# FERTILISERS

PRODUCT CATEGORY CLASSIFICATION: UN CPC 3461, 3462, 3463, 3464 & 3465

PCR REGISTRATION NUMBER TO BE ADDED UPON PUBLICATION
DRAFT VERSION 4.0.0 FOR OPEN CONSULTATION. DO NOT USE OR CITE.

VALID UNTIL 20XX-YY-ZZ

## DRAFT PCR FOR OPEN CONSULTATION

# INTRODUCTION TO OPEN CONSULTATION

This draft PCR document is available for open consultation from 2024-05-22 until 2024-07-22. Feel free to forward the draft to any other stakeholder you might think is relevant, including colleagues and other organisations.

We are interested in comments from stakeholders on:

- General
  - Alignment with PCRs available in other programmes for type III environmental declarations, industry-specific LCA guidelines or similar.
- Scope of PCR
  - Product category definition and description
  - Classification of product category using CPC codes
- Goal and scope, life cycle inventory and life cycle impact assessment
  - Functional unit/declared unit
  - System boundary
  - Allocation rules
  - Data quality requirements
  - Recommended databases for generic data
  - Impact categories and impact assessment methodology
- Additional information

Comments shall be sent directly to the PCR Moderator (contact details available in Section 1). There is a template for comments on www.environdec.com that may be used.

For questions about the PCR, please contact the PCR moderator. For general questions about the International EPD System, EPD or PCR development, please contact the Secretariat via pcr@environdec.com.

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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, ISO 14040:2006, ISO 14044:2006, and product-specific standards such as EN 15804 and ISO 21930 for construction products. Environmental Product Declarations (EPD) are voluntary documents for a company or organisation to present transparent, consistent and verifiable information about the environmental performance of their products (goods or services).

The rules for the overall administration and operation of the programme are the General Programme Instructions (GPI), publicly available at www.environdec.com. A PCR complements the GPI and the normative 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.

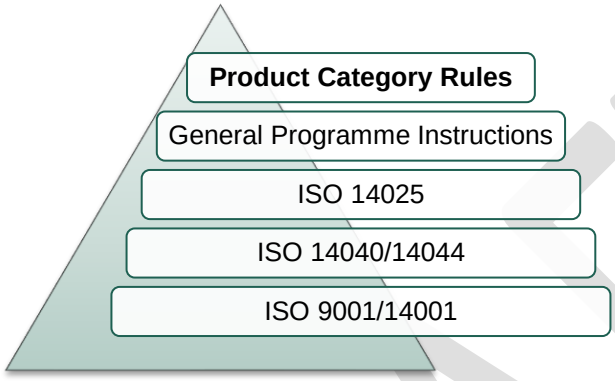


*Figure 1 The hierarchy between PCRs, standards and other documents. EN 15804 and ISO 21930 are normative standards for construction products only.*

Within the present PCR, the following terminology is adopted:

- The term “shall” is used to indicate what is obligatory, i.e. a requirement.
- The term “should” is used to indicate a recommendation, rather than a requirement. Any deviation from a recommendation shall be justified in the EPD development process.
- The terms “may” or “can” is used to indicate an option that is permissible.

For definitions of further 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 at www.environdec.com. Stakeholder feedback on PCRs is very much encouraged. Any comments on this PCR may be sent directly to the PCR Moderator and/or the Secretariat during its development or during its period of validity.

Any references to this document shall 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, and make it 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 EPDs, Environmental Product Declarations.

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# 2 GENERAL INFORMATION

## 2.1 ADMINISTRATIVE INFORMATION

| | |
|---|---|
| Name: | Fertilisers |
| Registration number and version: | *To be added by the Secretariat* |
| Programme: | THE INTERNATIONAL EPD® SYSTEM<br>The International EPD System |
| Programme operator: | EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden.<br>Website: www.environdec.com<br>E-mail: info@environdec.com |
| PCR Moderator: | Francesca Falconi, francesca.falconi@lca-lab.com |
| PCR Committee: | Federico Tonelli, SCAM S.p.A., federico.tonelli@scam.it<br>Daniel El Chami, Roullier, Daniel.ElChami@roullier.com<br>Mustapha Arkoun, Roullier, mustapha.arkoun@roullier.com<br>Alessio Altieri, Valagro SPA, alessio.altieri@syngenta.com |
| Date of publication and last revision: | *To be added by the Secretariat* |
| Valid until: | *To be added by the Secretariat* |
| Schedule for renewal: | A PCR is valid for a pre-determined time period 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 PCR and renewing its validity.<br>A PCR may also be updated without prolonging its period of validity, provided significant and well-justified proposals for changes or amendments are presented.<br>See www.environdec.com for the latest version of the PCR.<br>When there has been an update of the PCR, the new version should be used to develop EPDs. The old version may however be used for 90 days after the publication date of the new version, as long as the old version has not expired. |
| Standards and documents conformance: | General Programme Instructions of the International EPD System, version 4.0, based on ISO 14025 and ISO 14040/14044<br>PCR 2021:03 Basic Chemicals, VERSION 1.1.1 |
| PCR language(s): | At the time of publication, this PCR was available in English. In case of translated versions, the English version takes precedence in case of any discrepancies. |

