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LCA METHODOLOGY FOR ENVIRONMENTAL FOOD LABELLING

EIT Food is a European innovation ecosystem that supports startups, entrepreneurs, and researchers to transform the food system that produces healthy sustainable food for all. We bring together expert scientists and leading figures from food production and retailing across the UK and EU who all share a vision of a future food industry that doesn't destroy the planet. This methodology was developed in collaboration with Mérieux NutriSciences | Blonk.

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Forward

Scientific progress relies not only on discovery and innovation, but on the rigor, transparency, and reproducibility of the methods that make discovery possible. In an era characterised by rapidly expanding data and information, increasingly complex analytical tools, and interdisciplinary collaboration, the careful articulation and credibility of methodology has never been more essential.

This publication is devoted to the advancement and critical examination of a scientific method that seeks to determine the life cycle impact of a food or beverage product. It seeks to provide all involved stakeholders, across the food value chain, with a robust, clearly defined approach that can be applied, tested, and refined across diverse contexts whilst at the same time caring for useability and facilitation of application. By emphasising methodological clarity and reproducibility, we aim to contribute to a body of work that is not only innovative, but also reliable and verifiable.

The contributions presented here reflect both established practices and emerging techniques, highlighting the dynamic nature of methodological development. Importantly, it is the second iteration of the previous Foundation Earth methodology that was the first of its kind to go public and open source in the space of making food claims related to environmental impact. The scientific team that worked on this method would like to underscore the importance of continual evaluation, adaptation, and openness in scientific inquiry. In doing so, this work aligns with a broader commitment to integrity and transparency in research.

This methodology was also developed with the experience, knowledge and insights of hundreds of stakeholders from across the value chain, including NGOs, policy makers, researchers, impact experts, industry actors from farm-to-table as well as broader specialists who work tirelessly on international harmonisation for a standard that is scientifically sound as well as drives on consumer choice and behaviour. We hope that this publication will serve as a valuable resource for all these actors and more, globally, to test, learn and drive not only results, but improved awareness and knowledge. Researchers, practitioners, and students alike - supporting the design of rigorous studies, encouraging critical reflection on existing methods, and fostering innovation grounded in sound scientific principles.

Ultimately, the strength of science lies in its methods and ability to compare fairly and transparently. By refining how we investigate, measure, and interpret the world, we strengthen the foundation upon which knowledge is built.

It is my sincere pleasure to share this scientific method as a strategic contribution to food system transformation for food value chain actors around the world. During the development process of this method, I worked with my outstanding colleague, Nicola Organ as we transitioned from Foundation Earth to EIT Food to drive further scale and uptake across its community. We also worked with our partner Blonk Consultancy and its wonderful consultants to include and ensure voices from across this scientific space included their deep knowledge and experience.

Thank you to all that made this possible.

Cliona Howie del Río, ex CEO of Foundation Earth and Richard Zaltzman, CEO EIT Food

Terms and Conditions of use EIT Food Life Cycle Assessment Methodology

1. Introduction

1.1 These Terms and Conditions ("Terms") govern the use of the EIT Food Life Cycle Assessment Methodology ("the Methodology"), which is made publicly available by EIT Food AISBL (“EIT Food”) in support of transparency, collaboration, and continued innovation in the assessment of the environmental impact of food and beverage products.

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8.1 These Terms and any dispute arising from their interpretation or execution shall be governed by and construed in accordance with the laws of Belgium. The courts of Brussels, Belgium shall have exclusive jurisdiction over any such dispute.

9. Contact Information

9.1 For enquiries relating to the Methodology or these Terms, please contact: nicola.organ@eitfood.eu.

Abbreviations and definitions

Abbreviation	Full name
EC	European Commission
EF	Environmental Footprint
FE	Foundation Earth
FU	Functional Unit
LCA	Life Cycle Assessment
PEF	Product Environmental Footprint
PEFCR	Product Environmental Footprint Category Rules
SKU	Stock Keeping Unit
Primary data	Measured or collected data from specific processes within the supply chain
Secondary data	Data that is not directly collected, measured, or estimated by the company, but sourced from a third-party life cycle inventory (LCI) database or other sources
Foreground processes	Processes in the product life cycle for which direct access to information is available; for example, the producer's site and other processes it has direct control over, such as through contractors (e.g. goods transport, material, and resource use for production)
Background processes	Processes in the product life cycle for which no direct access to information is possible; for example, most of the upstream life-cycle processes and generally all processes further downstream to the company's operations (e.g. a food manufacturer won't have primary data on how purchased energy is generated)

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1.

Introduction

In March 2023, the Beta Version 1.0 of this cradle-to-grave Life Cycle Assessment (LCA) methodology was published by Foundation Earth (FE)—FE was integrated into EIT Food in August 2024. This methodology was based on the European Commission's (EC) Product Environmental Footprint (PEF) method, including all life cycle stages from cradle to grave. In this methodology all 16 EC Environmental Footprint (EF) impact categories were included and aggregated to a single score, as the EF method allows.

We have since tested this methodology with a wide range of food and beverage companies, gathering insight and feedback to further improve the methodology. In 2024 we led a review of the methodology, using insights from testing together with results from in-depth interviews and surveys. Key stakeholders from industry, academia, policy, and LCA service providers were methodology review. The review was conducted in collaboration with Mérieux NutriSciences | Blonk, and the outcome of the process is presented in this updated document (Beta Version 2.0).

As with Beta Version 1.0, multiple choices must be made when setting up LCA models, including: allocation, use of primary and background data, approach for data gaps, data quality, modelling of packaging material with recycled content, and returnable packaging.

As far as possible, the EIT Food (LCA) methodology continues to align with the PEF.

The PEF framework already gives some guidance on several LCA modelling issues, and PEF category rules (PEFCR) have already been developed for several product groups.

A PEFCR is a set of product-specificrules that complement the general PEF method developed by the European Commission. PEFCRs provide detailed guidance on how to calculate and report the environmental footprint of products within a specific product category, ensuring the consistency, comparability, and reproducibility of results.

Within food categories, PEFCRs have been developed for beer, dairy, wine, packed water, and pasta. Additional PEFCR-aligned methods (e.g. shadow PEFCRs or FoodDrinkEurope standards), which are not officially part of the PEF framework, but aligned with it to a large extent, have been developed for marine fish and fresh produce. However, for other product categories, no standardised methods are available. A further issue is that certain methodological aspects laid down in the PEFCRs for different product groups can be conflicting.

EIT Food acknowledged in Beta Version 1.0 that such gaps in the EIT Food (LCA) methodology can hinder the fair comparison of environmental labels and ventured to develop a harmonised EIT Food (LCA) methodology based on PEF principles and building blocks (i.e. PEFCRs and Technical Advisory Board documents from the EC) that allows comparison across categories.

Although the grading system itself, meaning the methodology for converting the aggregated single score into an on-pack consumer label grade, is not within the scope of this methodology, its underlying principles continue to apply and are retained in the Beta Version 2.0 of the EIT Food (LCA) methodology: Products should be graded on a stock keeping unit (SKU) level in the country of sale.

- Comparison of grades between products of different food categories must be possible (e.g. meat product vs vegetable product).
- Comparison of grades between products within the same food category must be possible (e.g. carrot vs tomato or carrot vs carrot).

The grading system is the intellectual property of EIT Food. For any questions or comments regarding this methodology, please contact nicola.organ@eitfood.eu.

1.1 Status and Validity

This document is an updated Beta Version outlining the harmonised EIT Food (LCA) methodology. This guidance aims to enable consistent environmental impact calculations intended for communication of the impact to consumers. The grading system methodology to translate the environmental footprint into an environmental score is out of scope of this methodology document. Additionally, the development of a possible verification process of the footprint calculations is not within the scope of this methodology document.

This methodology builds on Beta Version 1.0 and must be seen as a continued attempt towards a harmonised PEF-based methodology. It brings together the development work that has been done within the PEF so far and considers development work that is currently happening in the context of sectoral PEFCRs and other relevant footprinting guidance (as shown in the Annex). Where inconsistencies or overlaps between PEFCRs and related guidance were identified, the EIT Food (LCA) methodology now provides a coherent approach to ensure a fully standardised methodology. In this respect, if the EIT Food (LCA) methodology deviates from a specific PEFCR, the EIT Food (LCA) methodology will take precedence and shall be followed instead. An overview of deviations from the PEFCRs can be found in the Annex (Tab 15).

Chapter 7 provides detail on the limitations of this document, including topics discussed in the Task Force review meetings that are not covered in this update. Further research and guidance will be needed to fill such gaps and further improve the methodology.

The EIT Food (LCA) methodology applies to in-scope products consumed across all global markets.

To ensure alignment with evolving footprinting standards, this Beta Version 2.0 includes a dynamic Annex as an Excel document. The Annex centralises references to the latest standards, enabling certain updates without altering the main document, thereby supporting the method's longevity and conformance with best practices. Additionally, all updates and changes made from Beta Version 1.0 to Beta Version 2.0 of the methodology are documented in the Annex (Tab 2). This ensures full traceability of the revisions, allowing users to clearly see what has been modified, added, or refined between the two versions.

This methodology employs precise terminology to clarify requirements, recommendations, and optional actions. The term '**shall'** is used to denote mandatory elements that must be met for an LCA study to conform with the methodology. '**Should'** indicates a recommendation rather than a strict requirement, but any deviation from a 'should' recommendation must be justified and transparently documented by the user. Finally, '**may'** is used to indicate permissible options that do not require further justification, providing flexibility where appropriate. This structured language ensures clarity and guidance on the levels of obligation for different aspects of the methodology.

1.2 General information about the EIT Food

1.2.1 Technical Secretariat

The Technical Secretariat responsible for the development of the EIT Food (LCA) methodology is composed of the following organisations:

Mérieux NutriSciences and eit Food Co-funded by the European Union

1.2.2 Consultation and stakeholders

Following the development of the Beta Version 1.0 document, a structured testing phase was conducted to evaluate its practical application and gather insights from the stakeholders. Preliminary feedback was then collected through interviews and a questionnaire, targeting LCA practitioners and industry representatives, to understand their experiences and challenges in applying the method. Subsequently, a series of Task Force meetings were organised to review the collected feedback, explore potential solutions, and gather additional insights that would inform updates to the methodology. The revised methodology document presented here is the outcome of this collaborative process, reflecting the contributions and perspectives of multiple stakeholders who engaged in shaping a more robust, practical, and effective approach. The Task Force meetings were organised and conducted jointly by Mérieux NutriSciences | Blonk and EIT Food.

After the consultation process, the EIT Food (LCA) methodology as well as the Annex were reviewed by a third independent party. The review process took place in July-August 2025.

1.2.3 Review statement

The revised methodology demonstrates substantial progress from the first submission, effectively addressing several of the concerns raised during the initial review. The documents now exhibit clearer structuring

Overall, this methodology is seen as an effective step in the right direction towards streamlining footprinting within the food sector. The methodology is evaluated as scientifically sound and technically appropriate to meet the intended purpose. The methodology is commended for bringing together a wide range of product category-level guidelines into a sector-level guideline, built upon the PEF framework, but adapted to support the goal of implementability in the sector.

The EIT Food (LCA) Beta 2.0 methodology demonstrates strong alignment with PEF (although, it doesn't intend to be fully aligned) and provides a solid foundation for consistent footprinting in the food sector. To ensure credible results, users should apply the methodology within its intended scope and stay attentive to the documented limitations. Continued refinement of the methodology through practical application and feedback will be essential to ensure its long-term relevance and credibility.

For the full Review Statement, please e-mail nicola.organ@eitfood.eu.

2. Scope

The system boundaries (Section 2.1) define the life cycle stages that shall be included in the environmental footprint and the stages and processes that are out of scope. The product granularity defines how specific the LCA represents one or certain products (Section 2.2). Section 2.3 describes the general definition of a functional unit (FU) for which the environmental impact shall be calculated. The life cycle stages for the EIT Food (LCA) methodology are described in Section 2.4. Subsections 2.1, 2.2, and 2.3 of this chapter start with a text box which provides an overview of the key aspects of each section that shall be followed when applying the methodology. This methodology is applicable to all food and drink products available through retail channels. To ensure clarity and conformity with PEFCR practices, an overview of relevant product classification codes (CPA) is included in the Annex (Tab 16) to illustrate which products are covered by this methodology.

