banks	X	X		2

		Inability to afford a proper meal	X		X	2
Food environment	Food affordability	Affordability of a healthy diet: ratio of cost to food expenditures	X	X	X	3
		Share of the population unable to afford a healthy diet	X	X	X	3
		Cost of a healthy diet				0
	Food availability	Ratio plant to total protein supply		X	X	2
		Supply by food group		X	X	2
	Food heritage	Number of products under EU quality schemes	X			1
	Food messaging	Share of food products with a sustainability claim				0
		Share of food products with a front-of-pack nutrition label				0
Nutrition and Health	Properties of food	Share of food products eligible for marketing to children				0
	Food security	Prevalence of moderate or severe food insecurity in the population		X	X	2
	Health impact from diets	Burden of disease attributable to dietary risk factors				0
		Prevalence of overweight and obesity				0
	Nutrition and healthy, sustainable diets	Wholegrains consumption		X		1
		Food consumption by food category	X	X	X	3
		Prevalence of infants breastfed at age 6 months		X	X	2
		Alcohol consumption				0
		Salt intake				0
		Dietary choices	X		X	2

NB: S – stability, A – adaptability, T – transformability.

Source: Authors.

Annex 5. Statistical analysis of data variables in the EU Food System Monitoring Dashboard

Table 26. Indicators selected for correlation analysis

Indicator	Description	Pillar	Dimension	Direction	Min. year	Max. year
agri_lab	Labour productivity in the food chain – Agriculture	Sectoral growth	Economic	1	2008	2022
bev_lab	Labour productivity in the food chain – Beverage	Sectoral growth	Economic	1	2008	2022
fish_lab	Labour productivity in the food chain – Fishing and Aquaculture	Sectoral growth	Economic	1	2008	2022
food_lab	Labour productivity in the food chain – Food	Sectoral growth	Economic	1	2008	2022
cereal_ss	Self-sufficiency rates of agricultural commodities – Total cereals	Trade	Economic	1	2002	2023
dairy_ss	Self-sufficiency rates of agricultural commodities – Dairy	Trade	Economic	1	2002	2023
apple_ss	Self-sufficiency rates of agricultural commodities – Fruits/vegetables/Apples	Trade	Economic	1	2002	2023
tomato_ss	Self-sufficiency rates of agricultural commodities – Fruits/vegetables/Tomatoes	Trade	Economic	1	2010	2024
meat_ss	Self-sufficiency rates of agricultural commodities – Meat	Trade	Economic	1	2002	2024
oilseed_ss	Self-sufficiency rates of agricultural commodities – Oilseeds	Trade	Economic	1	2002	2023
rawmilk_ss	Self-sufficiency rates of agricultural commodities – Raw milk	Trade	Economic	1	2002	2023
cons_inf	Consumer food inflation	Price	Economic	–1	2005	2025
price_idx	Price indices of agricultural inputs – Total	Price	Economic	–1	2000	2017
fuel_fish	Fuel use of fisheries per value of fish landed in ports	Price	Economic	–1	2008	2023
hh_spend	Share of household spending on food	Price	Economic	–1	1975	2024
dist_inc	Labour income share – Distribution	Labour income share	Economic	1	2008	2022
food_inc	Labour income share – Food services	Labour income share	Economic	1	2008	2022
manuf_inc	Labour income share – Manufacturing	Labour income share	Economic	1	2008	2022
prim_inc	Labour income share – Primary producers	Labour income share	Economic	1	2008	2022
dist_sal	Average salary by sector – Distribution	Average salary by sector	Economic	1	2008	2022
food_sal	Average salary by sector – Food services	Average salary by sector	Economic	1	2008	2022
manuf_sal	Average salary by sector – Manufacturing	Average salary by sector	Economic	1	2008	2022
prim_sal	Average salary by sector – Primary producers	Average salary by sector	Economic	1	2008	2022