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# 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 Fertilisers nitrogenous, phosphatic and potassic) and the declaration of this performance by an EPD. The product category corresponds to UN CPC 3461, 3462, 3463, 3464 and 3465.

This PCR covers the product group fertilisers, which is defined by UN CPC classes 3461, 3462, 3463, 3464 and 3465 categorized according to the UN CPC version 2.1:

- Division: 34 - Basic chemicals
  - Group: 346 - Fertilisers and pesticides
    - Class 3461 - Mineral or chemical fertilisers, nitrogenous
    - Class 3462 - Mineral or chemical fertilisers, phosphatic
    - Class 3463 - Mineral or chemical fertilisers, potassic
    - Class 3464 - Mineral or chemical fertilisers containing at least two nutrients of nitrogen, phosphate and potash
    - Class 3465 - Other fertilisers.

The following related UN CPC classes are not included in the scope of this PCR:

- Class 3466 - Insecticides, fungicides, herbicides and disinfectants.

## 2.2.2 GEOGRAPHICAL SCOPE

This PCR may be used globally.

## 2.2.3 EPD VALIDITY

An EPD based on this PCR shall be valid for a 5-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 declared indicators of environmental impact,
- errors in the declared information, or
- significant changes to the declared product information, content declaration, or additional environmental, social or economic information.

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

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# 3 PCR REVIEW AND BACKGROUND INFORMATION

This PCR was developed in accordance with the PCR development process described in the GPI of the International EPD System, including open consultation and review.

## 3.1 OPEN CONSULTATION

### 3.1.1 VERSION 4.0.0

This PCR was available for open consultation from 2024-05-22 until 2024-07-22, during which any stakeholder was able to provide comments by contacting the PCR Moderator and/or the Secretariat.

*Add information about any physical or web-based meetings held during the open consultation phase, if applicable.*

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. The following stakeholders provided comments during the open consultation and agreed to be listed as contributors in the PCR and at www.environdec.com.

- *List of stakeholder names and affiliation (to be added after the open consultation).*

## 3.2 PCR REVIEW

### 3.2.1 VERSION 4.0.0

| | |
|---|---|
| PCR review panel: | The Technical Committee of the International EPD System. A full list of members is available at www.environdec.com. The review panel may be contacted via info@environdec.com.<br><br>Members of the Technical Committee were requested to state any potential conflict of interest with the PCR Committee, and if there were conflicts of interest they were excused from the review. |
| Chair of the PCR review: | *To be added by the Secretariat* |
| Review dates: | *To be added by the Secretariat* |

## 3.3 EXISTING PCRS FOR THE PRODUCT CATEGORY

As part of the development of this PCR, existing PCRs and other internationally standardized methods that could potentially act as PCRs were considered to avoid unnecessary overlaps in scope and to ensure harmonisation with established methods of relevance for the product category. The existence of such documents was checked among the following EPD programmes and international standardisation bodies:

- International EPD System. www.environdec.com.

No existing PCRs with overlapping scope were identified.

## 3.4 REASONING FOR DEVELOPMENT OF PCR

This PCR was developed to enable publication of EPDs for this product category based on ISO 14025, ISO 14040/14044. The PCR enables different practitioners to generate consistent results when assessing the environmental impact of products of the same product category, and thereby it supports comparability of products within a product category.

