FRUITS AND NUTS

PRODUCT CATEGORY CLASSIFICATION: UN CPC 013

PCR 2019:01
VERSION 1.0.3

VALID UNTIL: 2024-07-21

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1 INTRODUCTION

This document constitutes Product Category Rules (PCR) developed in the framework of the International EPD® System: a programme for type III environmental declarations[1] according to ISO 14025:2006. Environmental Product Declarations (EPD) are voluntary documents for a company or organisation to present transparent information about the life cycle environmental impact for their goods or services.

The rules for the overall administration and operation of the programme are the General Programme Instructions, publicly available at www.environdec.com. A PCR complements the General Programme Instructions and the standards by providing specific rules, requirements and guidelines for developing an EPD for one or more specific product categories (see Figure 1). A PCR should enable different practitioners using the PCR to generate consistent results when assessing products of the same product category.

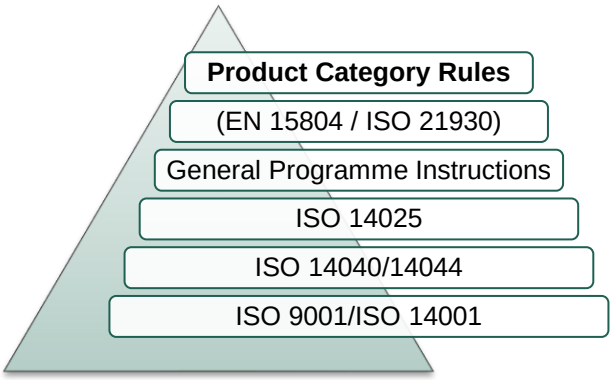

Figure 1 Illustration PCR in relation to the hierarchy of standards and other documents.

Within the present PCR, the following terminology is adopted:

- The term “shall” is used to indicate what is obligatory.
- The term “should” is used to indicate a recommendation, rather than a requirement.
- The term “may” or “can” is used to indicate an option that is permissible

For the definition of terms used in the document, see the normative standards.

A PCR is valid for a pre-determined period of time to ensure that it is updated at regular intervals. The latest version of the PCR is available via www.environdec.com. Stakeholder feedback on PCRs is very much encouraged. Any comments on this PCR document may be given via the PCR Forum at www.environdec.com or sent directly to the PCR moderator during its development or during the period of validity.

Any references to this document should include the PCR registration number, name and version.

The programme operator maintains the copyright of the document to ensure that it is possible to publish, update when necessary, and available to all organisations to develop and register EPDs. Stakeholders participating in PCR development should be acknowledged in the final document and on the website.

[1] Type III environmental declarations in the International EPD® System are referred to as EPD, Environmental Product Declarations.

2 GENERAL INFORMATION

2.1 ADMINISTRATIVE INFORMATION

Name:	Fruits and nuts
Registration number and version:	2019:01, version 1.0.3
Programme:	The International EPD® System
Programme operator:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden. Website: www.environdec.com E-mail: info@environdec.com
PCR moderator:	Elisabetta Redavid, Life Cycle Engineering Srl, redavid@studiolce.it
PCR Committee:	Life Cycle Engineering Srl, Assomela
Date of publication and last revision:	2024-02-06 (Version 1.0.3)
Valid until:	2024-07-21
Schedule for renewal:	A PCR is valid for a pre-determined period of time to ensure that it is updated at regular intervals. When the PCR is about to expire the PCR moderator shall initiate a discussion with the Secretariat how to proceed with updating the document and renewing its validity. A PCR document may be revised during its period of validity provided significant and well-justified proposals for changes or amendments are presented. See www.environdec.com for up-to-date information and the latest version.
Standards conformance:	▪ General Programme Instructions of the International EPD® System, version 3.0, based on ISO 14025 and ISO 14040/14044 ▪ PCR Basic Module, CPC Division 01: Products of agriculture, horticulture and market gardening, version 3.0, dated 2018-05-03
PCR language(s):	This PCR was developed and is available in English. In case of translated versions the English version takes precedence in case of any discrepancies.

2.2 SCOPE OF PCR

2.2.1 PRODUCT CATEGORY DEFINITION AND DESCRIPTION

This document provides Product Category Rules (PCR) for the assessment of the environmental performance of Fruits and nuts and the declaration of this performance by an EPD. The product category corresponds to UN CPC 013 Fruits and nuts, which includes the following classes[2]:

- Class 0131: Tropical and subtropical fruits

[2] ISIC-PCP version 2.1 https://unstats.un.org/unsd/classifications/unsdclassifications/cpcv21.pdf

- Class 0132: Citrus fruits
- Class 0133: Grapes
- Class 0134: Pome fruits and stone fruits
- Class 0135: Berries and other fruits
- Class 0136: Fruit seeds
- Class 0137: Nuts (excluding wild edible nuts and groundnuts), in shell

Note: Melons and watermelons are classified as vegetables (see PCR CPC GROUP 012: VEGETABLES, class 0122 Melons)

2.2.2 GEOGRAPHICAL REGION

This PCR is applicable to be used globally.

2.2.3 EPD VALIDITY

An EPD based on this PCR shall be valid from its registration and publication at www.environdec.com and for a five year period starting from the date of the verification report ("approval date"), or until the EPD has been de-registered from the International EPD® System.

An EPD shall be updated and re-verified during its validity if changes in technology or other circumstances have led to:

- an increase of 10% or more of any of the indicators listed in Section 5.4.5.1,
- errors in the declared information, or
- significant changes to the declared product information, content declaration, or additional environmental information.

If such changes have occurred, but the EPD is not updated, the EPD owner shall contact the Secretariat to de-register the EPD.

3 PCR REVIEW AND BACKGROUND INFORMATION

This PCR was developed in accordance with the process described in the General Programme Instructions of the International EPD® System, including PCR review and open consultation.

3.1 PCR REVIEW

3.1.1 VERSION 1.0

PCR review panel:	The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com. Members of the Technical Committee were requested to state any potential conflict of interest with the PCR moderator or PCR committee, and were excused from the review.
Chair of the PCR review:	Filippo Sessa
Review dates:	2018-11-21 until 2018-12-20

3.2 OPEN CONSULTATION

3.2.1 VERSION 1.0

This PCR was available for open consultation from 2018-07-31 until 2018-09-30, during which any stakeholder was able to provide comments by posting on the PCR forum on www.environdec.com or by contacting the PCR moderator.