2.1 System boundary

Key aspect:

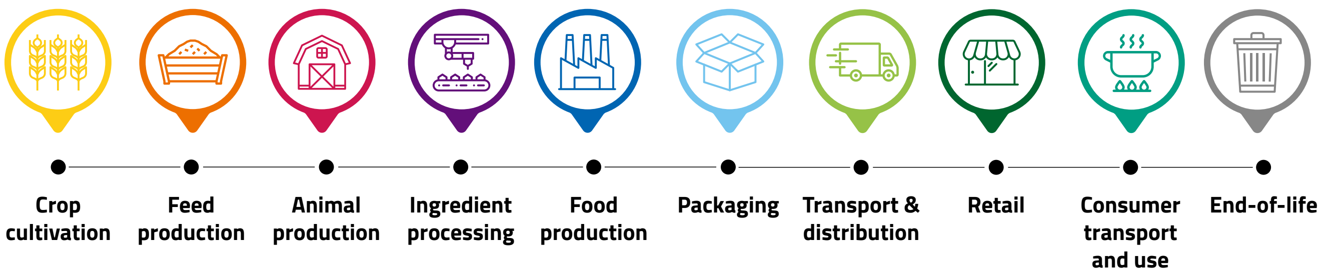
The LCAs are performed with a system boundary of cradle-to-grave

The system boundary defines which life cycle stages are analysed. To be PEF compliant, all life cycle stages from raw materials up until the end-of-life treatment of a product shall be included.

The goal of the EIT Food environmental label is to inform consumers about the environmental impact of the products they purchase. To enable a fair comparison between different products (e.g. pre-cooked vs raw food products), a cradle-to-grave system boundary is required. The footprint of food products can significantly change between a cradle-to-retail and cradle-to-grave system boundary. For instance, the carbon footprint of dry tea purchased in the supermarket is around 6 kg CO_2-eq/kg product, while the footprint of a cup of tea prepared at home is about 0.2 kg CO_2-eq/kg product. A limitation of choosing a cradle-to-grave system boundary is that the consumer has influence on the personal transport, use, and waste phase of the product, which is unknown to the food producer. Therefore, for those life cycle stages, it is necessary to make assumptions to calculate a product footprint from cradle-to-grave. For this reason, specific guidance is provided in the Annex (Tab 9) of this EIT Food (LCA) methodology to model the use stages.

The life cycle stages within the cradle-to-grave system boundary can be different for particular product groups. The main life cycle stages of food products are schematically shown in *Figure 1*. All life cycle stages will not necessarily be relevant for all food products. For example, for plant-based food items (e.g. fruit, vegetables, and meat replacers), the feed production and animal production stages are not applicable.

FIGURE 1. CRADLE-TO-GRAVE SYSTEM BOUNDARY FOR EIT FOOD (LCA) METHODOLOGY.



2.2 Product granularity

Key aspect:

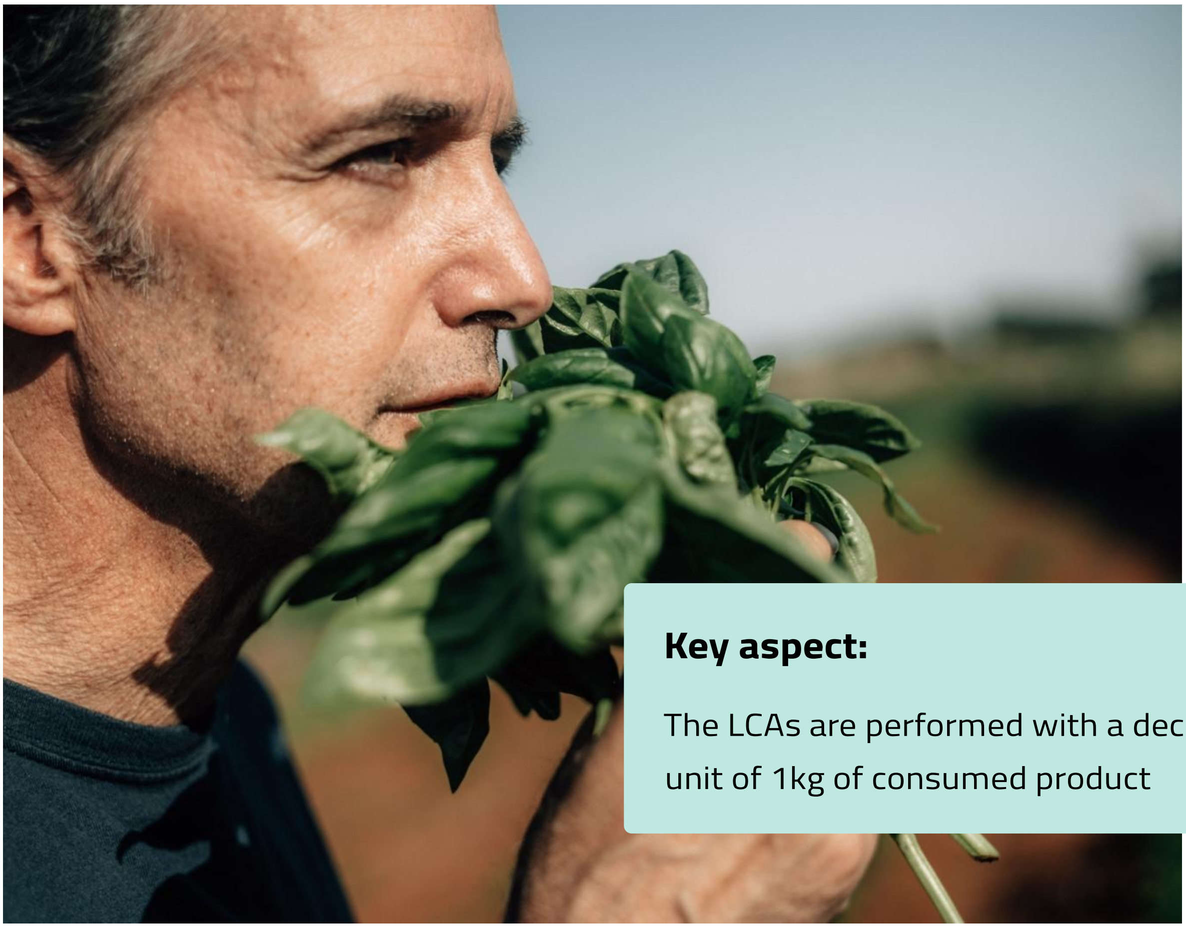
The LCAs are product- and country-specific and shall thus be performed per stock keeping unit (SKU) per country of sale

The LCAs and thus the environmental labels are product- specific, meaning that the labels are specific for each SKU. A SKU is a unique code which identifies a product and its characteristics. A SKU can vary in several aspects at each life cycle stage:

- **At the raw material production level,** the environmental footprint is differentiated for different types of production systems (e.g. depending on country of origin).
- **At the ingredient processor level,** the environmental footprint is differentiated for different types of processing (e.g. marinated or cut pieces).
- **At the food producer level**, the environmental footprint is differentiated for the different product compositions.
- **At the packaging level,** the product-specific types of packaging material (e.g. a combination of plastic and paper) determine the footprint.
- **At the retail and consumer level,** the environmental footprint is differentiated for different types of electricity production mix per country.

By combining these differences at all life cycle stages, a unique product is identified at the SKU level.

2.3 Functional unit and declared unit



Key aspect:

The LCAs are performed with a declared unit of 1kg of consumed product

The FU is defined by specifying what function should be provided by the product, how much, how well, and how long. All input and output flows in the analysis are related to the specified FU.

In some cases, products or product groups can fulfill multiple functions and it can be difficult to define one FU. The functions of food intake range from the supply of basic energy to the provision of social or cultural functions. Hence, the function of food intake is no longer restricted to the intake of required nutritional values. Because of this wide range of functions, it is not straightforward to state one FU. The PEF method recommends using a declared unit, such as mass or volume, for intermediate products with multiple functions. Although this methodology focuses on finished products, multi-functionality remains a relevant challenge; therefore, the decision was made to also apply a declared unit in this case.

The declared unit (equal to the reference flow) for the EIT Food (LCA) methodology is defined as: **1 kg of consumed product**

The choices for the different aspects of this definition are explained below.

Mass of product

Every product has its own set of nutritional values, which can for example be a combination of proteins, fats, and vitamins. The EIT Food label applies one methodology to several product groups, which makes it challenging to specify one nutritional value as the main function of all products. The EIT Food (LCA) methodology closely follows the PEF method recommendation to use a declared unit (e.g. mass or volume) in case no single FU can be defined.

Consumed product

The use of consumed product as a basis enables a fair comparison between different product types, as such:

- Making comparisons on a consumed product basis enables comparison between products with different amounts of ingredients used for the preparation of 1 kg of prepared (and consumed) product. For some products, moisture might be lost during preparation (e.g. evaporation of water during frying of meat), whereas for other products, water might be added during preparation (e.g. rice, tea).

- Besides moisture addition or loss, the FU accounts for the edible part of the product rather than the total product weight before preparation. It thus considers unavoidable food waste that is inherent to the type of product. The edible part of food refers to the portion of a product that is safe and suitable for human consumption, excluding inedible components such as shells, peels, bones, seeds, or other parts that are typically discarded or not eaten. For example, the bones in spare ribs or the shell of an egg are not considered edible and are thus not included in the 1 kg of consumed product. According to the PEF method, '*the FU shall be measured at product consumption level and should exclude inedible parts*'.
- The 'food production' life cycle stage includes the industrial processing of the food products (e.g. cutting and marinating food), which can also include pre-cooking at industrial scale. A fair comparison of raw, pre-cooked, or ready-to-consume products (available at retail) is only possible when comparing prepared and consumed products.

More information on the preparation of the product, including the calculations of the consumed weight, is available in the Annex (Tab 9 – Section 1 and 3).

2.4 Life cycle stages

Figure 1 above provides a general overview of the life cycle stages that are included in the system boundaries of the EIT Food (LCA) methodology.

According to the PEF method, to guarantee a minimal level of harmonisation among different PEFCRs, the default life cycle stages presented shall, at a minimum, include:

- **Raw material acquisition and pre-processing** (including the production of parts and unspecified components);
- **Production of the main product;**
- Product distribution and storage;
- **Use stage** (unless an intermediate product);
- **End-of-life** (including material recovery/recycling, unless an intermediate product).

Life cycle stages may be added or existing stages split if there are good reasons for this. For instance, the 'Raw material acquisition and pre-processing' life cycle stage may be split into 'Raw material acquisition', 'pre-processing', and 'raw materials supplier transport'.

For the EIT Food (LCA) methodology, the FoodDrinkEurope standard is applied (FoodDrinkEurope, 2022), with a further split of 'Raw material acquisition and pre-processing' into 'Crop cultivation', 'Animal husbandry', and 'Ingredient production'. This split is made to preserve granularity in the results and to allow identification of hotspots in the supply chain. *Table 1* provides an overview of the life cycle stages and the corresponding minimum reporting categories, which define the minimum level of detail required for reporting. *Table 1* also lists the type of activities in each of the life cycle stages.

TABLE 1: OVERVIEW OF LIFE CYCLE STAGES, REPORTING CATEGORY, AND CORRESPONDING ACTIVITIES TO BE USED IN THE EIT FOOD (LCA) METHODOLOGY.

Life cycle stage / Reporting category	Activities
Life cycle stage: **CROP CULTIVATION** Reporting category: **Crop cultivation**	Cultivation of crops for food or as input for feed production, including farm inputs, farm activities, land use change, and land management emissions
Life cycle stage: **FEED PRODUCTION** Reporting category: **Animal husbandry**	Transport from crop or livestock farm gate to feed processor and processing of crops and other raw materials into feed
Life cycle stage: **ANIMAL PRODUCTION** Reporting category: **Animal husbandry**	Animal farming, including farm inputs, farm activities, land use change, land management emissions, and manure management
Life cycle stage: **INGREDIENT PRODUCTION** Reporting category: **Ingredient**	All activities after crop farm gate or livestock farm gate until food production; transport to and between processing facilities, energy consumption, food losses, and other emissions at the processing facility (including slaughterhouse); for synthetic ingredients (defined as all those ingredients which do not originate from agricultural production), all activities required for their synthesis or manufacturing, including raw material acquisition
Life cycle stage: **FOOD PRODUCTION** Reporting category: **Food production**	All activities after ingredient production during which ingredients are combined or transformed into consumer-ready food products; transport to food production facility, energy consumption, losses, and other emissions in food production processes (e.g. cutting and marinating)

Life cycle stage	Reporting category	Description
PACKAGING	**Packaging**	Extraction of raw materials, pre-processing, and production of primary, secondary, and tertiary packaging
RETAIL	**Distribution**	Energy consumption and food losses at supermarkets
CONSUMER TRANSPORT	**Packaging**	Transport between the supermarket or other retail outlet and the consumer[1]
USE	**Use**	Use phase of food products, including food storage and preparation
END-OF-LIFE	**End-of-life**	Food waste treatment (losses and inedible parts) and end-of-life of packaging material

[1] This stage is included in the 'Distribution' reporting category, in line with the PEF method (EC, 2021).

Additionally, any cut-off shall be avoided, unless under the following rules defined in the PEF method. Processes and elementary flows may be excluded up to 3.0% (cumulatively) based on material and energy flows and the level of environmental significance (single overall score). The processes subject to a cut-off shall be made explicit and justified, in particular with reference to the environmental significance of the cut-off applied. This cut-off has to be considered in addition to the cut-off already included in the background datasets. This rule is valid for both intermediate and final products. The processes that cumulatively account for less than 3.0% of the material and energy flow as well as the environmental impact for each impact category may be excluded.