## 3.5 UNDERLYING STUDIES USED FOR PCR DEVELOPMENT

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

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- Effect of different organic matrices on the flow of N, P, K in the soil-plant system, Coppola E., 1993.
- Organo-mineral fertilisers for corn, Tassan Mazzocco G., Contin M. 2000.
- Life Cycle Assessment (LCA) of different fertiliser product types, K.Hasler, S.Broring, S.W.F.Omta, H.-W.Olfs, 2015.
- Life Cycle Assessment of organic and mineral fertilisers in a crop sequence of cauliflower and tomato, R. Quiros, G.Villalba, X. Gabarrell, P.Munoz, 2015.
- Melone e pomodoro da industria: efficienza della concimazione con Organo Minerali liquidi, P.P.Pasotti, M. Pelliconi, V.Tisselli, S. Tagliavini, 2017 Colture Protette N° 4 aprile 2017

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# 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 DECLARED UNIT

The declared unit shall be defined as 1000 kg of product with its packaging (the weight of the packaging is not included in this 1000 kg).

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.

The declared unit shall be stated in the EPD. The environmental impact shall be given per declared unit. In the EPD a statement should be added to specify that the declared unit may have different functionality depending on the composition of the product that is declared.

## 4.2 TECHNICAL SPECIFICATION, LIFESPAN AND REFERENCE SERVICE LIFE (RSL)

For fertilisers it is possible to state some technical specification if these specifications are relevant or applicable to product typology.

Important technical specification may be: Agronomic Efficiency Index (AEI) and the Uptake Index (UI).

Agronomic Efficiency Index (AEI)

The AEI expresses the increase of the production of useful dry substance for each given Fertilizing Unit (FU). The AEI is used to evaluate the efficiency of the fertilization of the ground/plant system in order to define the right input of nutrients for the specific ground/plant system. AEI is calculated as follows:

$$AEI = (\text{yield nC} - \text{yield 0C})/\text{nFU}$$

where:
nC = yields obtained in fertilized parcels
0C = yields obtained in unfertilized parcels
nFU = applied Fertilizing Units

Uptake Index (UI)

The Uptake Index constitutes the easiest methodology to face the evaluation of the nutritive capacities of a fertiliser. It is based on the calculation of the plant uptakes, for the specific nutrient, with relation to what is established in the unfertilized witness.

UI is calculated as follows:

UI = [nutrient element up-taken from the cultivation in the fertilized option (kg/ha) – nutrient element ep-taken from the cultivation in the unfertilized option (kg/ha)]/nutrient unit (kg/ha) * 100.

Reference Service Life (RSL) is not applicable for this product category.

## 4.3 SYSTEM BOUNDARY

The scope of this PCR and EPDs based on it is 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 the product is divided into three life cycle stages:

- Upstream processes (from cradle-to-gate)

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- 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 and in aggregated form. 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 unit processes are part of the product system and shall be classified as upstream processes:

- extraction and processing of raw materials,
- recycling processes of secondary materials from other product life cycles,
- production of input components,
- relevant services, such as transport of raw materials and components along the upstream supply chain to a distribution point (e.g. a stockroom or warehouse),
- production of distribution and consumer packaging, and
- generation of electricity and production of fuels, steam and other energy carriers used in upstream processes.

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.

For modelling of infrastructure and capital goods, see Section 4.3.2.

#### 4.3.1.2. Core processes

The following unit processes are part of the product system and shall be classified as core processes:

- transportation of materials and components to the manufacturing of the product under study,
- manufacturing of the product under study,
- end-of-life treatment of manufacturing waste, even if carried out by third parties, including transportation, and
- generation of electricity and production of fuels, steam and other energy carriers used in core processes.

Core processes not listed may also be included. Manufacturing of a minimum of 99% of the total weight of the declared product including packaging shall be included.

The following processes shall not be included:

- business travel of personnel,
- travel to and from work by personnel, and
- research and development activities.

For modelling of infrastructure and capital goods, see Section 4.3.2.

#### 4.3.1.3. Downstream processes

The following unit processes are part of the product system and shall be classified as downstream processes:

- transportation of the product to retailer/consumer,
- product use, e.g. use of electricity or water, use activities causing direct emissions, maintenance activities,
- end-of-life treatment of the used product and its packaging, including transportation, and
- generation of electricity and production of fuels, steam and other energy carriers used in downstream processes.

For modelling of infrastructure and capital goods, see Section 4.3.2.