Stakeholders were invited via e-mail or other means to take part in the open consultation and were encouraged to forward the invitation to other relevant stakeholders.

3.3 EXISTING PCRS FOR THE PRODUCT CATEGORY

As part of the development of this PCR, existing PCRs were considered in order to avoid overlaps in scope. The existence of such documents was checked in the public PCR listings of the following programmes based on ISO 14025 or similar:

- International EPD® System. www.environdec.com.

This PCR merge the two PCRs listed below in a new one that includes the full scope of all fruits and nuts in a same document.

PCR NAME	PROGRAMME	REGISTRATION NUMBER	SCOPE
Kiwi fruit	International EPD® System	2011:25	Kiwifruit, fresh or chilled
Fruit and nuts, excl. kiwi fruit	International EPD® System	2012:07	Fruit and nuts, excluding kiwi fruit

Within the International EPD System or other programmes, below related PCRs have been identified.

PCR NAME	PROGRAMME	REGISTRATION NUMBER	SCOPE
Vegetables	International EPD® System	2011:20	Fresh vegetables
Arable crops	International EPD® System	2013:05	Cereals, oilseeds, pulses and forage products
Green coffee	International EPD® System	2013:21	Green coffee

3.4 REASONING FOR DEVELOPMENT OF PCR

This PCR was developed in order to enable publication of Environmental Product Declarations (EPD) for this product category based on ISO 14025, ISO 14040/14044 and other relevant standards to be used in different applications and target audiences.

3.5 UNDERLYING STUDIES

The methodological choices made during the development of this PCR (functional unit/declared unit, system boundary, allocation methods, impact categories, data quality rules, etc.) in this PCR were primarily based on the following underlying studies:

- "Life cycle assessment (LCA) applicata alla filiera di coltivazione e di distribuzione delle mele da parte degli associati in Assomela", version 02 of 17/11/2017
- Environmental Product Declaration – Italian Apples, Registration number S-P-00369, version 06 of 04/12/2017
- Environmental Product Declaration – Zeus Kiwi Fruit, Registration number S-P-00310, version 1.0 of 03/01/2017

4 GOAL AND SCOPE, LIFE CYCLE INVENTORY AND LIFE CYCLE IMPACT ASSESSMENT

The goal of this section is to provide specific rules, requirements and guidelines for developing an EPD for the product category as defined in Section 2.2.1.

4.1 FUNCTIONAL UNIT/DECLARED UNIT

The declared unit shall be 1 kg of product, including its packaging (the weight of the packaging is not included in this 1 kg) and the non-edible parts. The reference flow in the LCA shall be defined at the point where the product arrives at the customer gate, i.e. any losses occurring before then must be taken into account.

This PCR uses a declared unit instead of a functional unit as all functional and qualitative aspects are not possible to capture in the same unit. These aspects should be taken into consideration when comparing EPDs based on this PCR.

4.2 REFERENCE SERVICE LIFE (RSL)

Not applicable for this product category.

4.3 SYSTEM BOUNDARY

The International EPD® System uses an approach where all attributional processes from "cradle to grave" should be included using the principle of "limited loss of information at the final product". This is especially important in the case of business-to-consumer communication.

The scope of this PCR and EPDs based on it is from cradle-to-grave.

4.3.1 LIFE CYCLE STAGES

For the purpose of different data quality rules and for the presentation of results, the life cycle of products is divided into three different life cycle stages:

- Upstream processes (from cradle-to-gate);
- Core processes (from gate-to-gate);
- Downstream processes (from gate-to-grave).

In the EPD, the environmental performance associated with each of the three life-cycle stages above shall be reported separately. The processes included in the scope of the PCR and belonging to each life cycle stage are described in Sections 4.3.1.1–4.3.1.3.

4.3.1.1. Upstream processes

The following attributional processes are part of the product system and classified as upstream processes:

- Operations for the transformation of land use, if the crop life time is expected to be less than 25 years.
- Operations for the initial establishment of the crop including the irrigation system, if its life time is expected to be less than 25 years.
- Production of seeds, cuttings or plants for the cultivation
- Production of fertilizers used in the agriculture
- Production of other agrichemicals used in the agriculture
- Production of compost, if applicable
- Production of electricity and fuels used in the upstream module
- Production of auxiliary products used such as detergents for cleaning, etc.
- Production of semi products used in the core process, if applicable
- Production of primary, secondary and tertiary packaging
- Nursery operations providing seedlings and cuttings. Use primary data, if this process is under the direct control of the organization. If not, use the recommended databases for generic data (see Section 4.8). To aid analysis of hot spots within core processes inflows and emissions from nursery operations should be reported separately.
- Cultivation materials (wooden, plastic, metals, etc.)
- Extraction and use of water
- Waste treatment of waste generated during upstream phase

Upstream processes not listed may also be included. All elementary flows at resource extraction shall be included, except for the flows that fall under the general cut-off rule in Section 4.5.

4.3.1.2. Core processes

The following attributional processes are part of the product system and classified as core processes:

- External transportation to the core processes
- Agriculture including e.g. operations at the farm(s) (installation of the orchard, compost use and application, mowing or other weed control measurement, trimming, pruning, mulching, plant protection e.g. fertilisers and agrichemicals spreading, irrigation, frost control, etc.), air, soil and water emissions and emissions from energy wares used in the agriculture as well as emissions of nitrous gases. The cradle for the agriculture is soil preparation and cultivation.
- Maintenance of machinery (e.g. tractors) and equipment (e.g. in the packing house)
- Preparation of the final product, including post-harvest and post packaging treatment if applicable
- The production processes for the generation of energy wares (fuel and electricity) used in agriculture at the farm and in the packaging and other facilities including cool storage.
- On site storage including cool storage, before dispatch.
- The management of any by-products
- Waste treatment of waste generated during manufacturing, including discarded fruit

Manufacturing processes not listed may also be included. The production of the raw materials used for production of all product parts shall be included. A minimum of 99% of the total weight of the declared product including packaging shall be included.