Tab 15 in the Annex gives an overview of the definition of life cycle stages across different standards.

2.4.1 Food loss and waste in the value chain

Food loss rates across the entire life cycle of the product shall be included. Differentiation shall be made between losses during the crop cultivation, losses during the feed and animal production, losses during the ingredient and food production phase, losses during distribution and retail, and losses and waste during the consumer use phase. The PEF guidelines specify that waste treatment shall be modeled in the life cycle stage where the waste is generated. For example, if waste is produced during manufacturing, its treatment (e.g. recycling, incineration, landfilling) shall be accounted for within the manufacturing stage. Additional products and materials to replace material and product losses shall be included.

There are differing hierarchies to be followed in the case of food loss. The hierarchies for food losses at manufacturing plants/food processors and at the consumer level are discussed below. For all remaining life cycle stages, the following hierarchy shall be followed:

1. If specific loss rates in the value chain are known (primary data), these shall be considered.
2. As value chain-specific (measured) loss rates will be difficult to obtain in many cases, country- or region-specific food loss data may be obtained from literature, if the source is publicly available and published by either a sector organisation or a peer-reviewed source. This approach, despite deviating from the PEF method, is deemed necessary due to the limited data granularity present in the PEF. When country- or region-specific food loss data is obtained from literature, a clear justification must be provided explaining why this source offers the most accurate representation of the product's value chain, highlighting its relevance and why it is more appropriate than the default values provided in the PEF method. It shall be documented how it improves the Data Quality Rating (DQR) for inventory values, in terms of precision and representativeness, as described in Chapter 6.
3. In the case that no suitable specific source is found, the food loss rates as presented in Annex II - Part F of the PEF method shall be used (EC, 2021).

Specifically for food losses at manufacturing plants/food processors, for which no defaults are available in Annex II - Part F, the following hierarchy shall be followed:

1. Primary data from the food manufacturing plant regarding food losses for the specific product in question shall be used when available.
2. In case no data is available for the product in question, but only for the plant as a whole, an estimate shall be made (e.g. by a factory expert). Substantiation shall be provided on how this estimate was made.

3. In case no estimate can be made, data shall be obtained from literature, if the source is relevant to the product in question, publicly available, and published by either a sector organisation or a peer-reviewed source.
4. In case no data can be found in literature, a food loss percentage of 10% shall be used.

Food waste at the consumer phase can be challenging to quantify due to limited availability of primary data and the high variability between countries and markets. When assessing consumer level food waste, the following hierarchy shall be applied:

1. Primary data directly related to the product in scope shall be used when available.
2. If no suitable primary data is available, default food loss rates provided in Annex II - Part F of the PEF method (EC, 2021) shall be used.

2.4.2 Additional guidance on use stage

The use stage can result in a high overall environmental contribution for many food products. As the use stage is calculated using many modelling assumptions, the real contribution is affected by potentially very high uncertainties (EC, 2021). The use stage includes all activities and products that are needed for the proper use of the product (i.e. ensuring it continues to perform its intended function throughout its lifetime). This includes, for example, the provision of tap water when cooking pasta (EC, 2021). The use phase assessment for food products shall consider different aspects, such as, but not limited to:

- The type (e.g. ambient, chilled, frozen) and estimated duration of storage;
- The variability or the typical use, supported with local consumer insight studies where available;
- Instructions required for the use;
- Additional material, equipment, or processes required for the consumption that are dependent on the product type and product design (e.g. the energy needed for hot water in the making of a hot beverage; FoodDrinkEurope, 2022).

Dependent and independent processes

The use stage often involves multiple processes. A distinction shall be made between (i) product-independent and (ii) product-dependent processes. In this EIT Food (LCA) methodology, product-dependent processes shall be included in the life cycle inventory of the use stage. Product-independent processes may be excluded in the life cycle inventory of the use stage.

(i) Product-independent processes have no relationship with the way the product is designed or distributed. The use stage process impacts will remain the same for all products in this product (sub) category even if the producer changes the product's characteristics. Therefore, they don't contribute to any form of differentiation between two products and might even hide the difference. Examples are the use of a glass for drinking wine (as the product doesn't determine a difference in glass use) or the washing machine used for heavy laundry detergents (capital good; EC, 2021).

For the food and drink sector, this refers to products that indirectly require energy (e.g. fuels or electricity) or materials during their use phase (e.g. additional ingredients, accessories), which are not defined by the design of a product. One example includes a consumer cup, as this product does not determine a difference in dishwashing, energy, and water required for the additional water boiled (e.g. if boiling 1 L of water for a 100 mL cup of tea, the energy and water required for the extra 900 mL; FoodDrinkEurope, 2022).

(ii) Product-dependent processes are directly or indirectly determined or influenced by the product design or are related to instructions for use of the product. These processes depend on the product characteristics and therefore contribute to differentiation between two products. All instructions regarding storage conditions and preparation provided by the producer and directed towards the consumer (through labels, websites, or other media) shall be considered product-dependent. Examples of such instructions are guidance on how long the food must be cooked, how much water must be used, storage conditions of foods and drinks, or, in the case of drinks, the recommended serving temperature. An example of a directly dependent process is the energy use of electrical equipment when used in normal conditions (EC, 2021).

For the food and drink sector, this refers to food and drink products that directly consume energy (fuel or electricity) or materials during their use phase, and which are defined by the design and type of a product. Additional examples include electricity used for a beverage vending machine or a coffee machine (FoodDrinkEurope, 2022). Additionally, the PEF method states that if shelf-life (often indicated as 'best before date' or 'use by date') is provided on the packaging (e.g. number of months) of food products, then food losses at storage, retail, and consumer stages shall be quantified. If the type of packaging affects the shelf-life, it shall be taken into account.

Defaults for dependent processes (e.g. amount of water, energy consumed in cooking) are available in the Annex (Tab 9). For process-dependent data that food producers cannot influence, such as the amount and source of energy required to prepare or preserve foods or drinks, default values from the Annex (Tab 9 – Section 4) shall be used to ensure consistency. For process-dependent data related to consumer behaviour, such as cooking time or method, more specific information shall be used where available, either from on-pack instructions as defined by the product manufacturer or from industry knowledge on consumer behaviour. If no specific data is available, the defaults from the Annex (Tab 9 – Section 1 to 7) shall be applied. Additionally, the most common way of cooking the product in the region/country of assessment may be considered (FoodDrinkEurope, 2022).

Use phase per food category

In the case that product- and supply chain-specific (or primary) data on storage and preparation can be obtained, this shall be used to model the use phase of the product. As mentioned in the paragraph on product-dependent processes above, primary data includes all instructions regarding storage conditions and preparation provided by the producer and directed towards the consumer (through labels, websites, or other media).

If no primary data can be obtained, it is important that the use phase is modelled consistently between similar products. For this reason, specific guidance to model the use phase is provided in this EIT Food (LCA) methodology. The PEF method provides specific guidance for some food products as described in the 'Use' section of *Table 2* of this document. The guidance referred to in this table, however, does not cover all food categories which are in scope for the EIT Food label. Based on the PEF method and FoodDrinkEurope guidance, a specified description of use phase activities per food category has been defined according to the food categories of the European Food Safety Authority (EFSA, 2011). The use phase activities can be found in the Annex (Tab 9) and shall be used if no primary data is available. The use phase characteristics are defined based on expert judgement and discussions among the methodological advisors during the development of Beta Version 1.0.

The following generic rules apply for the definition of the use phase of food items, regardless of whether primary data is used:

- Additional ingredients shall be included if these are liquids which are integrated in the consumed product. This mainly applies to powders that require the addition of liquids to make them consumable (e.g. the addition of water to tea and instant coffee). If specific instructions for the type of added liquid are available (through on-pack labels, websites, or other media), those shall be followed (e.g. the addition of semi-skimmed milk to chocolate powder)[1]. When no milk type is specified, semi-skimmed cow's milk can be assumed, as it is the most consumed milk type in Europe (The European Dairy Association, 2018).

- In the case that no instructions are provided or no explicit type of liquid is instructed, it may be assumed that the added liquid is tap water. Ingredients which are recommended by the food producer but not integrated in the consumed product and not required to make the product consumable (such as the addition of minced meat to pasta sauce or the addition of yoghurt or milk to cereals) shall not be included in the use phase of the product.

- For generic ingredients that cannot be directly consumed and have multiple purposes or applications (e.g. flour, sugar), no preparation phase and no additional ingredients need to be accounted for.

- The default storage condition for shelf-stable products (e.g. canned products) is ambient. No energy inputs for this storage type are to be included in the LCA. This overrules Annex (Tab 9 – Section 3) storage conditions in the case of inconsistencies.

- For sauces which are consumed warm, energy used to heat up to 100 degrees shall be included. This shall include energy used to heat up added water to 100 degrees.

[1] This choice is made to encourage food producers to promote sustainable consumer choices.

3.

Life cycle inventory

The LCA shall be performed using a combination of primary and secondary data. Section 3.1 specifies which processes and activities shall be considered in the LCA. The requirements regarding primary data are specified in Section 3.2. Guidance on the use of secondary data is provided in Section 3.3. Section 6 describes the Data Quality Rating (DQR).

3.1 Included processes

The main processes and activity data which shall be included in the LCA according to the EIT Food (LCA) methodology are specified per life cycle stage in *Table 2*. In the following paragraphs, additional guidance is provided on what data shall be based on primary (site-specific, company-specific [if multiple sites for the same product] or supply chain-specific) data and what may be obtained from secondary sources. A complete description of all processes and activity data which shall be included for each life cycle stage is present in the Annex (Tab 3-10).

TABLE 2: MAIN PROCESSES OR ACTIVITY DATA WHICH SHALL BE INCLUDED IN THE LCA, DEFINED FOR EACH OF THE LIFE CYCLE STAGES BASED ON SEVERAL RELEVANT SOURCES.

Life cycle stage	Main processes or activity data	Reference methodology
CROP CULTIVATION	• Relevant cultivation inputs and outputs (e.g. fertiliser use; yield; co-products; starting materials; plant protection agents; fuel use; land use)	PEF method FloriPEFCR FoodDrinkEurope
FEED PRODUCTION	• Processing inputs and outputs per feed component • Ration composition • Compound feed composition	PEFCR Feed
ANIMAL PRODUCTION	• Feed conversion ratio • Energy consumption • Manure management (type of system)	PEFCR Dairy PEFCR GRSB Marine fish FCR Red Meat FAO LEAP guidance for pig poultry, and large ruminants
INGREDIENT PRODUCTION (including slaughterhouse)	• Transport to processing facility • Productivity • Economic value of co-products • Energy consumption • Waste streams (food losses and other waste)	PEF method FoodDrinkEurope
FOOD PRODUCTION	• Transport to processing facility • Energy consumption • Amount and type of additional ingredients and auxiliary materials • Waste streams (food losses and other waste) • Productivity	PEFCR Dairy PEFCR Dry Pasta PEFCR Beer PEFCR Wine FoodDrinkEurope

PACKAGING	• Type of packaging material (primary, secondary, and tertiary) • Amount of material per type (virgin and recycled; primary, secondary, and tertiary) • Extraction of raw material • Production of packaging material	PEF method FoodDrinkEurope
TRANSPORT AND DISTRIBUTION	• Average time in distribution centre • Use of electricity, heat, and refrigerants • Per transport leg (average distance and type of vehicle) • Emission factors per type of transport • Emission factors for energy use, refrigerant leakage	PEF method FoodDrinkEurope
RETAIL	• Use of electricity, heat, and refrigerants • Food losses • Emission factors per type of transport • Emission factors for energy use, refrigerant leakage	PEF method FoodDrinkEurope
CONSUMER TRANSPORT	• Transport distance and mode	PEF method FoodDrinkEurope
USE	• Energy requirement for chilled or frozen storage • Preparation method and required inputs (e.g. heat, frying oil) • Raw-to-cooked ratio and inedible fraction	PEF method FoodDrinkEurope
END-OF-LIFE	• Food waste percentage and destination • Recycling rates for packaging	PEF method FoodDrinkEurope

3.2 Primary data requirements

The environmental labels are product specific, and LCAs are to be performed at a product (SKU) level. To generate results that reflect the environmental footprint of a specific product, value chain-specific data shall be used for the main activities in several life cycle stages. The PEF method specifies two requirements that shall be met when performing a PEF study:

1. The bill of material (BoM) shall be specific to the product in scope.
2. The modelling of the manufacturing processes shall be based on company-specific data (e.g. energy needed to assemble the materials, components of the product in scope).

However, the PEF Method does not specify the data points for which primary (site-specific, company-specific [if multiple sites for the same product], or value chain-specific) data shall be collected. Some PEFCRs do specify more detailed, mandatory company-specific data requirements (such as the Dairy PEFCR). In general, the PEF recommends using higher quality data for the processes that contribute most to the total environmental footprint. For most food products, primary agricultural production (i.e. cultivation of crops and/or animal production on farms) is a significant contributor to the total environmental footprint (Poore & Nemecek, 2018). Meanwhile, access to primary farm data is sometimes limited for food producers.