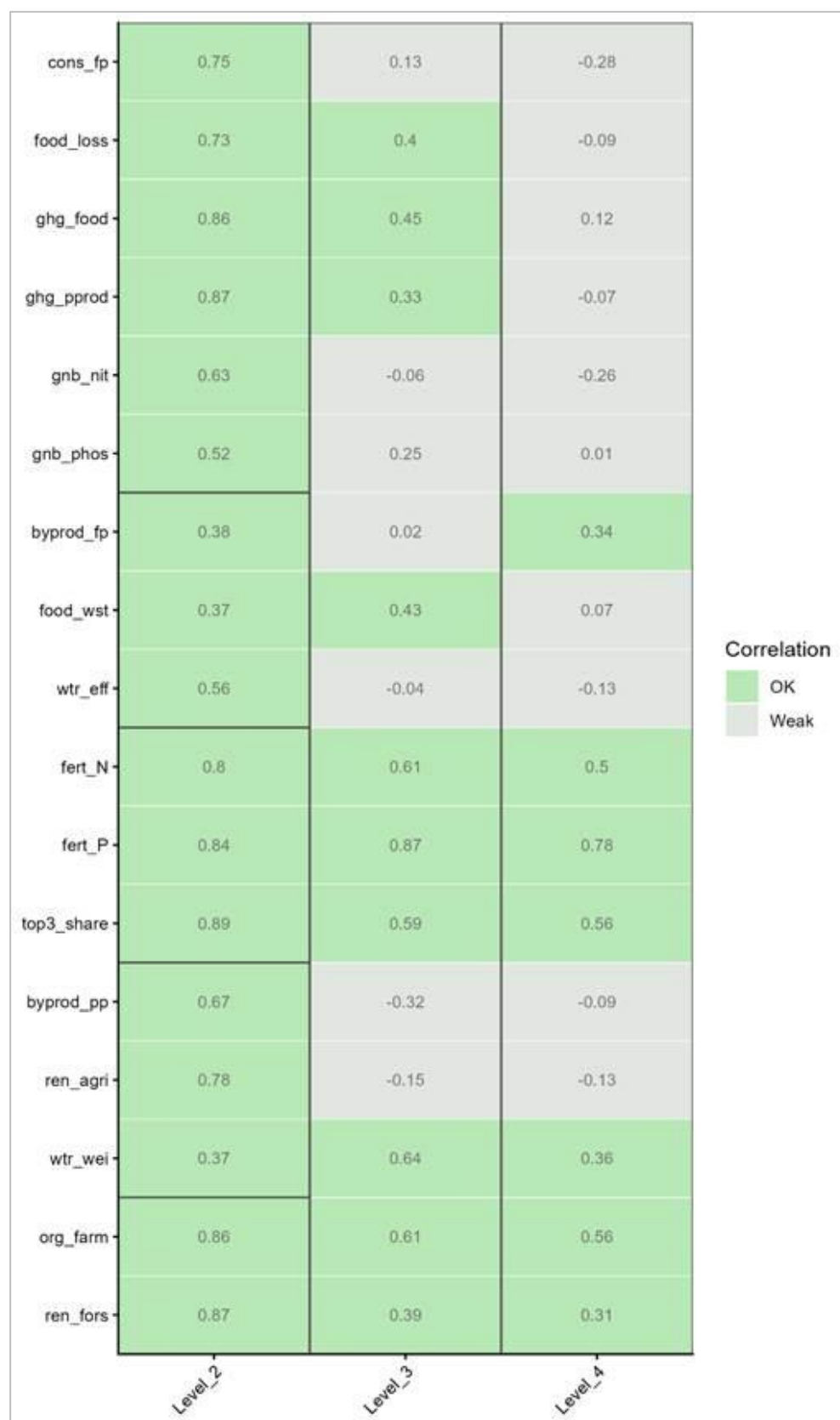
prim_ern	Employee earnings ratio – Primary producers	Average salary by sector	Economic	1	2008	2022
farm_inc	Farmers' income from agriculture compared with average wages in the general economy	Employee earnings ratio	Economic	1	1995	2023
dist_earn	Employee earnings ratio – Distribution	Employee earnings ratio	Economic	1	2008	2022
food_earn	Employee earnings ratio – Food services	Employee earnings ratio	Economic	1	2008	2022
manuf_ern	Employee earnings ratio – Manufacturing	Employee earnings ratio	Economic	1	2008	2022
gross_cap	Gross fixed capital formation in agriculture	Market power and business structure	Economic	1	1973	2024
fish_land	Fish landings of the EU small-scale fisheries	Market power and business structure	Economic	1	2008	2024
inc_cost	Share of intermediate costs on total agricultural output	Market power and business structure	Economic	-1	2015	2025
basic_trn	Agricultural training of farm managers – Basic training	Technology and digitalisation	Economic	1	2010	2020
full_trn	Agricultural training of farm managers – Full training	Technology and digitalisation	Economic	1	2010	2020
rural_ng	Rural Next Generation Access broadband coverage	Technology and digitalisation	Economic	1	2013	2022
ai_food	Use of Artificial Intelligence in the food manufacturing sector	Technology and digitalisation	Economic	1	2021	2025
dig_basic	Digital skills of the labour force in the agriculture, forestry or fishing sectors	Technology and digitalisation	Economic	1	2021	2025
dig_int	Digital intensity in food manufacturing enterprises	Technology and digitalisation	Economic	1	2015	2025
patents	Patent application in the agri-food sectors	Technology and digitalisation	Economic	1	2008	2020
byprod_fp	Generation and use of by-products – Food processing	Farming efficiency	Environmental	1	2003	2022
food_wst	Food waste	Farming efficiency	Environmental	-1	2020	2023
wtr_eff	Water-use efficiency	Farming efficiency	Environmental	-1	2005	2023
byprod_pp	Generation and use of by-products – Primary food production	Sustainable Energy	Environmental	1	2003	2022
ren_agri	Production of renewable energy from agriculture and forestry – from agriculture	Sustainable Energy	Environmental	1	2002	2022
wtr_wei	Water exploitation index, plus (WEI+)	Sustainable Energy	Environmental	-1	2000	2023
ren_fors	Production of renewable energy from agriculture and forestry – from forestry	Sustainable farming	Environmental	1	1990	2021
org_farm	Share of agricultural area under organic farming	Sustainable farming	Environmental	1	2012	2024
fert_N	Consumption of inorganic fertilisers – Nitrogen	Fertilisers	Environmental	-1	1995	2024
fert_P	Consumption of inorganic fertilisers – Phosphorus	Fertilisers	Environmental	-1	1995	2024
top3_share	Share of the top three crops in the total agricultural area	Fertilisers	Environmental	-1	2000	2024