The technical system shall not include:

- Manufacturing of production equipment, buildings and other capital goods

- Business travel of personnel
- Travel to and from work by personnel
- Research and development activities

4.3.1.3. Downstream processes

The following attributional processes are part of the product system and classified as downstream processes:

- Transport to a repacking operation, if applicable
- Transportation to a storage or cold store facility, if applicable
- Transportation from final production / storage of the product to a distribution platform
- Customer or consumer use of the product
- End-of-life processes of any wasted part of the product (e.g. peel of oranges)
- End-of-life processes of packaging waste
- Transport to landfill or other end-of-life management operation e.g. municipal composting
- Losses from the cold store, repacking or in transportation shall be considered and appropriate waste management of fruit shall be included

4.3.2 OTHER BOUNDARY SETTING

4.3.2.1. Boundary towards nature

Boundaries to nature are defined as flows of material and energy resources from nature into the system. Emissions to air, water and soil cross the system boundary when they are emitted from or leaving the product system.

4.3.2.2. Boundaries in the life cycle

See Section 4.3.1. The EPD may present the information divided into additional sub-divisions.

4.3.2.3. Boundaries towards other technical systems

See Section 4.6.2.

4.4 SYSTEM DIAGRAM

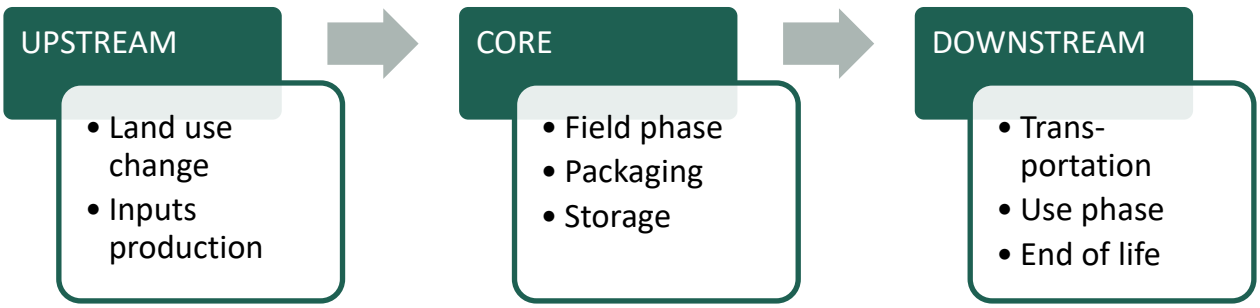

Figure 2 *System diagram illustrating the processes that are included in the product system, divided into upstream, core and downstream processes.*

4.5 CUT-OFF RULES

Data for elementary flows to and from the product system contributing to a minimum of 99% of the declared environmental impacts shall be included (not including processes that are explicitly outside the system boundary as described in Section 4.3).

The check for cut-off rules in a satisfactory way is through the combination of expert judgment based on experience of similar product systems and a sensitivity analysis in which it is possible to understand how the un-investigated input or output could affect the final results.

4.6 ALLOCATION RULES

4.6.1 CO-PRODUCT ALLOCATION

Where fruits and nuts are destined for human consumption, even though they may be of potentially different grades, they are considered equivalent in terms of the service they deliver, therefore no allocation is appropriate.

Where substandard or waste fruits or nuts are used as animal feed this will be regarded as «near to waste treatment» and it is not considered as a displacement of other feedstock.

The following step-wise procedure shall be applied for multifunctional products and multiproduct processes:

1. Allocation shall be avoided, if possible, by dividing the unit process into two or more sub-processes and collecting the environmental data related to these sub-processes.
2. If allocation cannot be avoided, the inputs and outputs of the system shall be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them; i.e. they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system.
3. Where physical relationships alone cannot be established or used as the basis for allocation (or they are too time consuming), Table 1 shall be consulted for key processes. For processes not listed the most suitable allocation procedure shall be used and documented.

Any deviation from these rules must be declared in the LCA and in the EPD.

PROCESS	MAIN PRODUCT AND CO-PRODUCTS	ALLOCATION INSTRUCTION
Polyculture plantation	Cultivation of more than one type of fruits or nuts in the same field/farm	Mass allocation
Production process	Processing of more than one type of fruits or nuts in the same plant/company	Mass allocation

Table 1 Allocation procedure for key processes in the product system, if steps 1 and 2 are not possible.

4.6.2 REUSE, RECYCLING, AND RECOVERY

In the framework of the International EPD® System, the methodological choices for allocation for reuse, recycling and recovery have been set according to the polluter pays principle (PPP). This means that the generator of the waste shall carry the full environmental impact until the point in the product's life cycle at which the waste is transported to a scrapyard or the gate of a waste processing plant (collection site). The subsequent user of the waste shall carry the environmental impact from the processing and refinement of the waste but not the environmental impact caused in the "earlier" life cycles. See General Programme Instruction for further information and examples.

4.7 DATA QUALITY REQUIREMENTS

An LCA calculation requires two different kinds of information:

- data related to the **environmental aspects** of the considered system (such materials or energy flows that enter the production system). These data usually come from the company that is performing the LCA calculation.
- data related to the **life cycle impacts** of the material or energy flows that enter the production system. These data usually come from databases.

Data on environmental aspects shall be as specific as possible and shall be representative of the studied process.

Data on the life cycle of materials or energy inputs are classified into three categories – specific data, selected generic data, and proxy data, defined as follows:

- **specific data** (also referred to as "primary data" or "site-specific data") – data gathered from the actual manufacturing plant where product-specific processes are carried out, and data from other parts of the life cycle traced to the specific product system under study, e.g. materials or electricity provided by a contracted supplier that is able to provide data for the actual delivered services, transportation that takes place based on actual fuel consumption, and related emissions, etc.,
- **generic data** (sometimes referred to as "secondary data"), divided into**:**
  - **selected generic data** – data from commonly available data sources (e.g. commercial databases and free databases) that fulfil prescribed data quality characteristics for precision, completeness, and,
  - **proxy data** – data from commonly available data sources (e.g. commercial databases and free databases) that do not fulfil all of the data quality characteristics of "selected generic data".

As a general rule, specific data shall always be used, if available, after performing a data quality assessment. It is mandatory to use specific data for the core processes as defined above. For the upstream processes, downstream processes, and infrastructure, generic data may also be used if specific data are not available.