Based on discussions with industry experts during the development of Beta Version 1.0, a specific primary data requirement list has been drawn up for two groups of food producers: Category 1 and Category 2. The data points defined as 'Primary' are the minimal primary data requirements that shall be adhered to. Additional primary data is preferred and encouraged for all life cycle stages (for Category 1 and Category 2 producers), where available.

CATEGORY 1 FOOD PRODUCER

is defined as a food producer for which primary (agricultural) production **either falls within company boundaries or takes place at a Tier 1 supplier**.

CATEGORY 2 FOOD PRODUCER

is defined as a food producer for which primary (agricultural) production **does not fall within company boundaries, nor does it take place at a Tier 1 supplier.**

TIER 1 SUPPLIER

is defined as a supplier that provides goods or services directly to either a Category 1 or 2 food producer, **without any intermediaries in the supply chain**.

3.2.1 Primary data requirements for Category 1 food producers

A Category 1 food producer is defined as a food producer for which primary production (i.e. crop cultivation for plant-based foods or animal production for animal-based foods) either falls within company boundaries or takes place at a Tier 1 supplier, meaning there is no intermediate actor between primary production and the food producer. In both cases, the food producers are expected to be able to get into contact with the primary producers (e.g. farms) to obtain primary data. Typically, the Category 1 food producer is a company or cooperative providing fresh produce or minimally processed produce to retail outlets.

The data requirements for company-specific data per life cycle stage are specified in *Table 3*. As the table shows, primary data shall be used for the key parameters in crop cultivation for plant-based foods or for the key parameters in animal production for animal-based foods. In addition, primary data shall be used for food production and packaging (if relevant). A comprehensive description of required primary data for Category 1 food producers is present in the Annex (Tab 3-10). For the Use phase, the guidance provided in Chapter 2.4.2 applies.

TABLE 3: DATA REQUIREMENTS FOR CATEGORY 1 FOOD PRODUCERS FOR EACH LIFE CYCLE STAGE

Life cycle stage	Activity data	Data source
Crop cultivation	• For feed: All cultivation inputs (e.g. fertiliser use; yield)	• Secondary from allowed databases
	• For plant-based foods: All cultivation inputs except capital goods (e.g. fertiliser use; yield)	• Primary
Feed production	• Ration composition	• Primary
	• Compound feed composition	• Primary
Animal production	• Productivity	• Primary
	• Energy consumption and energy type	• Primary
	• Manure management (type of system)	• Primary
	• Feed conversion ratio or amount of feed	• Primary
Ingredient production (including slaughterhouse)	• Transport to facility	• Primary or estimate
	• Productivity	• Primary or PEF default
	• Economic value of co-products	• Primary or PEF default
	• Energy consumption and energy type	• Primary
Food production	• Transport to processing facility	• Primary
	• Energy consumption and energy type	• Primary
	• Amount and type of ingredients and auxiliary materials	• Primary
	• Waste streams (food losses and other waste)	• Primary

	• Productivity/output	• Primary
	• Energy production	• Secondary from allowed databases
Packaging (for primary, secondary, and tertiary packaging)	• Type of packaging material	• Primary
	• Amount of material per type (virgin and recycled)	• Primary
	• Recycled content	• Primary
	• Extraction of raw material	• Secondary from allowed databases
	• Production of packaging material	• Secondary from allowed databases
Transport and distribution	• Average time in distribution centre	• Secondary or PEF default
	• Use of electricity, heat, and refrigerants	• Secondary or PEF default
	• Per transport leg (average distance and type of vehicle)	• Secondary or PEF default
	• Emission factors per type of transport	• Secondary from allowed databases
	• Emission factors for energy use, refrigerant leakage	• Secondary from allowed databases
Retail	• Use of electricity, heat, and refrigerants	• Secondary or PEF default
	• Food losses	• Secondary or PEF default
	• Emission factors per type of transport	• Secondary from allowed databases
	• Emission factors for energy use, refrigerant leakage	• Secondary from allowed databases

Consumer transport	• Transport distance and mode	• Secondary or PEF defaults
Use	• Energy requirement for chilled or frozen storage	• Secondary, PEF defaults, or other guidance (Tab 9 of the Annex)
	• Preparation method and required inputs (e.g. heat, frying oil)	• Secondary, PEF defaults, or other guidance (Tab 9 of the Annex)
End-of-life	• Food waste percentage and destination	• Primary or hierarchy Section 2.4.1
	• Recycling rates for packaging	• Secondary or PEF defaults

3.2.2 Primary data requirements for Category 2 food producers

A Category 2 food producer is defined as a food producer for which primary production (either crop cultivation for plant-based foods or animal production for animal-based foods) does not fall within company boundaries, nor does it take place at a Tier 1 supplier. A wide variety of ingredients might be used in food products, which are delivered through different intermediate actors. Typically, the Category 2 food producer is a company which processes different kinds of ingredients into foods for delivery to retail outlets. Therefore, it is expected to be the exception for food processors to have, or obtain, access to primary data on primary production. However, whenever possible, it is recommended to use primary data for ingredient production (starting with key ingredients/data points as obtained from a hotspot analysis based on background data) in order to get more insight into impacts linked to ingredient sourcing and to improve data quality. A situation may occur when food processors source multiple ingredients from suppliers at different tiers; for example, some ingredients coming from Tier 1 suppliers and others from Tier 2 or lower. In such cases, Category 2 food producers likely have better access to primary data for the ingredients sourced from Tier 1 suppliers. Therefore, Category 1 data requirements should apply specifically to those Tier 1 ingredients.

The data requirements for company-specific data per life cycle stage are specified in *Table 4*. As the table shows, primary data is not required for crop cultivation or animal production (although, it is encouraged where available) but is required for food production and packaging. Criteria for secondary data are explained in Section 3.3.2. A more detailed description of required primary data for Category 2 food producers is present in the Annex (Tab 3-10).

For Category 2 food producers, the life cycle stages ‘Crop cultivation’/‘Animal production’ and ‘Feed production’/‘Ingredient’ may be merged when data gathering proves to be highly challenging or LCA practitioners only have access to aggregated emissions factors for the above-mentioned life cycle stages. However, this approach should be regarded as a last resort, as it can reduce the granularity and accuracy of the LCA. Wherever possible, producers should keep life cycle stages separate as defined in Chapter 2.4 to maintain transparency and enable more precise assessments of individual stages. Only when data limitations severely impede analysis should stage merging be considered, and such instances should be documented clearly in the assessment and results. When merging these life cycle stages, LCA practitioners should adhere to methodological and data requirements as set out in the EIT Food (LCA) methodology and the Annex, clearly documenting the modelling choices, assumptions, and other relevant information. Note that aggregation of life cycle stages has consequences for the DQR, outlined in Section 6.

TABLE 4: DATA REQUIREMENTS FOR CATEGORY 2 FOOD PRODUCERS FOR EACH LIFE CYCLE STAGE.

Life cycle stage	Activity data	Data source
CROP CULTIVATION	• All cultivation inputs (e.g. fertiliser use, yield) except capital goods	• Secondary from allowed databases
FEED PRODUCTION	• Processing impact per feed component	• Secondary from allowed databases
	• Ration composition	• Secondary from allowed databases
	• Compound feed composition	• Secondary from allowed databases
ANIMAL PRODUCTION	• Productivity	• Secondary from allowed databases
	• Energy consumption and energy type	• Secondary from allowed databases
	• Manure management (type of system)	• Secondary from allowed databases
	• Feed conversion ratio or amount of feed	• Secondary from allowed databases
INGREDIENT PRODUCTION (including slaughterhouse)	• Transport to facility	• Secondary from allowed databases
	• Productivity	• Secondary from allowed databases
	• Economic value of co-products	• Secondary from allowed databases
	• Energy consumption and energy type	• Secondary from allowed databases

FOOD PRODUCTION	• Transport to processing facility	• Primary
	• Energy consumption and energy type	• Primary
	• Amount and type of ingredients and auxiliary materials	• Primary
	• Waste streams (food losses and other waste)	• Primary or hierarchy Section 2.4.1
	• Productivity/output	• Primary
	• Energy production	• Secondary from allowed databases
PACKAGING (for primary, secondary, and tertiary packaging)	• Type of packaging material	• Primary
	• Amount of material per type (virgin and recycled)	• Primary
	• Recycled content	• Primary
	• Extraction of raw material	• Secondary from allowed databases
	• Production of packaging material	• Secondary from allowed databases
TRANSPORT AND DISTRIBUTION	• Average time in distribution centre	• Secondary or PEF default
	• Use of electricity, heat, and refrigerants	• Secondary or PEF default
	• Per transport leg (average distance and type of vehicle)	• Secondary or PEF default
	• Emission factors per type of transport	• Secondary from allowed databases
	• Emission factors for energy use, refrigerant leakage	• Secondary from allowed databases

RETAIL	• Use of electricity, heat, and refrigerants	• Secondary or PEF default
	• Food losses	• Secondary or PEF default
	• Emission factors per type of transport	• Secondary from allowed databases
	• Emission factors for energy use, refrigerant leakage	• Secondary from allowed databases
CONSUMER TRANSPORT	• Transport distance and mode	• Secondary or PEF defaults
USE	• Energy requirement for chilled or frozen storage	• Secondary, PEF defaults, or other guidance (Tab 9 of the Annex)
	• Preparation method and required inputs (e.g. heat, frying oil)	• Secondary, PEF defaults, or other guidance (Tab 9 of the Annex)
END-OF-LIFE	• Food waste percentage and destination	• Primary or hierarchy Section 2.4.1
	• Recycling rates for packaging	• Secondary or PEF defaults

3.2.3 Data sampling procedure

The requirements as laid down in the PEF method regarding primary data collection (Chapters 4.4.6 and 4.6) shall be followed (EC, 2021). Where applicable, data sampling procedures are specified per life cycle stage in the Annex (Tab 3-8). However, sampling is not mandatory and any user of this EIT Food (LCA) methodology may decide to collect the data from all the operations, without performing any sampling. Regarding sample size, this implies that the minimum applied sample size for company-specific data is $\sqrt{n}$ in case of n entities in one sub-population. This means, for example, that data shall be gathered for a representative $\sqrt{n}$ number of processing facilities in the food processing stage. Another example for food producers is that if a distinction is made between organic and conventional production, and production systems are significantly different in the north and the south of the country of origin, then four sub-populations (organic-north, organic-south, conventional-north, and conventional-south) are distinguished, and a sample of $\sqrt{n}$ is assumed for each of the four groups. This approach is compliant with the PEF method (EC, 2021).

Specific requirements apply for co-manufacturers or co-packers. Co-manufacturers are defined as companies producing ingredients of foods products for another brand, using the brand's recipe and standards. Similarly, co-packers package food products for other brands, often handling operations such as filling and/or labelling. If no primary data for operations from a co-manufacturer or co-packer is available, the same (average) data for processing per litre or kilogram of a product shall be assumed as for similar operations taking place in the producer's own factory (for the same type of product), but using the grid mix for the country of the co-manufacturer or co-packer and corresponding heat source from the country market mix (unless the type of energy used at the co-packer or co-manufacturer is known). If that is not available, literature shall be used if the source is relevant to the product in question, publicly available, and published by either a sector organisation or a peer-reviewed source.

3.2.4 Time period to be considered for data collection

The following guidance outlines how primary data shall be collected to ensure time representativeness and relevance. Primary data shall be representative of the current operation and shall not be older than five years. Cultivation data for annual crops shall be gathered for a period of at least three years to account for variations in yields due to changing growing conditions; where three years of data are not available (e.g. due to starting up a new production system), a minimum of one year shall be used. The intention is to level out any seasonal differences. For crops other than annuals, the time period for data collection shall follow the PEF method (Section 4.4.1.3; EC, 2021).

For ingredient sourcing, a three-year average should be recorded or the quantity of ingredients sourced per region (or country, if regional differentiation is not available) to account for year-to-year fluctuations in sourcing locations.

3.3 Secondary data

To be fully PEF compliant, either EF-compliant datasets shall be used or the data quality of all other used datasets shall be assessed with the EF DQR formula. Currently, the EF 4.0 database is not yet available, and there is an ongoing discussion whether the new EF version will contain unit or system level datasets. This could create a transparency issue as system level datasets report aggregated results, so it wouldn't be possible to derive the contribution of different life cycle stages from the available information. Finally, previous EF database versions (EF 2.0 and EF 3.0) were only allowed to be used for PEF-compliant studies, and it was not permitted to use this data outside of the PEF framework. Therefore, other commercial or non-commercial databases shall be used for the EIT Food (LCA) methodology at the current time.