cons_fp	Consumption Footprint – Food	Climate impact	Environmental	–1	2010	2023
food_loss	Food losses	Climate impact	Environmental	–1	2003	2022
ghg_food	GHG food system emissions	Climate impact	Environmental	–1	1990	2023
ghg_pprod	GHG emissions from primary food production – total	Climate impact	Environmental	–1	1990	2023
gnb_phos	Gross nutrient balance – phosphorus	Climate impact	Environmental	–1	1985	2023
gnb_nit	Gross nutrient balance – nitrogen	Climate impact	Environmental	–1	1985	2023
food_ins	Prevalence of moderate or severe food insecurity in the population	Nutrition and health	Social	–1	2015	2023
ovwt_child	Prevalence of overweight and obesity among children (<5 years)	Nutrition and health	Social	–1	2000	2024
diet_risk	Burden of disease attributable to dietary risk factors	Nutrition and health	Social	–1	1990	2021
wgrain	Wholegrains consumption	Nutrition and health	Social	1	2005	2018
salt	Salt intake	Nutrition and health	Social	–1	1990	2019
org_aqua	Organic production of aquaculture products	Animal welfare	Social	1	2012	2024
barn_hen	Share of laying hens by farming method – Barn	Animal welfare	Social	1	2011	2021
free_hen	Share of laying hens by farming method – Free range	Animal welfare	Social	1	2011	2021
org_hen	Share of laying hens by farming method – Organic	Animal welfare	Social	1	2011	2021
emp_food	Employment by economic activity – Total Food System	Employment	Social	1	2008	2024
inf_emp	Informal employment in agriculture, forestry and fisheries	Employment	Social	–1	2007	2024

NB: Indicator abbreviations are to facilitate the linking of the correlation plots to indicators in the dashboard. The explanation of the term ‘pillar’ is included in **Section 4.4**.