Any data used should preferably represent average values for a specific reference year. However, the way these data are generated could vary, e.g. over time, and in such cases they should have the form of a representative annual average value for a specified reference period. Such deviations should be declared.

4.7.1 RULES FOR USING GENERIC DATA

The attributional LCA approach in the International EPD® System forms the basic prerequisites for selecting generic data. To allow the classification of generic data as "selected generic data", they shall fulfil selected prescribed characteristics for precision, completeness, and representativeness (temporal, geographical, and technological), such as:

- the reference year must be as current as possible and preferably assessed to be representative for at least the validity period of the EPD,
- the cut-off criteria to be met on the level of the modelled product system are the qualitative coverage of at least 99% of energy, mass, and overall environmental relevance of the flows,
- completeness in which the inventory data set should, in principle, cover all elementary flows that contribute to a relevant degree of the impact categories, and
- the representativeness of the resulting inventory in the given temporal, technological, and geographical reference should, as a general principle, be better than ±5% of the environmental impact of fully representative data.

Section 4.8 provides a list of recommended databases/data sets to be used for generic data.

If selected generic data that meets the requirements of the International EPD® System are not available as the necessary input data, proxy data may be used and documented. The environmental impacts associated with proxy data shall not exceed 10% of the overall environmental impact from the product system.

The EPD may include a data quality declaration to demonstrate the share of specific data, selected generic data and proxy data for the environmental impacts.

4.8 RECOMMENDED DATABASES FOR GENERIC DATA

Table 2 lists recommended databases for generic data. Please note that this listing does not imply that other data that fulfil the data quality requirements may not be used and that data quality assessment shall also be performed for the data sets in the recommended database by an LCA practitioner.

PROCESS	GEOGRAPHICAL SCOPE	DATABASE
Agricultural product	Worldwide	Agrifootprint, Ecoinvent
Plastic	Europe	Industry data 2.0, Plastics Europe

Aluminium	Europe	EAA (European Aluminium Association)
Steel	Worldwide	Worldsteel
National residual electricity mix	Europe	Association of Issuing Bodies
Transport	Worldwide	Ecoinvent

Table 2 Recommended databases for generic data.

4.9 IMPACT CATEGORIES AND IMPACT ASSESSMENT

The EPD shall declare the default impact categories as described in the General Programme Instructions. The characterisation models and factors to use for the default impact categories are available on www.environdec.com/indicators and shall be updated on a regular basis based on the latest developments in LCA methodology and ensuring the market stability of EPDs. The source and version of the characterisation models and the factors used shall be reported in the EPD. Alternative regional life cycle impact assessment methods and characterisation factors are allowed to be calculated and displayed in addition to the default list. If so, the EPD shall contain an explanation of the difference between the different sets of indicators, as they may appear to the reader to display duplicate information.

To better characterise the environmental performance of this product category, the potential environmental impacts listed below shall be calculated and reported in the EPD.

4.10 OTHER CALCULATION RULES AND SCENARIOS

4.10.1 UPSTREAM PROCESSES

The following requirements apply to the upstream processes:

- Data referring to processes and activities upstream in a supply chain over which an organisation has direct management control shall be specific and collected on site.
- Data referring to contractors that supply main parts, packaging, or main auxiliaries should be requested from the contractor as specific data, as well as infrastructure, where relevant.
- The transport of main parts and components along the supply chain to a distribution point (e.g. a stockroom or warehouse) where the final delivery to the manufacturer can take place based on the actual transportation mode, distance from the supplier, and vehicle load.
- In case specific data is lacking, selected generic data may be used. If this is also lacking, proxy data may be used.
- For the electricity used in the upstream processes, electricity production impacts shall be accounted for in this priority when specific data are used in the upstream processes:

  1. Specific electricity mix as generated, or purchased, from an electricity supplier, demonstrated by a Guarantee of Origin (or similar, where reliability, traceability, and the avoidance of double-counting are ensured) as provided by the electricity supplier. If no specific mix is purchased, the residual electricity mix from the electricity supplier shall be used.[3]
  2. National residual electricity mix or residual electricity mix on the market
  3. National electricity production mix or electricity mix on the market.

  The mix of electricity used in upstream processes shall be documented in the EPD, where relevant.
- Packaging: specific data shall be used for the consumer packaging production if it is under the direct control of the organization or if the environmental impact related to the consumer packaging production is more than 10% of the total product environmental indicators. In other cases, generic data may be used. When consumer packaging shows the organization's logo, the LCA report should report the exerted/non exerted direct control on the production of consumer packaging by the organization.

[3] The residual electricity mix is the mix when all contract-specific electricity that has been sold to other customers has been subtracted from the total production mix of the electricity supplier.

4.10.2 CORE PROCESSES

The following requirements apply to the core processes:

- Specific data shall be used for the assembly of the product and for the manufacture of main parts as well as for on-site generation of steam, heat, electricity, etc., where relevant.
- For the electricity used in the core processes, electricity production impacts shall be accounted for in this priority:
  1. Specific electricity mix as generated, or purchased, from an electricity supplier, demonstrated by a Guarantee of Origin (or similar, where reliability, traceability, and the avoidance of double-counting are ensured) as provided by the electricity supplier. If no specific mix is purchased, the residual electricity mix from the electricity supplier shall be used.[4]
  2. National residual electricity mix or residual electricity mix on the market
  3. National electricity production mix or electricity mix on the market.

  The mix of electricity used in the core processes shall be documented in the EPD, where relevant.
- Production processes which are mandatory to include:
  - Pruning
  - Frost control
  - Soil cultivation
  - Fuel use in orchard/farm operations
  - Mowing or other mechanical or manual weed control measures
  - Trimming and mulching
  - Composting
  - Fertiliser applications including field emissions
  - Chemical weed control and plant protection applications
  - Irrigation
  - Harvesting
  - Post-harvest and any post packaging requirements
  - Packing and repacking
  - Storage and cool storage at orchards or at packing facilities for fruit prior to transport to the consumer
  - By-products generation
  - Transport from the final delivery point of raw materials, chemicals, main parts, and components (see above regarding upstream processes) to the manufacturing plant/place of service provision should be based on the actual transportation mode, distance from the supplier, and vehicle load, if available.
  - By product-generation and measurement
  - Waste treatment processes of manufacturing waste should be based on specific data, if available.
- If applicable, unproductive years of the plantation shall be taken into account. The consumptions and emissions of unproductive years of the plantation shall be spread out over the productive years considering the yearly yields and entire lifetime of the plantation. Similar to productive years, data inventory for unproductive years shall include all relevant activities related to the plant cultivation.
- By-products and products not meeting desired quality standards shall be included. If they are destined to other chains (such as animal feed or organic waste treatment) this must be included. Environmental impacts related to their transportation to other chains shall be included, but their treatment should not be included in the system boundaries.