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## 4.3.2 INFRASTRUCTURE AND CAPITAL GOODS

In general, the production and end-of-life processes of infrastructure or capital goods[2] used in the product system should not be included within the system boundaries. They may be included when infrastructure and capital goods are known to be relevant in terms of their environmental impact, or when a generic LCI dataset includes infrastructure/capital goods, and it is not possible, within reasonable effort, to subtract the data on infrastructure/capital goods from this dataset. If an infrastructure/capital good is produced with the intention to be used one or a few times only (e.g., a manufacturing plant or machinery constructed to produce only one product), this infrastructure/capital good shall be included.

The inclusion or exclusion of infrastructure/capital goods shall be transparently described for upstream, core and downstream processes in the LCA report and in the EPD.

## 4.3.3 OTHER BOUNDARY SETTING

#### 4.3.3.1. Boundary towards nature

Boundaries to nature are defined as where the flows of material and energy resources leave nature and enter the technical system (i.e. the product system). Emissions cross the system boundary to nature when they are emitted to air, soil or water.

#### 4.3.3.2. Boundary towards other technical systems

Boundaries towards other technical systems define the flow of materials and components to/from the product system under study and from/to other product systems. If there is an inflow of recycled material to the product system in the production/manufacturing stage, the transport from the scrapyard/collection site to the recycling plant, the recycling process, and the transportation from the recycling plant to the site where the material is being used shall be included. If there is an outflow of material or component to recycling, the transportation of the material to the scrapyard/collection site shall be included. The material or component going to recycling is then an outflow from the product system.

See Section 4.6 for further guidance.

#### 4.3.3.3. Temporal boundary

The temporal boundary defines the time period for which the life cycle inventory data is recorded, e.g. for how long emissions from waste deposits are accounted. As default, the time period over which inputs to and outputs from the product system is accounted for shall be 100 years from the year that the LCA model best represents, considering the representativeness of the inventory data. This year shall, as far as possible, represent the year of the publication of the EPD.

#### 4.3.3.4. Geographical boundary

The geographical boundary defines the geographical coverage of the LCA. This shall reflect the physical reality of the product under study, accounting for the representativeness of technology, input materials and input energy.

[2] Examples of infrastructure and capital goods are the building in which the studied product or upstream materials or components are produced, machinery used in the manufacturing of the product or its materials or components, or vehicles used in transports in the product system. For example, if the EPD is on wind power, the power plant itself is considered the studied product and not infrastructure/capital goods. However, the buildings and machinery that make the wind turbine components are considered infrastructure/capital goods. Similarly, if the EPD is on a means of transport, the vehicle is considered the studied product and not infrastructure/capital goods.

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## 4.4 SYSTEM DIAGRAM

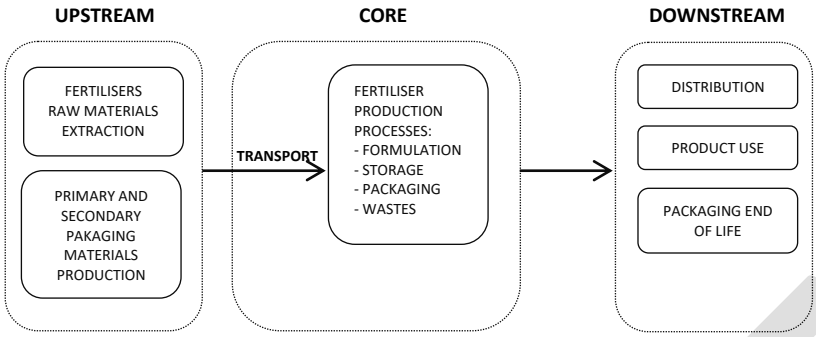


Figure 2 *System diagram illustrating the processes that shall be included in the product system, divided into upstream, core and downstream processes. The illustration of processes to include may not be exhaustive.*

## 4.5 CUT-OFF RULES

A cut-off rule of 1% shall be applied. In other words, the included inventory data (not including inventory data of processes that are explicitly outside the system boundary as described in Section 4.3) shall together give rise to at least 99% of the results of any of the environmental impact categories. Also, 99% of the mass of the product content and 99% of the energy use of the product life cycle shall be accounted for. The cut-off of inventory data should, however, be avoided, and all available inventory data shall be used.

The cut-off of inventory data, based on the above cut-off rule, should be an output of a sensitivity analysis, alone or in combination with expert judgment based on experience of similar product systems. Furthermore, the cut-off shall be possible to be verify in the verification process, hence the exclusion of inventory data based on the cut-off rule shall be documented in the LCA report, and the EPD developer shall provide the information the verifier considers necessary to verify the cut-off.