3.3.1 Preference hierarchy for secondary data

The EIT Food (LCA) methodology provides recommended data sources to be used for secondary data (or sub-processes) for each life cycle stage, shown in the Annex (Tab 13). The following hierarchy shall be applied when selecting background data to be used:

1. Preferably, the same data sources should be used for all product groups (e.g. categories of similar products, such as dairy, meat, or plant-based foods) for consistency, and the specific data sources shall be selected for their suitability (in terms of completeness and data quality) for the specific processes. The data quality of the preferred data sources was determined to be sufficient for application in the EIT Food (LCA) methodology during development of the Beta Version 1.0 methodology. The evaluation criteria used to inform this decision can be found in Section 3.3.2 below.
2. A list of alternative data sources is also shown in the Annex (Tab 13). The use of these data sources may be associated with a lower DQR (see Chapter 6).

3. In the case that no suitable data point is found in the sources described in points 1 and 2 above, a proxy shall be selected. The Annex (Tab 14) provides an approach to select a suitable proxy. The use of a proxy shall be associated with a lower DQR (see Chapter 6).

3.3.2 Criteria for secondary data sources

During the development of Beta Version 1.0, a set of criteria for the selection of preferred background databases was determined. These criteria have been established to make fair comparison possible and, as much as possible, to align with the following standards:

- PEF-compliant farm emission modelling
- PEF-compliant LUC modelling
- Inclusion of peat emissions modelling
- Multi-impact assessment (all relevant activity data available)
- Representativeness of datasets (e.g. country average)
- Consistent use of data sources of key parameters (e.g. fertiliser application, yields)
- Compliant with EF allocation methods
- Transparent (well-documented methodology report)
- Frequently reviewed and updated (<3 years old)
- Externally reviewed
- Availability of food products datasets

The results of the qualitative assessment and an overview of background databases that shall be used can be found in the Annex (Tab 13).

3.3.3 Selection of preferred data source

Not every database complies with all the criteria referenced above. The Annex (Tab 13) presents which databases can be used as preferred data source. When selecting the preferred database, the overall results of the assessment presented in Tab 13 of the Annex were used, but in addition, the availability of food and feed ingredient items in the specific database have also been considered. If alternative data sources are required, any of the above-mentioned databases should be used.

3.3.4 Proxy methodology

When performing a food product LCA, data gaps are frequently encountered. A consistent approach to fill those data gaps is necessary to make a fair comparison between different product footprints, if possible. As different LCA practitioners will make use of different background databases (allowed in this EIT Food [LCA] methodology) it becomes very time consuming at this stage to provide proxies for all kind of ingredients in all available databases. Hence, a more generic proxy methodology is proposed.

When the process/product is not available in the background database (for the specific origin), the proxy methodology shall be used as described in the Annex (Tab 13). Alternatively, the LCA practitioner can try to model the missing process/product based on value chain-specific information combined with estimates, literature, or own emission factors, considering the calculation rules as described in this document.

Own emission factors for all impact categories in scope (see Annex Tab 12) can be applied in the assessment when they align with the modelling choices defined in the EIT Food (LCA) methodology and the Annex, such as specific approaches to emissions modelling and allocation. Additionally, these factors must be based on data derived from the recommended background databases in the Annex (Tab 13), ensuring consistency and compatibility with the established data sources. This alignment helps maintain reliability and comparability in environmental assessments.

4.

Calculation methodology

In LCA, several modelling choices need to be made with regards to important topics such as multi-functionality, emissions modelling, and end-of-life. These modelling choices affect the results and are often caused by inconsistencies between different LCA methodologies. As LCA methodologies are often updated and new standards are released, modelling choices for each life cycle stage are presented in the Annex (Tab 3-10). This structure facilitates updates and ensures that the document remains aligned with the latest developments in the field, promoting a consistent approach.

4.1 Allocation

Whenever a process provides more than one function (e.g. delivering several goods or services), it is considered multi-functional. Multi-functionality implies that it can be difficult to divide the environmental burden of the process between its different functions. According to the ISO 14044 standard, allocation should be avoided by, for instance, subdividing the process into multiple sub-processes to effectively share the environmental burden. When allocation cannot be avoided, then multiple approaches can be applied.

Following the PEF and the different PEFCRs can present certain inconsistencies that need to be resolved. For example, the recommended allocation at dairy processing is economic in the Feed PEFCR but dry matter-based in the Dairy PEFCR. To allow fair comparisons for food products of different food categories, allocation type needs to be harmonised for each process.

Allocation approaches are listed in the Annex per life cycle stage. The PEF, together with the relevant PEFCRs, are the leading documents for the proposed approaches.

Since the PEF does not provide clear guidance on how to deal with allocation in relation to waste or by-products at the food processing/manufacturing level, specific allocation rules have been defined. In the production process where the waste/by-product originates from, allocation shall be applied according to the following rules:

1. If the ingredient in question concerns a waste product, meaning a material that is produced whilst manufacturing the main product (with distinctively different features than the main product) and that has no monetary value or its economic value does not exceed the transport costs between the sending and receiving party (disposal costs covered by the sending party), it shall be assigned zero allocation. An example includes brewers' spent grain, which can be collected for free by feed companies.

2. In case the ingredient concerns a by-product, meaning a secondary material that is produced whilst manufacturing the main product, but one that has monetary value, economic allocation shall be applied between the main product and by-product(s). An example includes the grape pomace and lees that are by-products from wine production.

3. If the product concerns a version of the main product, however in a different shape or size (e.g. cuttings from slicing cheese, which is turned into grated cheese) or of lower quality (e.g. upper/lower parts cut from carrots, carrots with damage that would be discarded):

- Economic allocation shall be applied to distinguish different destinations: human consumption, feed (thus unsuitable for human consumption), energy generation, or waste

- Economic allocation shall be applied within the same destination to distinguish between different qualities, provided that the co-products can be separated into quality grades and the price of the lower-quality grade exceeds the transport costs between the sending and receiving party. For example, apples sorted into first-class for direct consumption and those for juice production shall both fall under the destination 'human consumption', but economic allocation is applied if the price of apples destined for juice production exceeds transport costs.

- Physical (mass) allocation shall be applied if no distinction is made between the quality of the co-products within the same destination.

The hierarchy below gives further guidance on how to deal with production locations with different production lines; in particular, how to partition the input or output flows between the different lines:

- Obtain specific data (energy, water, and other inputs) for each of the individual production lines (based on energy use of the machines operating on the production lines).

- In case no specific data is available, and the products produced on the different production lines concern similar products and/or have a similar production process, the energy of the entire factory (and other inputs) shall be allocated depending on the mass of the products.

- In case no specific data is available, and the production lines have distinctively different production characteristics, the energy of the entire factory (and other inputs) shall be allocated depending on the economic value of the products.

4.2 Emissions modelling

Emissions modelling is an important component of certain stages of the supply chain, particularly crop cultivation and animal farming. Emissions modelling refers to the accounting of emissions that originate from a process, for instance, as a result of combustion, oxidation, or dissolution. The proposed approach follows the PEF when possible. Whenever the PEF lacks guidance (e.g. animal farming), additional approaches based on the PEFCRs and best available standards are presented.

The Annex provides detailed emissions modelling methodologies for the foreground processes in separate tabs for crop cultivation (Tab 3), animal farming (Tab 4), emissions from drained peat soils (Tab 11), and land-use change (Tab 11).

4.2.1 Crop cultivation

In crop cultivation, the same approach as in the existing PEF and relevant PEFCRs is followed for the modelling of direct and indirect emissions. Emissions that shall be included in the modelling of crop cultivation are present in the Annex (Tab 3), including the recommended tier levels for the emissions modelling.

4.2.2 Animal farming

Emissions modelling for animal farming systems shall include, at a minimum, direct and indirect emissions from enteric fermentation, from manure handling in the stable, during on-farm manure storage, and during pasture.

Specific information on which emission calculations shall be used per animal system are provided in the Annex (Tab 4), including the recommended tier levels for the emissions modelling. The reported emission models are intended to be recommendations based on best practices and expert judgement. More simplified emission models (e.g. IPCC Tier 1) are also allowed, providing all relevant emission flows are included. At this moment, although no guidance is provided for all animal systems (i.e. those not listed in the Annex [Tab 4]), the emissions coming from such animal systems shall be accounted for, using data from literature, if the source is publicly available and published by either a sector organisation or a peer-reviewed source.

4.2.3 Emissions from drained peat soils

When cultivation occurs on peat soil, significant GHG emissions can occur. Most importantly, CO_2 emissions occur from carbon oxidation and N_2O emissions occur from nitrogen mineralisation. Although peatland emissions are usually difficult to estimate, the PEF states that '*drained peat soils shall include carbon dioxide emissions on the basis of a model that relates the drainage levels to annual carbon oxidation*'. More information on how to model peat oxidation emissions is provided in the Annex (Tab 11).

4.2.4 Emissions from land use change

Emissions from land use change shall be accounted for as indicated in the PEF. These refer to the emissions of carbon as CO_2 initially stored in biomass and lost due to changes in land use (e.g. from forest to cropland or from grassland to cropland). More information on how to model land use change emissions is provided in the Annex (Tab 11).

4.2.5 Carbon removals

Currently, there is a lack of consensus on accounting methodologies and available data on carbon removals. More information on carbon removals is provided in the Annex (Tab 11) and will be updated as insights evolve.

4.3 End-of-life

The Circular Footprint Formula (CFF) shall be applied for the modelling of the end-of-life (EoL) of packaging as indicated in the PEF. The CFF is applied to final and intermediate products and is a way to divide the benefits and burdens of recycling and energy recovery from waste incineration and landfilling. It consists of three parts:

- **Material:** the production and shaping impact of virgin and recycled material input and credit for recycling at end-of-life
- **Energy:** emissions and avoided emissions related to waste incineration with energy recovery
- **Disposal:** emissions from landfilling

Material $(1 - R_1)E_V + R_1 \times \left(AE_{recycled} + (1 - A)E_V \times \frac{Q_{Sin}}{Q_p}\right) + (1 - A)R_2 \times \left(E_{recyclingEoL} - E_V^* \times \frac{Q_{Sout}}{Q_P}\right)$

Energy $(1 - B)R_3 \times (E_{ER} - LHV \times X_{ER,heat} \times E_{SE,heat} - LHV \times X_{ER,elec} \times E_{SE,elec})$

Disposal $(1 - R_2 - R_3) \times E_D$

FIGURE 2: THE CIRCULAR FOOTPRINT FORMULA.

The parameters of the CFF can be found in the PEF Annex II Part C (EC, 2021), to be used as defaults in the case that primary data is not available. Additional guidance on how to apply the CFF can be found in the Annex (Tab 10).

Waste generated by using the product, such as food waste and its primary packaging or the product itself once no longer functional, is excluded from the use stage and shall be part of the EoL stage of the product.

5. Impact assessment

The Annex (Tab 12) specifies the EF impact assessment method to be used, including the required version, relevant impact categories, and any deviations. By detailing this information in the Annex, users can consistently apply the correct EF method aligned with the most recent standards.

6. Data Quality Rating

Through the pilot phase and evaluation of the Beta Version 1.0 method, it became evident that the Data Quality Rating (DQR) was not broadly implemented and was perceived as too complex and time-consuming.

The Beta Version 2.0 methodology aims to resolve these issues by providing a quick and simple way to assess data quality of a study that is carried out in conformity with this EIT Food (LCA) methodology, avoiding a time-consuming flow-by-flow analysis of each of the data points used in the model. Instead, it assigns a DQR score for the most contributing processes. This will make DQR analysis more accessible and ensure wider application. In this context, a 'process' is defined as a dataset representing a unit of activity, which can be either a single operation (e.g. transport by truck) or a combination of multiple operations aggregated into one dataset (e.g. fertiliser application, irrigation, and other steps combined into a spinach cultivation dataset).

Below, the DQR method is described step by step, accompanied by examples.

Step 1: Determine the most contributing processes and the life cycle stage they belong to

The following guidance shall be used to evaluate the most contributing processes and the life cycle stages they belong to:

Carry out a contribution analysis (using the single score of the EF impact assessment method), following the life cycle stages as defined in the FE methodology. This will result in an overview showing the relative contribution of each life cycle stage to the overall single score, illustrated in the example below.

EXAMPLE

The hypothetical product used for the examples in this DQR guidance concerns a plant-based burger which contains pea protein concentrate, sunflower oil, and spinach as its main ingredients.

TABLE 5: CONTRIBUTION ANALYSIS, SHOWING THE RELATIVE CONTRIBUTION OF THE LIFE CYCLE STAGE TO THE SINGLE SCORE OF THE PRODUCT.

Life cycle stage	Contribution
Crop cultivation	**38%**
Ingredient production	**20%**
Food production	**22%**
Packaging	**13%**
Distribution	**9%**
End-of-life	**0%**

As a next step, create a table of the most contributing processes and the life cycle stages they belong to. Depending on the LCA software used, this can be done using the 'process contribution' functionality. Sort the table from highest to lowest impact and select those processes cumulatively contributing to at least 80% of the total impact. Note that one process can be used in different life cycle stages. For example, the electricity process can be the sum of electricity used in different life cycle stages (if it concerns the same type of electricity), such as for irrigation during cultivation, ingredient processing, food production, and consumption. However, the quantity of electricity used will have been obtained in a different way for each life cycle stage. For example, for cultivation, electricity could be part of a background dataset, whereas for processing, primary data on electricity could be available and for consumption, a default on electricity could be used. Thus, the electricity dataset needs to be scored differently for each life cycle stage. Hence, this method can only work if datasets can be evaluated for individual life cycle stages (using unique processes per life cycle stage). The example below further explains this.