[4] The residual electricity mix is the mix when all contract-specific electricity that has been sold to other customers has been subtracted from the total production mix of the electricity supplier.

- Where waste fruit is used for cattle feed this should be quantified and the transport requirements included. A default factor of 10% can be applied for waste arising, based on mass, unless better evidence is available. Waste deposited in landfill shall be declared as kg (and kg hazardous waste, if applicable).
- Waste deposited in landfill shall be declared as kg of waste (and kg of hazardous waste).
- Waste management shall be included in the system boundaries. Where waste is used as animal feed this shall be quantified and transport requirements included.
- For additional information about system boundaries concerning waste, etc., see the General Programme Instructions.
- Waste water treatment shall be included in the system boundaries, if relevant
- If there are no site or region-specific data available, emissions due to fertilizer use shall be calculated according to the rules presented in the paragraphs from 4.10.2.1 to 4.10.2.5.

	Emission	Paragraph	Source
Emission in air	Ammonia	4.10.2.1	EMEP/CORINAIR, 2013[5], IPCC, 2006[6]
	N_2O, NO – direct emission	4.10.2.2	Bouwman et al., 2002[7]
	N_2O – indirect emission	4.10.2.3	IPCC, 2006
Emission in water	Nitrates	4.10.2.4	IPCC, 2006
	Phosphorus	4.10.2.5	Prahsun, 2006[8]

Table 3. Sources of the emission factors proposed in the paragraphs from 4.10.2.1 to 4.10.2.5.

4.10.2.1. AMMONIA

Ammonia volatilized shall be estimated using the EMEP/CORINAIR emission factors.

Fertilizers type	Emission factor	
	Low soil pH	High soil pH
Ammonium nitrate (AN)	0.037	
Anhydrous ammonia	0.011	
Ammonium phosphate (MAP and DAP)	0.113	0.293
Ammonium sulphate (AS)	0.013	0.270
Calcium ammonium nitrate (CAN)	0.022	
Calcium nitrate (CN)	0.009	
Ammonium solutions (AN)	0.037	
Ammonium solutions (Urea AN)	0.125	
Urea ammonium sulphate (UAS)	0.195	
Urea	0.243	
Other NK and NPK	0.037	
Animal manure[9]	0.2	

Table 4. Total NH_3 emissions from cultures due to fertilizer volatilization. Values are kg NH_3-N volatilized per kg of N in fertilizers applied

4.10.2.2. DIRECT EMISSION OF N2O AND NO

N_2O and NO direct emissions shall be estimated using the emission factors calculated by Bouwman (2002).

Fertilizers type	Emission factor N_2O	Emission factor NO
Ammonium sulfate	0.010	0.007
Urea	0.011	0.007

[5] EMEP/EEA air pollutant emission inventory guidebook, 2013

[6] IPCC, 2006. Guidelines for National Greenhouse Gas Inventories

[7] Bouwman, A. F., L. J. M. Boumans, and N. H. Batjes, 2002, Modeling global annual N_2O and NO emissions from fertilized field

[8] Prahsun V., 2006. Erfassung der PO_4^- Austrage fur die Okobilanzierung SALCA Phosphor. Agroscope Reckenholz – Tanikon ART, 20p

[9] Source: IPCC, 2006. Indirect N_2O emissions from agriculture

Ammonium nitrate	0.008	0.006
Calcium ammonium nitrate	0.007	0.006
Ammonia, direct application	0.009	0.005
Nitrogen solutions	0.010	0.007
Other straight N	0.012	0.010
Ammonium phosphates	0.009	0.007
Other compound NP-N	0.009	0.006
Compound NK-N	0.009	0.008
Compound NPK-N	0.008	0.006
Generic mineral N fertilizers	0.010	0.007
Animal manure	0.008	0.005

Table 5. Total N_2O emissions from cultures due to fertilizer use. Values are kg N_2O-N and NO-N emitted per kg of N in fertilizers applied

4.10.2.3. INDIRECT EMISSION OF N_2O

Indirect emissions of N_2O shall be estimated using the emission factors proposed by the IPCC.

	Emission factor N_2O indirect emission
per kg of NH_3-N volatilized from fertilizers applied	0.01
per kg of NO_{3^-}-N lost by leaching/runoff	0.0075

Table 6. Total N_2O emissions from cultures due to fertilizer volatilization. Values are kg N_2O-N emitted per kg of NH_3-N volatilized from fertilizers applied and per kg of NO_3--N lost by leaching/runoff

4.10.2.4. EMISSION OF NITRATES

Nitrates leaching and runoff shall be estimated using the most accurate methodology available. If more accurate methodologies cannot be used, they can be estimated using the emission factor proposed by the IPCC.

	Emission factor NO_{3^-} indirect emission
per kg of N in fertilizers applied	0.3

Table 7. Total NO_3^- emissions due to leaching and runoff. Values are kg NO_3^--N emitted per kg of N in fertilizers applied

4.10.2.5. EMISSION OF PHOSPHORUS

We distinguish three different kinds of phosphorus emission to water:

- **leaching** of soluble phosphate to ground water (inventoried as “phosphate, to ground water”),
- **run-off** of soluble phosphate to surface water (inventoried as “phosphate, to river”);
- **erosion** of soil particles containing phosphorus (inventoried as “phosphorus, to river”)

Phosphorus **leaching** to the ground water shall be estimated as an average leaching, corrected by phosphorus fertilization:

$$\mathbf{P_{gw} = P_{gwl} * F_{gw}}$$

P_{gw} = quantity of phosphorus leached to ground water (kg/ha)

P_{gwl} = average quantity of P leached to ground water for a land use category (0.07 kg P/ha assumed equivalent to the factor for arable land)