## 4.6 ALLOCATION RULES

Allocation can be divided into allocation of co-products, i.e. allocation of unit processes that generate several products, and allocation of waste, i.e. allocation of unit processes that generate materials that are, for example, landfilled recovered, recycled or reused, and which require further processing to cease being waste and become products (see criteria for end-of-waste state in Section 4.6.2).

The principles for allocation of co-products and allocation of waste are described separately in the following subsections

### 4.6.1 CO-PRODUCT ALLOCATION

The following hierarchy of allocation methods shall be followed for co-product allocation:

1. Allocation shall be avoided, if possible, by dividing the process to be allocated into sub-processes and collecting the inventory data for each sub-process.
2. If allocation cannot be avoided, the inventory data should be partitioned between the different co-products in a way that reflects the underlying physical relationships between them, i.e. allocation should reflect the way in which the inventory data changes if the quantities of delivered co-products change.
3. If a physical relationship between the inventory data and the delivery of co-products cannot be established, the inventory data should be allocated between the co-products in a way that reflects other relationships between them. For example, inventory data might be allocated between co-products in proportion to their economic values. If economic allocation is used, a sensitivity analysis exploring the influence of the choice of the economic value shall be included in the LCA report.

### 4.6.2 ALLOCATION OF WASTE TREATMENT PROCESSES

Allocation of waste shall follow the polluter pays principle and its interpretation in EN 15804: “processes of waste processing shall be assigned to the product system that generates the waste until the end-of-waste state is reached.” The end-of-waste state is reached when all the following criteria for the end-of-waste state are fulfilled (adapted from EN 15804):

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- the recovered material, component or product is commonly used for specific purposes;
- a market or demand, identified e.g. by a positive economic value, exists for such a recovered material, component or product;
- the recovered material, component or product fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and
- the use of the recovered material, product or construction element will not lead to overall adverse environmental or human health impacts.

The above outlined principle means that the generator of the waste shall carry the full environmental impact until the point in the product life cycle in which the end-of-waste criteria are fulfilled. Waste may have a negative economic market value, and then the end-of-waste stage is typically reached after (part of) the waste processing and further refinement, at the point at which the waste no longer has a negative market value. This allocation method is (in most cases) in line with a waste generator's juridical and financial responsibilities. See the GPI for further information and examples.

## 4.7 DATA QUALITY REQUIREMENTS AND SELECTION OF DATA

Life cycle inventory data are classified into specific data and generic data, where the latter can be selected generic data or proxy data. The data categories are 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;
  - actual data from other parts of the life cycle traced to the product under study, for example site-specific data on the production of materials or generation of electricity provided by contracted suppliers, and transportation data on distances, means of transportation, load factor, fuel consumption, etc., of contracted transportation providers; and
  - LCI data from databases on transportation and energyware that is combined with actual transportation and energy parameters as listed above.
- generic data (sometimes referred to as "secondary data"), divided into:
  - selected generic data: data (e.g. commercial databases and free databases) that fulfil prescribed data quality requirements for precision, completeness, and representativeness (see below Section 4.7.1),
  - proxy data: data (e.g. commercial databases and free databases) that do not fulfil all of the data quality requirements of "selected generic data".

Specific data shall be used for the core processes. Specific data shall be used for upstream and downstream processes, when available, otherwise generic data may be used. Generic data should be used in cases in which they are representative for the purpose of the EPD, e.g. for bulk and raw materials on a spot market, if there is a lack of specific data on the final product or if a product consists of many components.

### 4.7.1 RULES FOR USING GENERIC DATA

For generic data to be classified as "selected generic data", the following requirements apply:

- datasets shall be based on attributional LCA modelling (e.g., not be based on marginal data and not include credits from system expansion),
- the reference year shall be as current as possible and should be representative for the validity period of the EPD,
- the 1% cut-off rule (as described in Section A.3.3 of the GPI) shall be met on the level of the product system,
- datasets shall represent average values for a specific reference year; however, how data are generated could vary, e.g. over time, and then they should have the form of a representative annual average value for a specified reference period (such deviations shall be justified and declared in the EPD), and
- the representativeness of the data shall be assessed to be better than ±5%, in terms of the environmental impact calculated on the basis of the data, of data that is fully representative for the given temporal, technological and geographical context.

If selected generic data that meets the above data quality requirements are not available, proxy data may be used. The environmental impacts associated with proxy data shall not exceed 10% of the overall environmental impact of the product system.