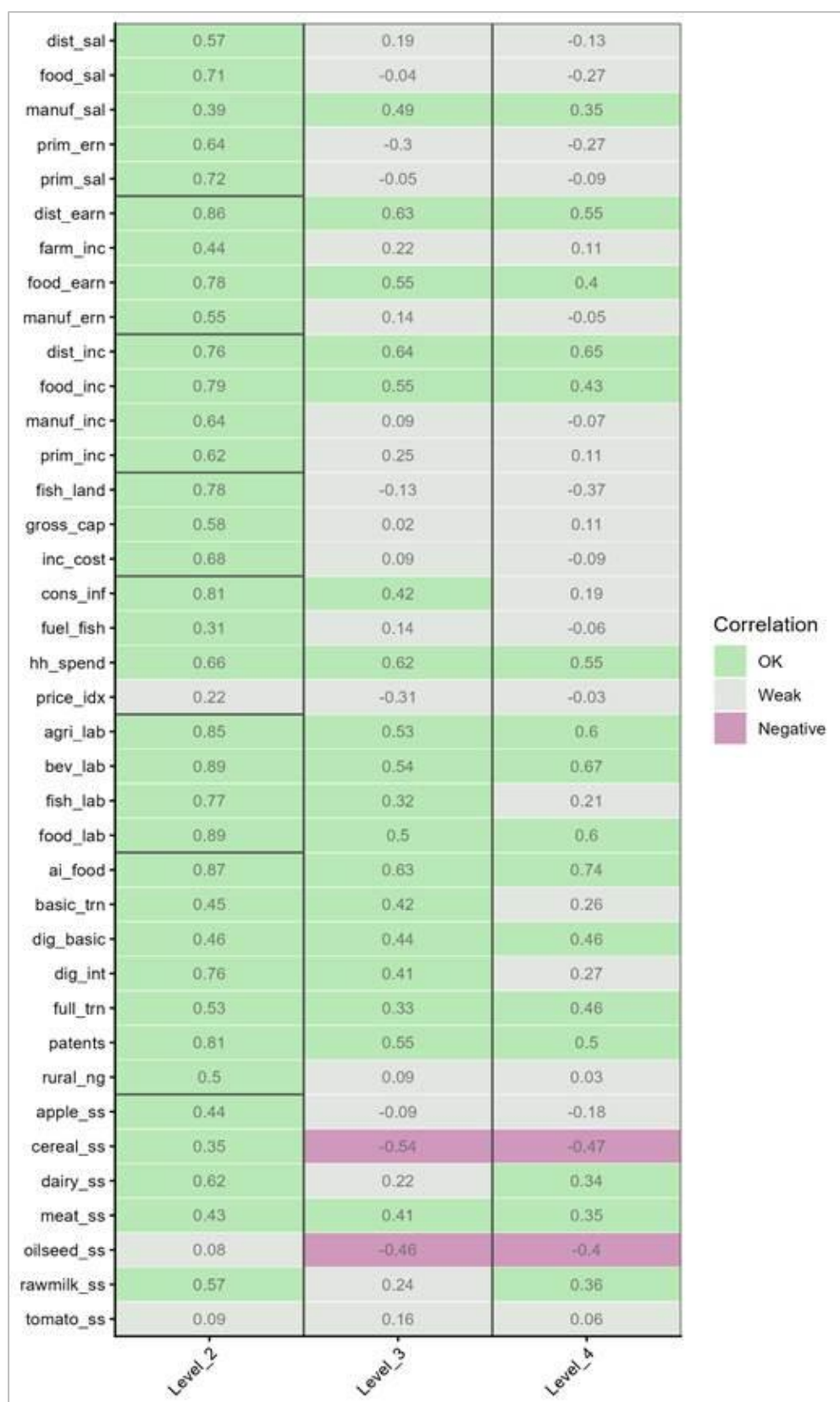
Source: Author’s elaboration based on FSMS dashboard data.