EXAMPLE

Using the same example as above, *Table 6* shows what the outcome would be if selecting those processes that cumulatively contribute to 80% of the impact (see yellow marked percentages). The most contributing process is heat, which occurs in several life cycle stages.

TABLE 6: DETERMINING THE MOST CONTRIBUTING PROCESSES (IRRESPECTIVE OF LIFE CYCLE STAGE)

Process	Total	% contribution	Crop cultivation	Ingredient production	Food production	Packaging	Distribution	EoL
Heat, natural gas	2.07	**34.3%**		0.80	1.30	0.04		-0.07
Peas, at farm	1.15	**19.0%**	1.15					
Spinach, at farm	0.70	**11.6%**	0.70					
Plastic	0.57	**9.4%**				0.57		
Transport truck	0.50	**8.3%**		0.06			0.44	
Sunflower, at farm	0.43	7.1%	0.43					
Electricity DE	0.24	4.0%		0.15			0.09	
Extrusion, plastic film	0.10	1.7%				0.10		
Electricity NL	0.08	1.3%		0.08				
Waste treatment	0.06	1.0%						0.06
Energy, diesel	0.05	0.8%		0.05				
Cardboard	0.05	0.8%				0.05		
Additive	0.04	0.7%		0.04				
Total impact	**6.04**	**100%**	**2.28**	**1.18**	**1.30**	**0.76**	**0.53**	**-0.01**

Even though heat shows up as a single dataset in the results in *Table 6* above, it needs to be rated separately for the life cycle stages it occurs in, as the data has been obtained in a different way for each life cycle stage. However, for some life cycle stages, heat does not have a significant contribution (e.g. for packaging). To filter out those processes that contribute the most, create a table that contains a column with processes and a column with corresponding life cycle stage, as shown in the *Table 7* below (this means that in contrast to the table above, there are multiple heat processes, one for each life cycle stage it occurs in). The processes are ranked from highest to lowest impact contribution.

TABLE 7: MOST CONTRIBUTING PROCESSES (USING UNIQUE PROCESSES PER LSC), SORTED FROM HIGH TO LOW IMPACT

Process	LSC	Impact	% contribution
Heat, natural gas	Food production	**1.30**	21.5%
Peas, at farm	Crop cultivation	**1.15**	19.0%
Heat, natural gas	Ingredient production	**0.80**	13.2%
Spinach, at farm	Crop cultivation	**0.70**	11.6%
Plastic	Packaging	**0.57**	9.4%
Transport truck	Distribution	**0.44**	7.3%
Sunflower, at farm	Crop cultivation	0.43	7.1%
Electricity DE	Ingredient production	0.15	2.5%
Extrusion, plastic film	Packaging	0.10	1.7%
Electricity DE	Distribution	0.09	1.5%
Electricity NL	Ingredient production	0.08	1.3%
Transport truck	Ingredient production	0.06	1.0%
Waste treatment	EoL	0.06	1.0%
Energy, diesel	Ingredient production	0.05	0.8%
Cardboard	Packaging	0.05	0.8%
Additive	Ingredient production	0.04	0.7%
Heat, natural gas	Packaging	0.04	0.7%
Heat, natural gas	EoL	-0.07	-1.2%

Now those processes that cumulatively contribute to 80% of the impact (marked in yellow) can be selected. Note that this table can also be obtained in a different way (depending on LCA software).

Create an overview of the most contributing processes and calculate the relative contribution of each of these processes to the sum of their impact, re-scaling to 100%. This results in *Table 8*.

TABLE 8: OVERVIEW OF THE MOST CONTRIBUTING PROCESSES

Process	LSC	Impact	Contribution
Heat, natural gas	Food production	1.30	26%
Peas, at farm	Crop cultivation	1.15	23%
Heat, natural gas	Ingredient production	0.80	16%
Spinach, at farm	Crop cultivation	0.70	14%
Plastic	Packaging	0.57	11%
Transport truck	Distribution	0.44	9%
Total		**4.96**	**100%**

It should be noted that the most contributing processes can be different depending on the databases that are used. Some databases use system datasets (aggregated), and some use unit (non-aggregated) processes. If unit processes are used, this could mean that for the case of cultivation, the pea cultivation dataset does not show up as the most contributing process. Rather, there may be one (or more) of the underlying processes that contributes most to the pea dataset, such as energy use or emissions linked to pea cultivation. It is recommended to use system datasets to facilitate the DQR analysis.

Step 2: Determine the DQR for each of the contributing processes

As a next step, the DQR should be determined using the scoring guidance as provided in the table below. For each of the most contributing processes, the DQR should be assessed by considering three data quality components:

- **Quality of the inventory values (DQR_{IV})**: This assesses the quality of the activity/inventory data and elementary flows. Note: The inventory values in scope of the assessment also include yield and allocation (when primary data is used), as these can significantly influence the environmental impact.

- **Quality of the included datasets (DQR_{ID})**: This assesses the quality of the datasets used. It is evaluated through considering the declared DQRs in the metadata of all used datasets[2] in the system or, if the dataset has no DQR or a different type of DQR, by assessing the data quality of the dataset yourself. If a dataset has no declared DQR or uses a different type of DQR, its quality shall be assessed at the dataset level, without performing a detailed flow-by-flow reassessment.
- **Quality of modelling of data connections (DQR_M)**: This assesses the quality of the connections between the inventory values and included datasets, meaning whether the datasets used are appropriate for actual conditions ('fitness for purpose').

For each of these components (except for DQR_M), two criteria should be assessed:

- **Precision**: This indicates how exact data was collected and derived. It encompasses sample size but does not account for potential biases in the sampling process, such as cultivation data of just one season, calculation methods, data sources, or adopted standards. The rating ranges from 1 (large set of samples obtained with reliable instruments or calculation techniques) to 5 (few, rough, or approximated measurements or estimates). Precision is not applicable for DQR_M.
- **Representativeness**: This is the degree to which data represents the system analysed in terms of technological, geographical, and time-related characteristics. It determines whether data are biased and correctly distributed to cover the different processes and operational conditions. It can be assessed by determining the technological, geographical, and time-related differences between the collected data and the product/system under analysis and evaluating how significant these differences are for the product's/process's performance, efficiency, location, and time period.

Below is an example on how these data quality components should be interpreted.

Note that there are two minimum prerequirements that need to be adhered to (since they are prerequisites, they are not ranked):

- Completeness: The inventory covers all the processes and products required to represent the system in scope and includes all emissions and resources required to calculate all EF impact categories.
- Methodological appropriateness and consistency: It must align with the EIT Food (LCA) methodology, given the method limitations stated in Chapter 7 and the deviations from the PEF method stated in the Annex (tab 15).

[2] Included dataset (ID) is defined as any dataset included by the user in the model that is taken from an external source or database.

EXAMPLE : INTERPRETATION OF DATA QUALITY COMPONENTS

The food production stage of the plant-based burger is taken as an example, where the ingredients are mixed and the main contributing process is heat. The three data quality components can be interpreted as follows:

- **Quality of the inventory values (DQR_{IV}):** Inventory data considers the quantity of materials and energy used in a certain process. For the food production stage, it concerns the quantity of heat used to manufacture the product. The DQR_{IV} thus assesses how this quantity has been determined.
- **Quality of the included datasets (DQR_{ID})**: This concerns the dataset used to model the heat in this example. It only looks at the quality of the dataset itself, not how well it fits to the actual conditions. The latter is tackled in data connections.
- **Quality of the modelling of data connections (DQR_{M})**: This considers how well the heat dataset fit to the actual conditions. For example, it could be that the heat dataset being used is based on burning heavy fuel oil in an industrial furnace, whereas it is known that natural gas is being used.

EXAMPLE: SCORING FOR THE CULTIVATION STAGE

A **Category 2 producer** must determine how much of a certain crop or animal product is used in their product. In the plant-based burger example, the pea and spinach cultivation are the most contributing processes. So when looking for an example with the pea ingredient, the following applies:

- **Quality of the inventory values (DQR_{IV}):** Since the pea is in the product as pea protein concentrate, the quantity of peas used in the final product is determined by 1) the quantity of pea protein concentrate used in the final product and 2) the quantity of raw peas used in ingredient production (production of pea protein concentrate). The more reliable, robust, and accurate the value of the pea quantity is, the better the score.
- **Quality of the included datasets (DQR_{ID})**: For the given example, this would concern the quality of the dataset that was used for the modelling of the pea cultivation and that was taken from an external source or database. Usually the quality of the dataset can be derived from its meta data.
- **Quality of the modelling of data connections (DQR_{M})**: This considers how well the dataset used for the pea cultivation fits the actual condition. For example, if the peas are sourced from a farmer in Germany but a European average dataset is used for pea cultivation, this would negatively impact the scoring

For **Category 1 producers**, a different perspective applies. Since Category 1 producers have access to data on cultivation/animal husbandry, the following rules apply. We're using as an example the cultivation of ingredients that are part of the plant-based burger (with pea and spinach cultivation being part of the most contributing processes) and a Category 1 producer who is engaged in crop production:

- **Quality of the inventory values (DQR_{IV}):** The inventory data concern the quantity of fertilisers, water, fuels, and other inputs used in pea and spinach cultivation, as well as direct emissions linked to their cultivation (e.g. N_2O and values used for yield and allocation). The more accurate these inputs and emissions are (e.g. measured) and representative of the actual situation (e.g. specific for pea and spinach cultivation, right geography, and cultivation technique), the higher the score.

- **Quality of the included datasets (DQR_{ID})**: This concerns the quality of the datasets used to model the fertilisers, fuels, and other inputs. Also, in this case, the quality of the datasets can be derived from the meta data.

- **Quality of the modelling of data connections (DQR_{M})**: This considers how well these datasets fit to the actual conditions. For example, if the synthetic fertiliser used in the model comes from a German supplier, and a dataset is applied that describes the same fertiliser type produced through the same process in Germany, this would positively contribute to the score.

To calculate the DQR score of the most contributing processes that have been identified in the previous step, refer to the DQR scoring matrix in *Table 9* below. It defines five data quality levels of decreasing quality from 1 to 5:

1	**2**	**3**	**4**	**5**
Excellent	Very good	Good	Fair	Not acceptable

It is possible to select intermediate rating such as 1.5 or 2.5. Level 5.0 is not accepted by the method, meaning that level 4 is the lowest acceptable level (4.5 is not accepted). Note that the scoring is tailored to each life cycle stage (especially the scoring related to inventory data). If the initial assessment indicates insufficient data quality, the evaluation should be iterated, improving the data until a sufficient level is reached.

Note that for representativeness, three aspects are included—time, technology, and geography—and shall be considered when assigning a score based on expert judgement. *Table 9* provides further guidance and guiding principles for expert judgement.

For the quality of the included datasets, ideally, existing DQR/quality scores of the dataset would be used; however, since these scores are likely not (yet) in line with this methodology, a new score shall be assigned using the criteria as defined in the table below.