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The EPD may include a data quality declaration to demonstrate the share of specific data, selected generic data and proxy data contributing to the results of the environmental impact indicators.

## 4.7.2 EXAMPLES OF DATABASES FOR GENERIC DATA

No specific databases are recommended for generic data. Admissible data has to respect the system boundaries set in the PCR as well as to meet the requirements of the International EPD System for data quality, representativeness, review and scope of documentation. If specific data or selected generic data that meets the requirements of the International EPD System is not available as the necessary input data, proxy data may be used and documented. The environmental impacts associated to proxy data must not exceed 10% of the overall environmental impact from the product system.

## 4.7.3 DATA QUALITY REQUIREMENTS AND OTHER MODELLING GUIDANCE PER LIFE-CYCLE STAGE

Below are further data quality requirement per life-cycle stage. Exceptions to the requirements may be accepted, if justified in the EPD; such exceptions are subject to the approval by the verifier on a case-to-case basis.

### 4.7.3.1. Upstream processes

- Data referring to processes upstream in a supply chain over which the EPD owner has direct management control shall be specific and collected on site.
- Data referring to processes of a supplier of main parts, packaging, or main auxiliaries should be requested from the supplier as specific data, as well as infrastructure, where relevant.
- Data on 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, should be specific and 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 (see Section 4.7).
- For upstream processes modelled with specific data, generation of electricity used 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 as provided by the electricity supplier.
    2. Residual electricity mix of the electricity supplier on the market.
    3. Residual electricity mix on the market[3].
    4. Electricity consumption mix on the market[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 consumption mix.

  "The market" in the above hierarchy shall be defined as being the (residual or consumption) grid mix of the country where the electricity is used, with exceptions for specified countries for which a sub-national electricity grid mix shall be used: Australia, Brazil, Canada, China, India, and USA.

  The mix of electricity used in upstream processes shall be documented in the EPD, where relevant.
- Packaging: specific data shall be used for production of consumer packaging, if the production is under the direct control of the EPD owner or if the environmental impact of the production is more than 10% of the declared results in any of the environmental performance indicators. In other cases, generic data may be used. When consumer packaging shows the

[3] The composition of the residual grid mixes on the market are available for all EU countries and a few additional European countries through the Association for Issuing Bodies (AIB) at https://www.aib-net.org/facts/european-residual-mix.

[4] For electricity markets without trade of Guarantees of Origin (or similar), the residual mix will, however, be identical to the consumption mix.

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organization's logo, the LCA report should report the exerted/non-exerted direct control on the production of consumer packaging by the organization.

#### 4.7.3.2. Core processes

- 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.
- Goods: 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.
- Services: Specific data shall be used for the consumption of materials, chemicals, steam, heat, electricity, etc., necessary for execution of the service
- For electricity used in the core processes, generation of electricity used 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 as provided by the electricity supplier.
    2. Residual electricity mix of the electricity supplier on the market.
    3. Residual electricity mix on the market[5].
    4. Electricity consumption mix on the market[6]. This option shall not be used for electricity used in processes over which the manufacturer (EPD owner) has direct control, as long as the composition of the residual grid mix has been publicly disclosed[7].

  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 consumption mix.

  "The market" in the above hierarchy shall be defined as being the (residual or consumption) grid mix of the country where the electricity is used, with exceptions for specified countries for which a sub-national electricity grid mix shall be used: Australia, Brazil, Canada, China, India, and USA.

  The mix of electricity used in the core processes shall be documented in the EPD, where relevant.
- Waste treatment processes of manufacturing waste should be based on specific data, if available.

#### 4.7.3.3. Downstream processes

The following requirements apply to the downstream processes:

- Use phase:

Modelling of the use phase consists of quantifying emissions (to air and water) from managed soils, due to fertiliser application.

The definition of a primary dataset according to the Tier 3 approach proposed by IPCC (2019) shall be prioritised. Annex 1A summarises the methodology required for such an approach.

If this approach is not possible because there is no experimental test data, it is possible to use the revised approach provided in the following sections.

[5] The composition of the residual grid mixes on the market are available for all EU countries and a few additional European countries through the Association for Issuing Bodies (AIB) at https://www.aib-net.org/facts/european-residual-mix.

[6] For electricity markets without trade of Guarantees of Origin (or similar), the residual mix will, however, be identical to the consumption mix.