Figure 13. Correlation between the indicators of the Environmental dimension



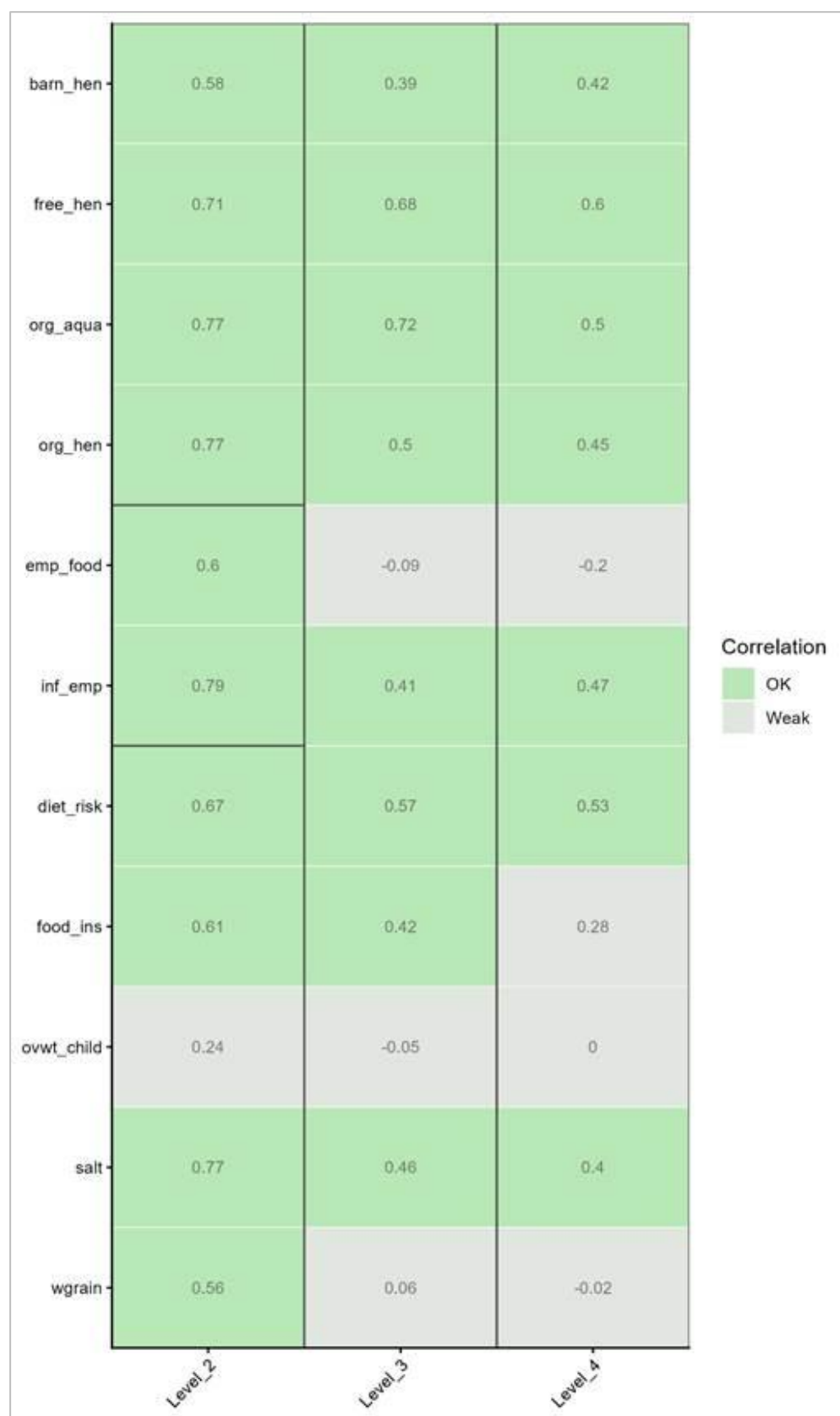
Source: Authors.

Figure 14. Correlation between the indicators of the Economic dimension



Source: Authors.

Figure 15. Correlation between the indicators of the Social dimension



Source: Authors.

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