F_{gw} = correction factor for fertilization with slurry

$$F_{gw} = 1+0.2/80*P_2O_{5sl}$$

P_2O5sl = quantity of P_2O_5 applied

Run-off to surface waters shall be calculated in a similar way to leaching to ground water:

$$\mathbf{P_{ro} = P_{rol} * F_{ro}}$$

P_{ro} = quantity of phosphorus lost through run-off to rivers (kg/ha)

P_{rol} = average quantity of P lost through run-off to rivers for a land use category (0.175 kg P/ha assumed equivalent to the factor for arable land)

F_{ro} = correction factor for fertilization with phosphorus, calculated as:

$$F_{ro} = 1+0.2/80* P_2O_{5min}+0.7/80* P_2O_{5sl}+0.4/80* P_2O_{5man}$$

P_2O_{5min} = quantity of P_2O_5 applied with mineral fertilizers (kg/ha)

P_2O_{5sl} = quantity of P_2O_5 applied with slurry (kg/ha)

P_2O_{5man} = quantity of P_2O_5 applied with solid manure (kg/ha)

Phosphorus emissions through **erosion** to surface waters, if there is no more accurate information available, could be estimated using the default value **0.53 kg P/ha**, derived from an elaboration made using the SALCA-P model (considering 1.5 t*ha-1*yr-1 of eroded soil).

4.10.2.6. ACTIVE SUBSTANCE OF PESTICIDES

To calculate the impact of pesticides production the content in active substance of the specific products shall be considered.

If no specific data are available, it shall be assumed that all pesticides applied are 100% emitted to agricultural soil.

Any deviation from these rules must be declared in the LCA and in the EPD.

4.10.3 DOWNSTREAM PROCESSES

The following requirements apply to the downstream processes:

- Data for the use stage are usually based on scenarios, but specific data should be used when available and relevant.
- Data on the pollutant emissions from the use stage should be based on documented tests, verified studies in conjunction with average or typical product use, or recommendations concerning suitable product use. Whenever applicable, test methods shall be internationally recognised.
- The use of electricity in the region/country where the product is used (as specified in the geographical scope of the EPD) shall be accounted for in the following priority:
  1. National residual electricity mix or residual mix on the market
  2. National electricity production mix or electricity mix on the market

  The mix of electricity used in the downstream processes shall be documented in the EPD, where relevant.
- The transport of the product to the customer shall be described in the reference PCR, which should reflect the actual situation to the best extent possible. The following priority should be used:
  1. Actual transportation distances and types.
  2. Calculated as the average distance of a product of that product type transported by different means of transport modes.
  3. Calculated as a fixed long transport, such as 1 000 km transport by lorry or 10 000 km by airplane, according to product type.
- The use and impact of cooling substances, e.g. refrigerants shall be included for all downstream operations including road freight, sea freight and air freight. Use primary data, if these processes are under the direct control of the organization. If not, use the recommended databases for generic data (see Section 4.8). Temporary and long-term cold storage of fruit including energy use and emissions of refrigerants shall be estimated for wholesalers and distributors prior to delivery to a retailer.
- The assessment shall include the environmental impacts related to repacking operations, if necessary:
  1. Cold storage including (energy and refrigerant losses) for fruit at a repacking facility before delivery to the retailer
  2. Use of packaging materials for repacking of fruit before delivery to the retailer
  3. Consideration of fruit losses during storage and repacking operations
  4. Waste disposal of packaging materials and fruit at a repacking facility

- If the product needs a freezing phase or cold storage for preserving its shelf life, the environmental impacts related to this process shall be estimated.

  Since the impacts could be quite variable, the following hypotheses shall be adopted in order to calculate the values in a "comparable" way. These hypotheses come from www.lcafood.dk. Electric energy due to the cold storage shall be evaluated by the following formula:

  $$\mathbf{E_p = E_s \times 100\%/u \times V_p \times t}$$

  Where:

  E_s is the specific energy consumption of the cooling room (kWh per m^3 per day). If specific data are not available, calculations can be based on consumption of 0.59 kWh per m^3 per day of storage in a cold place (5ºC) and 0.63 kWh per m^3 per day spent in cooling

  u is the degree of utilisation of the storage room (%). If no specific information is available, then 50% utilisation shall be considered

  V_p is the volume of the considered product m^3. If known, it can be calculated on the basis of the specific weight of the packed product, in kg/m^3

  t is the time of the storage (days) assumed by the shelf life of the product.

  A country-specific energy mix shall be used.

  Different calculations can be used but must be justified and documented in the EPD. Any differences in relation to the default method shall be highlighted.

  The environmental impact of the processes where the other generic data are used must not exceed 10% of the overall environmental impact from the product system.

- Scenarios for the end-of-life stage shall be technically and economically practicable and compliant with current regulations in the relevant geographical region based on the geographical scope of the EPD. Key assumptions regarding the end-of-life stage scenario shall be documented.

5 CONTENT AND FORMAT OF EPD

EPDs based on this PCR shall contain the information described in this section. Flexibility is allowed in the formatting and layout provided that the EPD still includes the prescribed information. A generic template for EPDs is available via www.environdec.com

As a general rule the EPD content:

- shall be in line with the requirements and guidelines in ISO 14020 (Environmental labels and declarations - General principles),
- shall be verifiable, accurate, relevant and not misleading, and
- shall not include rating, judgements or direct comparison with other products.

An EPD should be made with a reasonable number of pages for the intended audience and use.

5.1 EPD LANGUAGES

EPDs should be published in English but may also be published in additional languages. If the EPD is not available in English, it shall contain an executive summary in English including the main content of the EPD. This summary is part of the EPD and thus subject to the same verification procedure.