[7] If the composition of the residual grid mix has not been publicly disclosed, the second or third options in the above hierarchy are not feasible and thus the fourth option is the only remaining option (if the first option is not chosen).

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4.7.3.4. $NH_3$ and NO emissions

If no site or region-specific data are available, ammonia volatilized shall be estimated using the latest IPCC emission factors available[8].

| FERTILISERS TYPE | EMISSION FACTOR FOR $NH_3$ | EMISSION FACTOR FOR NO | TOTAL N VOLATILISED [$Frac_{GASF}$] |
|---|---|---|---|
| Ammonium nitrate (AN) | 0.030 | 0.029 | 0.059 |
| Anhydrous ammonia (AA) | 0.029 | 0.001 | 0.03 |
| Diammonium phosphate (DAP) | 0.091 | 0.007 | 0.098 |
| Monoammonium phosphate (MAP) | 0.053 | 0.007 | 0.06 |
| Ammonium sulphate (AS) | 0.095 | 0.007 | 0.102 |
| Calcium ammonium nitrate (CAN) | 0.016 | 0.016 | 0.032 |
| Sodium nitrate | 0.002 | 0.001 | 0.003 |
| Urea | 0.142 | 0.011 | 0.153 |

*Table 1. Total NH3 emissions from cultures due to fertiliser volatilisation: values are kg NH3-N volatilised per kg of N in fertilisers applied, Total NO emissions from cultures due to fertiliser volatilisation: values are kg NO-N volatilised per kg of N in fertilisers applied*

Blended and compound NP/NK/NPK fertilisers based on the fertiliser listed above shall be modelled as the separate contribution of each fertiliser present in the formulation.

For fertilisers not covered in Table 1, the following suggested mix shall be used:

| FERTILISER PRODUCT | FERTILISER MIX |
|---|---|
| Nitrogen solutions | Urea (50%), AN (25%), CAN (25%) |
| Other N straight | AN (50%), CAN (50%) |
| AP | MAP (50%), DAP (50%) |
| Where AN = Ammonium nitrate, CAN = calcium ammonium nitrate, AP = ammonium phosphate, MAP = monoammonium phosphate and DAP = diammonium phosphate. | |

*Table 2. Assumption of the potential mix of different fertilisers products*

4.7.3.5. Direct and indirect emissions of $N_2O$

If no site or region-specific data are available, $N_2O$ direct and indirect emissions shall be estimated using the Tier 2 methodology provided by IPCC (2019).

$$N_2O_{Total} = \left(N_2O_{Direct} - N + N_2O_{(ATD)} - N + N_2O_{(L)} - N\right) \times 44/28$$

$$N_2O_{Direct} - N = F_{SN} \times EF_1$$

$$N_2O_{(ATD)} - N = (F_{SN} \times Frac_{GASF}) \times EF_4$$

$$N_2O_{(L)} - N = \left(F_{SN} \times Frac_{LEACH-(H)}\right) \times EF_5$$

$F_{SN}$ = annual amount of synthetic fertiliser N applied to soils, kg N $yr^{-1}$

$EF_1$ = emission factor for $N_2O$ emissions from N inputs, kg $N_2O$–N (kg N input)$^{-1}$

$Frac_{GASF}$ = fraction of synthetic fertiliser N that volatilises as $NH_3$ and $NO_x$, kg N volatilised (kg of N applied)-1

$EF_4$ = emission factor for N2O emissions from atmospheric deposition of N on soils and water surfaces, [kg N–$N_2O$ (kg $NH_3$–N + $NO_x$–N volatilised)-1]

$Frac_{LEACH-(H)}$ = fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff, kg N (kg of N additions)$^{-1}$[9]

[8] Table 7A.3 in Chapter 11 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

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$EF_5$ = emission factor for N2O emissions from N leaching and runoff, kg N2O–N (kg N leached and runoff)$^{-1}$ [9]

| FACTOR | EMISSION FACTOR FOR $N_2O$ |
|---|---|
| $EF_1$ for N additions from synthetic fertilisers, organic amendments and crop residues, and N mineralised from mineral soil as a result of loss of soil carbon [kg N2O–N (kg N)$^{-1}$] | 0.010 |
| $EF_4$ [N volatilisation and re-deposition], kg N2O–N (kg NH3–N + NOx–N volatilised)$^{-1}$ | 0.010 |
| $EF_5$ [leaching/runoff], kg N2O–N (kg N leaching/runoff)$^{-1}$ | 0.011 |
| $Frac_{GASF}$ [Volatilisation from synthetic fertiliser], (kg NH3–N + NOx–N) (kg N applied)$^{-1}$ | See Tables 1 and 2 |
| $Frac_{LEACH-(H)}$ [N losses by leaching/runoff in wet climates], kg N (kg N additions or deposition by grazing animals)$^{-1}$ | 0.24 |