TABLE 9: DQR SCORING MATRIX, PROVIDING SCORING GUIDANCE PER LIFE CYCLE STAGE

	Inventory values (DQR_{IV})	Included datasets (DQR_{ID})	Modelling of data connections (DQR_M)
Crop cultivation – Category 1 producer			
Category 1 food producer			
P:	**1:** Primary (company-specific) data with a high level of precision and a sample size covering at least 50% of the total production volume (or farmers) **2:** Primary (company-specific) data with a good level of precision and a sample size covering > √n of the total production volume **3:** Primary (company-specific) data with a low level of precision and a sample size <√n of the total production volume **4**: Secondary data with a high level of precision (not possible when adhering to methodology data requirements) **5:** Secondary data with a low level of precision (not acceptable)	**1**: Dataset with high level of precision: based on large sample size and using exact calculation method **2**: Dataset with fair level of precision: based on acceptable sample size and calculation method **3**: Dataset with acceptable level of precision: based on nationwide statistics OR small sample size **4**: Dataset partly based on proxies and assumptions **5**: Dataset largely based on proxies and assumptions (not acceptable)	
R:	**1:** Primary (company-specific) data with a high level of representativeness: no older than 5 years, using 3-year average; same production conditions/techniques; from all areas in the supply chain **2:** Primary (company-specific) data with a good level of representativeness: no older than 5 years, using single-year average; production conditions /techniques representing >√n of the supply chain; areas representing >50% of the supply chain **3:** Primary (company-specific) data with a low level of representativeness: older than 5 years; production conditions/techniques representing <√n of the supply chain; areas	**1:** Data is exact and complete representation of technology/conditions and location; <5 years old **2:** Data adequately represents technology/conditions and location (but small differences); 6-8 years old **3:** Data represents similar technology/conditions but uses proxies (e.g. nationwide statistics); 8-10 years old **4**: Data based on differing technology or different production locations but with similar conditions (e.g. milling in NL is used for milling in DE); 10-15 years old	**1**: Exact match: Technology of the dataset is identical to actual technology; geographic area matches that of the inventory data (same geographic resolution); similar temporal range (difference of max 3 years) **2**: Close match: Technology of the dataset resembles the actual technology (e.g. more general technology); similar geographical resolution (e.g. another EU country with similar conditions); similar temporal range (difference of max 5 years) **3**: Good match: Technology of the dataset is similar to the actual technology (though some proxies used); geographical proxies are used (e.g. another EU country with similar

	representing <50% of production volume **4**: Secondary data with a high level of representativeness: not older than 5 years; same production conditions/techniques; from same area **5:** Secondary data with a low level of precision (not acceptable): older than 5 years; different production conditions/techniques; from different area	**5**: Data based on different technology (e.g. oven drying to represent spray drying) or different production locations with different conditions (e.g. wheat cultivation in SSA based on wheat cultivation in NL); >15 years old (not acceptable)	conditions); difference in temporal range of max 7 years **4**: Approximate match: Technology of the dataset has significant differences; geographical proxies are used (e.g. use of BE dataset to represent EU27); difference in temporal range of max 10 years **5**: Mismatch (not acceptable): Technology of the dataset is different; unrepresentative geographical proxies are used (country with different conditions); temporal difference of >10 years
Category 2 food producer			
P	**1**: Primary data (representing 2/3 of production volume) known for exact quantity of primary material (e.g. crop, animal product) for BoM of main product AND primary data (representing >50% of production volume) for BoM of ingredients; precise/measured data **2**: Primary data (representing >50% of production volume) for BoM of main product AND primary data for BoM of ingredients; BoM of ingredients based on low quality primary data (estimates or representing <50% of production volume) **3**: Primary data (representing >50% of production volume) for BoM of main product; secondary data for BoM of ingredients **4**: Primary data (representing <50% of production volume) for BoM of main product; secondary data for BoM of ingredients. **5**: BoM of main product based on secondary data defaults/estimates (not acceptable)	**1**: Dataset with high level of precision: based on large sample size and using exact calculation method; use in case of primary data collected from farms **2**: Dataset with fair level of precision: based on acceptable sample size and calculation method; based on on-farm data collection **3**: Dataset with acceptable level of precision: based on nationwide statistics OR small sample size **4**: Dataset partly based on proxies and assumptions **5**: Dataset largely based on proxies and assumptions (not acceptable)	
R:	**1:** Primary (company-specific) data with a high level of representativeness: no older than 3 years; same production	**1:** Data is exact and complete representation of	**1:** Exact match: Dataset based on primary data from farms that are actually sourced from (i.e. same

	conditions/techniques; representing >2/3 of locations (BoM main product) and >50% of production locations (BoM ingredients) **2:** Primary (company-specific) data with a good level of representativeness: 3-5 years old; production conditions/ techniques and locations representing 50%-66% of production volume (BoM main product) or <50% of production volume (BoM ingredients) **3:** Primary (company-specific) data for main product with a low level of representativeness: 5-10 years old; production conditions/techniques representing 50%-66% of production volume; BoM ingredients based on secondary data but representing the same technique and location **4**: Primary (company-specific) data for main product with a low level of representativeness: >10 years old; production conditions/techniques representing <50% of production volume; BoM ingredients based on secondary data, representing different techniques and areas **5:** Secondary data used for BoM main product and for BoM ingredients (not acceptable)	technology/conditions and location; <5 years old **2:** Data adequately represents technology/conditions and location (but small differences); 6-8 years old **3:** Data represents similar technology/conditions but uses proxies (e.g. nationwide statistics); 8-10 years old **4**: Data based on differing technology or different production locations but with similar conditions (e.g. milling in NL is used for milling in DE); 10-15 years old **5**: Data based on different technology (e.g. oven drying to represent spray drying) or different production locations with different conditions (e.g. wheat cultivation in SSA based on wheat cultivation in NL); >15 years old (not acceptable)	location and technology); data <3 years old **2**: Close match: Technology of the dataset resembles the actual technology (e.g. more general technology); similar geographical resolution (e.g. another EU country with similar conditions); similar temporal range (difference of max 5 years) **3**: Good match: Technology of the dataset is similar to the actual technology (though some proxies used); geographical proxies are used (e.g. another EU country with similar conditions); difference in temporal range of max 7 years **4**: Approximate match: Technology of the dataset has significant differences; geographical proxies are used (e.g. use of BE dataset to represent EU27); difference in temporal range of max 10 years **5**: Mismatch (not acceptable): Technology of the dataset is different; unrepresentative geographical proxies are used (country with different conditions); temporal difference of >10 years
Ingredient production and food processing			
P:	**1:** Primary data that is very precise: exact/direct measurements; from production locations representing >2/3 of production volume **2:** Primary data that is precise: measured at production locations representing >50% of production volume **3:** Primary data that is not very precise: contains some estimates or represents <50% of production volume	**1**: Dataset with high level of precision: based on large sample size and using exact calculation method **2**: Dataset with fair level of precision: based on acceptable sample size and calculation method **3**: Dataset with acceptable level of precision: based on nationwide statistics OR small sample size	

	OR (for ingredient processing): Secondary data with a high level of precision (qualified and reasoned expert estimate backed by data from peer-reviewed and verified sources) **4**: Secondary data that is reasonably precise (e.g. qualified estimates) **5**: Secondary data that is not precise (e.g. unexplained estimates, rough calculations) (not acceptable)	**4**: Dataset partly based on proxies and assumptions **5**: Dataset largely based on proxies and assumptions (not acceptable)	
R:	**1:** Primary (company-specific) data with a high level of representativeness: no older than 3 years; same production conditions/techniques; representing >2/3 of locations (food production) and >50% of production locations (ingredient processing) **2:** Primary (company-specific) data with a good level of representativeness: 3-5 years old; production conditions/ techniques and locations representing 50%-66% of production volume (food production) or <50% of production volume (ingredient processing) **3:** Primary (company-specific) data (for food production) with a low level of representativeness: data 5-10 years old; production conditions and techniques representing 50%-66% of production volume OR (for ingredient processing): Secondary data but representing the same technique and location **4**: Primary (company-specific) data (for food production) with a low level of representativeness: data >10 years old; production conditions/techniques representing <50% of production volume OR (for ingredient processing): Secondary data representing a technological proxy or global average location	**1:** Data is exact and complete representation of technology/conditions and location; <5 years old **2:** Data adequately represents technology/conditions and location (but small differences); 6-8 years old **3:** Data represents similar technology/conditions but uses proxies (e.g. nationwide statistics); 8-10 years old **4**: Data based on differing technology or different production locations but with similar conditions (e.g. milling in NL is used for milling in DE); 10-15 years old **5**: Data based on different technology (e.g. oven drying to represent spray drying) or different production locations with different conditions (e.g. wheat cultivation in SSA based on wheat cultivation in NL); >15 years old (not acceptable)	**1**: Exact match: Technology of the dataset is identical to actual technology; geographic area matches that of the inventory data (same geographic resolution); similar temporal range (difference of max 3 years) **2**: Close match: Technology of the dataset resembles the actual technology (e.g. more general technology); similar geographical resolution (e.g. another EU country with similar conditions); similar temporal range (difference of max 5 years) **3**: Good match: Technology of the dataset is similar to the actual technology (though some proxies used); geographical proxies are used (e.g. another EU country with similar conditions); difference in temporal range of max 7 years **4**: Approximate match: Technology of the dataset has significant differences; geographical proxies are used (e.g. use of BE dataset to represent EU27); difference in temporal range of max 10 years **5**: Mismatch (not acceptable): Technology of the dataset is different; unrepresentative geographical proxies are used (country with different conditions); temporal difference of >10 years

	5: Secondary data that is not representative (not acceptable): differences in production techniques/conditions and location		
Packaging			
P:	**1**: Primary data on packaging materials (incl. recycled content) and energy and water use for packaging manufacturing is highly precise (data from all packaging producers) **2**: Primary data on packaging materials (incl. recycled content) from all locations; secondary data for quantity of energy and water for packaging manufacturing **3**: Primary data on packaging materials from part of the production locations; secondary data for recycled content and for the quantity of energy and water for packaging manufacturing **4**: Low quality primary data for packaging materials (only for part of materials or estimates); secondary data for recycled content and for packaging manufacturing **5**: Secondary data/estimates used for packaging materials and for packaging manufacturing (not acceptable)	**1**: Dataset with high level of precision: based on large sample size and using exact calculation method **2**: Dataset with fair level of precision: based on acceptable sample size and calculation method **3**: Dataset with acceptable level of precision: based on nationwide statistics OR small sample size **4**: Dataset partly based on proxies and assumptions **5**: Dataset largely based on proxies and assumptions (not acceptable)	
R:	**1:** Primary data with a high level of representativeness: no older than 3 years; representing all production locations; origin of main materials is known **2:** Primary data with a good level of representativeness: 3-5 years old; production conditions/techniques and locations representing 50%-66% of production volume; origin of main materials is estimated **3:** Primary data with a low level of representativeness: data 5-10 years old; production conditions/techniques representing	**1:** Data is exact and complete representation of technology/conditions and location; <5 years old **2:** Data adequately represents technology/conditions and location (but small differences); 6-8 years old **3:** Data represents similar technology/conditions but uses proxies (e.g. nationwide statistics); 8-10 years old **4**: Data based on differing technology or different production locations but with	**1**: Exact match: Technology of the dataset is identical to actual technology; geographic area matches that of the inventory data (same geographic resolution); similar temporal range (difference of max 3 years) **2**: Close match: Technology of the dataset resembles the actual technology (e.g. more general technology); similar geographical resolution (e.g. another EU country with similar conditions); similar temporal range (difference of max 5 years)

	50%-66% of production volume; origin of main materials is unknown **4**: Primary data with a low level of representativeness: data >10 years old; production conditions/techniques representing <50% of production volume; origin of main materials is unknown **5:** Secondary data that is not representative (not acceptable): differences in production techniques/conditions and location	similar conditions (e.g. milling in NL is used for milling in DE); 10-15 years old **5**: Data based on different technology (e.g. oven drying to represent spray drying) or different production locations with different conditions (e.g. wheat cultivation in SSA based on wheat cultivation in NL); >15 years old (not acceptable)	**3**: Good match: Technology of the dataset is similar to the actual technology (though some proxies used); geographical proxies are used (e.g. another EU country with similar conditions); difference in temporal range of max 7 years **4**: Approximate match: Technology of the dataset has significant differences; geographical proxies are used (e.g. use of BE dataset to represent EU27); difference in temporal range of max 10 years **5**: Mismatch (not acceptable): Technology of the dataset is different; unrepresentative geographical proxies are used (country with different conditions); temporal difference of >10 years
Distribution			
P:	**1**: Primary (measured) data on distribution distance, transport mode, and storage conditions **2**: Distribution distances estimated (e.g. with maps) based on locations; most common transport mode and storage conditions known **3**: Data on distribution based on estimates (from country A to B); estimated transport mode and storage conditions **4.** Data on distribution based on EU-level defaults (if known ingredients are sourced from the EU) **5**: Data on distribution based on global defaults (if not known where ingredients are sourced from) (not acceptable)	**1**: Dataset with high level of precision: based on large sample size and using exact calculation method **2**: Dataset with fair level of precision: based on acceptable sample size and calculation method **3**: Dataset with acceptable level of precision: based on nationwide statistics OR small sample size **4**: Dataset partly based on proxies and assumptions **5**: Dataset largely based on proxies and assumptions (not acceptable)	
R:	**1**: Data represents >2/3 of distribution routes/volume in scope; not older than 3 years; represents exact transport mode and storage conditions	**1:** Data is exact and complete representation of technology/conditions and location; <5 years old **2:** Data adequately represents technology/conditions and	**1**: Exact match: Technology of the dataset is identical to actual technology; geographic area matches that of the inventory data (same geographic resolution); similar temporal range (difference of max 3 years)