5.2 UNITS AND QUANTITIES

The following requirements apply for units and quantities:

- The International System of Units (SI units) shall be used, e.g., kilograms (kg), Joules (J) and metres (m). Reasonable multiples of SI units may be decided in the PCR to improve readability, e.g., grams (g) or megajoules (MJ). The following exceptions apply:
  - Resources used for energy input (primary energy) should be expressed as kilowatt-hours (kWh) or megajoules (MJ), including renewable energy sources, e.g., hydropower, wind power and geothermal power.
  - Water use should be expressed in cubic metres (m^3)
  - Temperature should be expressed in degrees Celsius (°C),
  - Time should be expressed in the units most practical, e.g., seconds, minutes, hours, days or years.
- Three significant figures[10] should be adopted for all results, the number of significant digits shall be appropriate and consistent.
- The thousand separator and decimal mark in the EPD shall follow one of the following styles (a number with six significant figures shown for illustration):
  - SI style (French version): 1 234,56
  - SI style (English version): 1 234.56

  In case of potential confusion or intended use of the EPD in markets where different symbols are used, the EPD shall state what symbols are used for thousand separator and decimal mark.
- Dates and times presented in the EPD should follow the format in ISO 8601. For years, the prescribed format is YYYY-MM-DD, e.g., 2017-03-26 for March 26th, 2017.
- The result tables shall:
  - Only contain values or the letters “INA” (Indicator Not Assessed). It is not possible to specify INA for mandatory indicators. INA shall only be used for voluntary parameters that are not quantified because no data is available.[11]
  - Contain no blank cells, hyphens, less than or greater than signs or letters (except “INA”).

[10] Significant figures are those digits that carry meaning contributing to its precision. For example with two significant digits, the result of 123.45 shall be displayed as 120, and 0.12345 shall be displayed as 0.12. In scientific notation, these two examples would be displayed as $1.2*10^2$ and $1.2*10^{-2}$.

[11] This requirement does not intend to give guidance on what indicators are mandated (“shall”) or voluntary.

- Use the value 0 only for parameters that have been calculated to be zero.
- Footnotes shall be used to explain any limitation to the result value.

5.3 USE OF IMAGES IN EPD

Images used in the EPD, especially pictures featured on the cover page, may in themselves be interpreted as an environmental claim. Images such as trees, mountains, wildlife that are not related to the declared product should therefore be used with caution and in compliance with national legislation and best available practices in the markets in which the EPD is intended to be used.

5.4 EPD REPORTING FORMAT

The reporting format of the EPD shall include the following sections:

- Cover page (see Section 5.4.1)
- Programme information (see Section 5.4.2)
- Product information (see Section 5.4.3)
- Content declaration (see Section 5.4.4)
- Environmental performance (see Section 5.4.5)
- Additional environmental information (see Section 5.4.6)
- References (see Section 5.4.9)

The following information shall be included, when applicable:

- Information related to Sector EPDs (see Section 5.4.7)
- Differences versus previous versions (see Section 5.4.8)
- Executive summary in English (see Section 5.4.10)

5.4.1 COVER PAGE

The cover page shall include:

- Product name and image,
- Name and logotype of EPD owner,
- The text “Environmental Product Declaration” and/or “EPD”
- *Programme: The International EPD® System, www.environdec.com,*
- *Programme operator: EPD International AB*
- Logotype of the International EPD® System,
- EPD registration number as issued by the programme operator[12],
- *Date of publication (issue): 20XX-YY-ZZ,*
- *Date of revision: 20XX-YY-ZZ*, when applicable,
- *Date of validity; 20XX-YY-ZZ*
- A note that “*An EPD should provide current information, and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com*.”

[12] The EPD shall not include a “registration number” if such is provided by the certification body, as this may be confused with the registration number issued by the programme operator.

- A statement of conformity with ISO 14025,

5.4.2 PROGRAMME INFORMATION

The programme information section of the EPD shall include:

- Address of programme operator: *EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden, E-mail: info@environdec.com*
- The following mandatory statement from ISO 14025: "*EPDs within the same product category but from different programmes may not be comparable*."
- A statement that the EPD owner has the sole ownership, liability and responsibility of the EPD
- Information about verification[13] and reference PCR in a table with the following format and contents:

Product category rules (PCR): *<name, registration number, version and UN CPC code(s)>*
PCR review was conducted by: *<name and organisation of the review chair, and information on how to contact the chair through the programme operator>*
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☐ EPD verification
Third party verifier: *<name, organisation and signature of the third party verifier>* *In case of certification bodies:* Accredited by: *<name of the accreditation body and accreditation number, if applicable>.* *In case of individual verifiers:* Approved by: The International EPD® System Technical Committee, supported by the Secretariat
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☐ No

5.4.3 PRODUCT INFORMATION

The product information section of the EPD shall include:

- Address and contact information to EPD owner,
- Description of the organisation. This may include information on products- or management system-related certifications (e.g. ISO 14024 Type I environmental labels, ISO 9001- and 14001-certificates and EMAS-registrations) and other relevant work the organisation wants to communicate (e.g. SA 8000, supply-chain management and social responsibility),
- Name and location of production site,
- Product identification by name, and an unambiguous identification of the product by standards, concessions or other means,
- Identification of the product according to the UN CPC scheme system. Other relevant codes for product classification may also be included, e.g.
  - Common Procurement Vocabulary (CPV),
  - United Nations Standard Products and Services Code® (UNSPSC),

[13] If the EPD has been verified by an approved individual verifier who has received contractual assistance from a certification body that is not accredited, this certification body shall not be included in this table.

- Classification of Products by Activity (NACE/CPA) or
- Australian and New Zealand Standard Industrial Classification (ANZSIC),

- Description of the product, its application/intended use and technical functions, e.g. expected service life time,
- Geographical scope of the EPD, i.e., for which geographical location(s) of use and end-of-life the product's performance has been calculated,
- Functional unit or declared unit,
- Declaration of the year(s) covered by the data used for the LCA calculation and other relevant reference years,
- Reference to the main database(s) for generic data and LCA software used, if relevant,
- System diagram of the processes included in the LCA, divided into the life cycle stages,
- Description if the EPD system boundary is "cradle-to-gate", "cradle-to-gate with options" or "cradle-to-grave",
- Information on which life cycle stages are not considered (if any), with a justification of the omission,
- Relevant websites for more information or explanatory materials.

This section may also include:

- Name and contact information of organisation carrying out the underlying LCA study,
- Additional information about the underlying LCA-based information, such as assumptions, cut-off rules, data quality and allocation.

5.4.4 CONTENT DECLARATION

The content declaration shall have the form of a list of materials and chemical substances including information on their environmental and hazardous properties. The gross weight of material shall be declared in the EPD at a minimum of 99% of one unit of product. Moisture content shall be declared if relevant.

Information on the hazardous properties of materials and chemical substances should follow the requirements given in the latest revision of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)[14], issued by United Nations or national or regional applications of the GHS.

As an example, the following regulations should be used for EPDs intended to be used in the European Union:

- Regulation (EC) No 1907/2006 of the European parliament and of the council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)
- Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures

5.4.4.1. Information about recycled materials

Not relevant for this product category.

5.4.4.2. Information about packaging

As packaging is strongly connected with the product, the producer shall provide information about packaging in the EPD, when applicable. Packaging may be classified as:

- Distribution Packaging: packaging designed to contain one or more articles or packages, or bulk materials, for the purposes of transport, handling and/or distribution (ISO 21067-1:2016, Par. 2.2.6)
- Consumer Packaging: packaging constituting, with its content, a sales unit for the final user or consumer at the point of retail (ISO 21067-1:2016, Par. 2.2.7).

[14] The GHS document is available on www.unece.org.

Consumer packaging is generally the outcome of eco-design processes, or other activities, under direct control of the organisation. Many critical categories with strict legal requirements belong to consumer packaging category like food contact packaging and pharmaceutical packaging.

The type and function of packaging shall be reported in the EPD.

A statement of the source of the materials (pre-consumer or post-consumer) shall be presented in the EPD when the packaging is made in whole or in part by recycled materials.

5.4.5 ENVIRONMENTAL PERFORMANCE

5.4.5.1. Environmental impacts

The EPD shall declare the environmental impact indicators, per declared unit, per life cycle stage and in aggregated form, using the default impact categories, characterisation models and factors available on www.environdec.com/indicators. The source and version of the characterisation models and the factors used shall be reported in the EPD.

5.4.5.2. Use of resources

The EPD shall declare the mandatory, and may declare the optional, indicators for resource use listed at www.environdec.com/indicators per declared unit, per life-cycle and in aggregated form.

5.4.5.3. Waste production and output flows

Waste generated along the whole life cycle production chains shall be treated following the technical specifications described in the GPI. The EPD shall declare the indicators for waste production and output flows as listed at www.environdec.com/indicators, as well as an indicator for the output flow to animal feed or similar, per declared unit, per life-cycle stage and in aggregated form.

5.4.6 ADDITIONAL INFORMATION

A detailed description of an organisation's overall environmental work, such as:

- Information where interested parties may find more details about the organisation's environmental work
- The existence of a quality or environmental management system or organised environmental programmes
- Any related supply chain management, social responsibility or activity working with supply chain partners to reduce environmental impacts
- Peer-reviewed studies that highlight the environmental impact of production on biodiversity.

5.4.7 INFORMATION RELATED TO SECTOR EPDS

For sector EPDs, the following information shall also be included:

- a list of the contributing manufacturers that the Sector EPD covers,
- a description of how the selection of the sites/products has been done and how the average has been determined, and
- a statement that the document covers average values for an entire or partial product category (specifying the percentage of representativeness) and, hence, the declared product is an average that is not available for purchase on the market.

5.4.8 DIFFERENCES VERSUS PREVIOUS VERSIONS

For EPDs that have been updated, the following information shall also be included:

- a description of the differences versus previously published versions, e.g. a description of the percentage change in results and the main reason for the change;
- a revision date on the cover page

5.4.9 REFERENCES

The EPD® shall, if relevant, refer to:

- The underlying LCA
- The name, CPC code and version number of the PCR used
- Other documents that verify and complement the EPD®
- Instruction for recycling, if relevant
- The General Programme instructions of the International EPD® System
- Other ISO standards

5.4.10 EXECUTIVE SUMMARY IN ENGLISH

For EPDs published in another language than English, an executive summary in English shall be included.

The executive summary should contain relevant summarised information related to the programme, product, environmental performance, additional information, information related to sector EPDs, references and differences versus previous versions.

6 GLOSSARY

CO_2	Carbon dioxide
CPC	Central product classification
EPD	Environmental product declaration
ISO	International Organization for Standardization
kg	kilogram
LCA	Life cycle assessment
PCR	Product Category Rules
SI	The International System of Units
SO_2	Sulphur dioxide
UN	United Nations

7 REFERENCES

CEN (2013), EN 15804:2012+A1:2013, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

EPD International (2017) General Programme Instructions for the International EPD® System. Version 3.0 dated 2017-12-11. www.environdec.com

ISO (2000), ISO 14020:2000, Environmental labels and declarations – General principles

ISO (2004), ISO 8601:2004 Data elements and interchange formats – Information interchange – Representation of dates and times

ISO (2006a), ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures

ISO (2006b), ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework

ISO (2006c), ISO 14044: 2006, Environmental management – Life cycle assessment – Requirements and guidelines

ISO (2013), ISO/TS 14067:2013, Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification and communication

ISO (2014), ISO 14046:2014, Environmental management – Water footprint – Principles, requirements and guidelines

ISO (2017), ISO 21930:2017, Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services

LCA food database 2009. Accessible at www.lcafood.dk

EMEP/EEA air pollutant emission inventory guidebook - 2013

IPCC, 2006. Guidelines for National Greenhouse Gas Inventories

Bouwman, A. F., L. J. M. Boumans, and N. H. Batjes, 2002, Modeling global annual N2O and NO emissions from fertilized field

Prahsun V., 2006. Erfassung der PO4-Austrage fur die Okobilanzierung SALCA Phosphor. Agroscope Reckenholz – Tanikon ART, 20p

8 VERSION HISTORY OF PCR

VERSION 1.0, 2019-01-21

Original version, replacing the existing PCRs for Fruits and nuts, except kiwi fruit and Kiwifruit.

VERSION 1.01, 2019-08-18

- Clarified terms of use
- Editorial changes

VERSION 1.0.2, 2023-05-17

- Prolonged validity period of 1 year due to the initiation of a new PCR replacing this PCR.
- Editorial changes in Section 5.4.5 to clarify that the list at www.environdec.com applies also for the indicators of resource use, waste production and other output flows.
- Other editorial changes.

VERSION 1.0.3, 2024-02-06

- Prolonged validity period with another six months due to a delay in the development process for a new PCR. A second extension of the validity period was granted due to the upcoming rules in GPI 5.0.0, that will allow a second extension of validity up to a total extension of 1.5 years from the original expiration date.

FRUITS AND NUTS
PRODUCT CATEGORY CLASSIFICATION: UN CPC 013