	2: Data represents >50% of distribution routes in scope; 3-5 years old; represents most common transport mode and storage conditions **3**: Data represents <50% of distribution routes in scope; 5-10 years old; represents an estimate of most common transport mode and storage conditions **4**. Data based on EU-level defaults; >10 years old; represents a default transport mode and storage conditions **5**: Data on distribution based on global defaults (if not known where ingredients are sourced from) (not acceptable)	location (but small differences); 6-8 years old **3:** Data represents similar technology/conditions but uses proxies (e.g. nationwide statistics); 8-10 years old **4**: Data based on differing technology or different production locations but with similar conditions (e.g. milling in NL is used for milling in DE); 10-15 years old **5**: Data based on different technology (e.g. oven drying to represent spray drying) or different production locations with different conditions (e.g. wheat cultivation in SSA based on wheat cultivation in NL); >15 years old (not acceptable)	**2**: Close match: Technology of the dataset resembles the actual technology (e.g. more general technology); similar geographical resolution (e.g. another EU country with similar conditions); similar temporal range (difference of max 5 years) **3**: Good match: Technology of the dataset is similar to the actual technology (though some proxies used); geographical proxies are used (e.g. another EU country with similar conditions); difference in temporal range of max 7 years **4**: Approximate match: Technology of the dataset has significant differences; geographical proxies are used (e.g. use of BE dataset to represent EU27); difference in temporal range of max 10 years **5**: Mismatch (not acceptable): Technology of the dataset is different; unrepresentative geographical proxies are used (country with different conditions); temporal difference of >10 years
Use			
P:	**1**: Primary data from consumer studies with a large sample size **2**: Primary data from consumer studies with small sample size OR: Secondary data from literature, based on large sample size, exact measurements, or calculation method **3**: Secondary data from literature, based on small sample sizes or estimates 4: Defaults from the Annex **5:** Non-fitting defaults (not acceptable)	**1**: Dataset with high level of precision: based on large sample size and using exact calculation method **2**: Dataset with fair level of precision: based on acceptable sample size and calculation method **3**: Dataset with acceptable level of precision: based on nationwide statistics OR small sample size **4**: Dataset partly based on proxies and assumptions **5**: Dataset largely based on proxies and assumptions (not acceptable)	

R:	**1:** Data represents conditions (preparation techniques) related to the specific product/preparation method in scope; <3 years old; relates to the country in scope **2:** Data represents average conditions at the EU level related to a broader product category; 3-5 years old **3.** Secondary data comes from literature related to the product/preparation method in question (or a similar food category/preparation technique) **4**: Defaults from the Annex **5:** Non-fitting defaults (not acceptable)	**1:** Data is exact and complete representation of technology/conditions and location; <5 years old **2:** Data adequately represents technology/conditions and location (but small differences); 6-8 years old **3:** Data represents similar technology/conditions but uses proxies (e.g. nationwide statistics); 8-10 years old **4**: Data based on differing technology or different production locations but with similar conditions (e.g. milling in NL is used for milling in DE); 10-15 years old **5**: Data based on different technology (e.g. oven drying to represent spray drying) or different production locations with different conditions (e.g. wheat cultivation in SSA based on wheat cultivation in NL); >15 years old (not acceptable)	**1**: Exact match: Technology of the dataset is identical to actual technology; geographic area matches that of the inventory data (same geographic resolution); similar temporal range (difference of max 3 years) **2**: Close match: Technology of the dataset resembles the actual technology (e.g. more general technology); similar geographical resolution (e.g. another EU country with similar conditions); similar temporal range (difference of max 5 years) **3**: Good match: Technology of the dataset is similar to the actual technology (though some proxies used); geographical proxies are used (e.g. another EU country with similar conditions); difference in temporal range of max 7 years **4**: Approximate match: Technology of the dataset has significant differences; geographical proxies are used (e.g. s difference in temporal range of max 10 years **5**: Mismatch (not acceptable): Technology of the dataset is different; unrepresentative geographical proxies are used (country with different conditions); temporal difference of >10 years

Additional scoring guidelines for specific situations:

- Category 2 food producer: If disaggregated processes are used, underlying processes might show up as most contributing processes for the cultivation stage (e.g. contribution of emissions, fertilisers, or energy instead of the entire cultivation dataset). These sub-datasets should be rated in the same way that the overall dataset would be rated.
- Category 1 food producer: If emissions (e.g. N_2O) turn out to be the most contributing process in cultivation/animal husbandry, they should be scored in the same way as the data they are based upon (e.g. fertiliser quantity).
- If aggregated datasets are used (e.g. an ingredient for which cultivation and ingredient processing stages are grouped), the DQR score of that dataset cannot perform better than 3.0.
- If one particular dataset turns out to have a relatively very large contribution to the single score, one could further disaggregate it to assure more precise scoring (e.g. look at those sub-processes that contribute 80% to the overall impact of that process). This is optional and is most relevant if there's access to primary data for that particular process.

EXAMPLE OF SCORING FOR A CATEGORY 2 PRODUCER OF PLANT-BASED BURGER

TABLE 10: EXAMPLE OF HOW TO APPLY THE DQR SCORE

Life cycle stage	Main contributing processes	Contribution (%)	DQR_{IV}	DQR_{ID}	DQR_{M}
Crop cultivation	Pea cultivation	23%	P: 3 R: 3 Amount of pea ingredient used in pea protein concentrate is based on secondary data. The amount of pea concentrate in the product is based on actual BoM data. (Represents >50% of production volume)	P: 3 R: 3 Pea protein concentrate is an aggregated dataset from an approved LCA database, including both cultivation and processing (so max score 3.0).	R: 4 Pea cultivation dataset represents different pea variety and is from a neighbouring country.
	Spinach cultivation	14%	P: 1 R: 1	P: 1 R: 2	R: 2 Geography of the dataset used is from neighbouring

			Primary data collected from a large sample of spinach farms in a European country.	Datasets used in cultivation modelling are of good quality (i.e. derived from the meta data).	country with similar conditions.
Ingredient production	Heat	16%	P: 3 R: 3 Dataset relates to processing of pea protein concentrate and is derived from an approved LCA database.	P: 3 R: 2 Heat dataset is based on single location, but it is recent (7 years) and representative of technology.	R: 3 Dataset represents a somewhat different technology and is 6 years older.
Food production	Heat	26%	P: 1 R: 1 Dataset is based on primary data from all production locations.	P: 3 R: 2 Heat dataset is based on single location, but it is recent (7 years) and representative of technology.	R: 3 Dataset represents a somewhat different technology and is 6 years older.
Packaging	Plastic	11%	P: 2 R: 1 There is primary and recent data on packaging materials for all locations; however, it uses defaults for packaging forming.	P: 2 R: 2 Dataset is recent and based on data from one production location.	R: 2 The plastic dataset is the same as actual plastic used but is from a neighbouring country and recent.
Distribution	Truck transport	9%	P: 4 R: 4 No data is available, so PEF defaults are used.	P: 4 R: 3 The transport dataset is based on a not very accurate model but is fairly recent.	R: 4 There is an approximate match of transport dataset to EU level transport mode.

Step 3: Calculate the overall DQR

The overall DQR score is calculated by multiplying the DQR scores for each of the contributing processes by their relative contribution, differentiating between the precision and representativeness criteria. The DQR score should be presented in the following format. As of now, no further aggregation is applied.

TABLE 11: FINAL DQR SCORING FORMAT AT PRODUCT LEVEL

	DQR_{IV}	**DQR_{ID}**	**DQR_{M}**
Precision			
Representativeness			

EXAMPLE OVERALL DQR SCORING

Based on the scoring in *Table 10* above, an overall DQR score is calculated in *Table 12* below. For example, the Precision of DQR_{IV} is calculated as:

0.23*3+0.14*1+0.16*3+0.26*1+0.11*2+0.09*4 = 2.2

TABLE 12: FINAL DQR SCORE AT PRODUCT LEVEL

	DQR_{IV}	**DQR_{ID}**	**DQR_{M}**
Precision	2.2	2.6	
Representativeness	2.1	2.3	3.1

7. Limitations and future developments

Beta Version 1.0 of the EIT Food (LCA) methodology identified a number of gaps that still remain at the time of publishing Beta Version 2.0, listed below. In addition, during the review process, a number of topics were identified that were not included in the Beta Version 2.0 update due to a lack of supporting evidence. However, they are included below for potential consideration in a future update.

- SECONDARY DATA: This methodology gives guidance for the use of secondary data. Several issues can be expected in the use and need for secondary data:

- Data gaps: It is probable that there will be data gaps for certain food ingredients and that no datasets are available within the data sources listed. Further development of good secondary data is recommended.

- Compatibility with impact assessment method: It is likely that not all data sources will be fully compatible with the impact assessment method. Specifically for land use and water consumption, regionalised flows are necessary, which are not always available. Further compatibility assessment is recommended.

- Database selection: The choice of permissible databases and their versions remains an ongoing topic of discussion within the methodology. Additional work may be necessary to assess the implications of including older database versions, ensuring that all allowed versions reflect the latest and best available data while maintaining consistency in modelling practices.
- Consistency with foreground modelling rules: The recommended databases for secondary data may not always follow the same emission modelling rules as those

recommended for the foreground modelling (Annex Tab 13), representing a methodological limitation. Full alignment will only be possible when using the EF database (PEF-compliant). At present, the EF 4.0 database is not yet available.

- **CARBON REMOVALS:** For the moment, the rather conservative approach (as also indicated in the PEF) is applied, meaning carbon removals are not included. However, as newer methodologies develop and as the interest in carbon removals rises, it is important to re-evaluate the inclusion of carbon removals in LCA calculations.

- **IMPACT ASSESSMENT:** Despite the fact that all impact categories are included in the single score calculations, there is still an existing debate on the robustness of the toxicity impact categories and their potential refinement or exclusion from single score calculation for communication to consumers. This aspect will be evaluated in the case that the PEF position on these impact categories changes in the future.

- **BIODIVERSITY**: At the moment, biodiversity is only considered indirectly, which means some impact categories do reflect impact on biodiversity, but a category specifically referring to biodiversity is not available. This limitation is, however, intrinsic to the PEF method and is not based on any choice made within this EIT Food (LCA) methodology, although the importance of assessing biodiversity is recognised. Efforts to add an additional biodiversity-related indicator to the PEF impact categories are ongoing.

- **FUNCTIONAL UNIT:** The definition of an appropriate and comprehensive functional unit for food products is a challenging aspect. Food serves multiple roles, including providing nutrition as well as cultural and social functions. In addition, there is ongoing debate about whether a mass-based FU is appropriate, as it may not fully reflect the diverse functions or value of different food products.

During the Task Force meetings there was discussion of a functional unit defined as 1 kg of consumed food or as a serving size. Due to the absence of clear guidance at the EU level on standardised serving sizes across diverse food categories, the decision was made to keep the functional unit defined as 1 kg of consumed food to ensure consistency and comparability.

- **LIFE CYCLE STAGES:** The current definitions of life cycle stages will be retained, with additional descriptions implemented specifically for non-agricultural ingredients to enhance clarity. At this stage, no further merging or splitting of life cycle stages is anticipated, as the present structure is considered sufficiently comprehensive and aligned with PEF standards.

- **PEF ALIGNMENT:** This methodology builds on Beta Version 1.0 and represents a continued effort towards a harmonised PEF-based approach, integrating past and ongoing PEF development work, sectoral PEFCRs, and other relevant footprinting guidance into one coherent framework; however, deviations from PEF and PEFCRs are inevitable and are documented in the Annex (Tab 15).

- **GEOGRAPHICAL SCOPE**: While the methodology applies to in-scope products consumed across global markets, it has been developed primarily following the PEF method and existing PEFCRs. These standards were established within a European context, and, therefore, some of the default values and specific guidance elements provided by this methodology may reflect assumptions, data availability, or regulatory conditions more representative of Europe.

8.

References

Blonk Consultants. (2019). *Agri-footprint 5.0 - Part 2 - Description of data*.

Blonk, H., Tyszler, M., van Paassen, M., Braconi, N., Draijer, N., & van Rijn, J. (2022). *Agri-footprint 6 - Part 2: Description of Data*.

EC. (2021). *COMMISSION RECOMMENDATION (EU) 2021/2279 of 15 December 2021 on the use of the Environmental Footprint methods to measure and communicate the life cycle environmental performance of products and organisations*. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021H2279

EFSA. (2011). Evaluation of the FoodEx, the food classification system applied to the development of the EFSA Comprehensive European Food Consumption Database. *EFSA Journal*, *9*(3), 1970.

European Commission. (2020). *PEFCR Feed for food producing animals*. https://ec.europa.eu/environment/eussd/smgp/pdf/PEFCR_Feed_Feb 2020.pdf#page=28&zoom=100,92,186

FAO. (2016). *Greenhouse gas emissions and fossil energy use from poultry supply chains: Guidelines for assessment*. Livestock Environmental Assessment and Performance Partnership. https://www.fao.org/3/a-i6421e.pdf

FoodDrinkEurope. (2022). *Guidance on the use of PEF for the food and drink sector*. https://www.FoodDrinkEuropeeurope.eu/wp-content/uploads/2022/09/FoodDrinkEuropeEuropeGuidelines-on-Product-Environmental-Footprints.pdf

IPCC. (2014). *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*.

Poore, J. & Nemeck, T. (2018). Reducing food's environmental impacts through producers and consumers. *Science360*, 987-992(2018). DOI:10.1126/science.aaq0216

Technical Secretariat for the Red Meat Pilot. (2019). *Footprint Category Rules Red Meat, version 1.0*. http://www.uecbv.eu/UECBV/documents/FootprintCategoryRulesRedMeat16661.pdf

The European Dairy Association. (2018). *Product Environmental Footprint Category Rules for Dairy Products*. https://ec.europa.eu/environment/eussd/smgp/pdf/PEFCR-DairyProducts_2018-04-25_V1.pdf

9.

Annex

The Annex is a separate Excel document that can be accessed on the EIT Food website here

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