*Table 3. Parameters for direct and indirect emissions of $N_2O$*

4.7.3.6. 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 fertilisers applied | 0.24 |

*Table 4. Total $NO_3$- emissions due to leaching and runoff. Values are kg $NO_3^-$-N emitted per kg of N in fertilisers applied*

4.7.3.7. $CO_2$ direct emissions from liming and urea distribution on field

It is important to avoid a double count between the $CO_2$ emissions removed during urea production and those emitted during field distribution.

4.7.3.8. Emission of phosphorus

If no site or region-specific data are available, phosphorus emissions shall be estimated using the emission factor based on Cordell et al (2009) and Cordell et al (2011), namely: 0.33 kg of P emitted to water per each kg of P based fertilisers applied.

- The transport of the product to the customer shall be described in the EPD, where relevant, and be accounted for in this priority:
  1. Actual transportation modes and distances to a specific customer or market, representing the geographical scope of the EPD.
  2. A weighted average of transportation modes and distances, based on transportation to several customers or markets, representing the geographical scope of the EPD.
- 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 in the LCA report.

## 4.7.4 DATA QUALITY DECLARATION

EPDs may include a declaration of the quality of data used in the LCA calculations.

[9] Table 11.3 in Chapter 11 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories

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## 4.8 ENVIRONMENTAL PERFORMANCE INDICATORS

The EPD shall declare the default environmental performance indicators and their methods as described at the website (www.environdec.com/indicators), which includes both inventory indicators and indicators of potential environmental impact. The source and version of the impact assessment methods and characterisations factors used shall be reported in the EPD. Also other indicators may be declared, if justified, see Section 5.4.5.

If the default list of environmental performance indicators and methods at the www.environdec.com/indicators is updated, the previous version of the list is valid in parallel to the new version during a transition period of at least 90 days, as described at the website.

Apart from inventory indicators (such as the required and optional inventory indicators listed at www.environdec.com/indicators), other inventory data may also be declared in the EPD, if relevant and useful for EPD users. Such data shall not be declared in the main body of the EPD, but in an annex.

## 4.9 INCLUDING MULTIPLE PRODUCTS IN THE SAME EPD

### 4.9.1 MULTIPLE PRODUCTS FROM THE SAME COMPANY

Several sets of results, reflecting different products, are not allowed to be declared in the same EPD. However, similar products from a single or several manufacturing sites covered by the same PCR and manufactured by the same company with the same major steps in the core processes may be grouped and thereby included in the same EPD. For such an EPD, there are three options:

- For each indicator, declare the average results of the included products. This average shall be weighted according to the production volumes of the included products, if relevant. In this option, the average content shall be declared in the content declaration.
- Declare the results of one of the included products – a representative product. The choice of the representative product shall be justified in the EPD, using, where applicable, statistical parameters. For example, the choice may be based on production volumes. In this option, the content of the representative product shall be declared in the content declaration.
- For each indicator, declare the highest result of the included products (i.e., the results of a “worst-case product”, which may be the results of one or several of the included products). In this option, the content declaration shall include the lowest amounts of recycled and biogenic content of the included products and their packaging, respectively, and the information on environmental and hazardous properties of substances shall reflect the highest share and most hazardous such substances contained in the any of the included products.

The first two options are only possible if none of the declared environmental impact indicator results differ by more than 10% between any of the included products. The third option is possible also if variations are larger than 10%.

The option chosen shall be clearly described in the EPD.

### 4.9.2 SECTOR EPDS

The International EPD System allows for an industry association to develop an EPD in the form of a Sector EPD. A Sector EPD declares the average product of multiple companies in a clearly defined sector in a clearly defined geographical area. Products covered in a sector EPD shall follow the same PCR and the same declared/functional unit shall be applied.

Any communication of the results from a Sector EPD should contain the information that the results are based on averages obtained from the sector as defined in the EPD. The communication shall not claim that the sector EPD results are representative for a certain manufacturer or its product.

The following information shall also be included in a Sector EPD:

- 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.

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# 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 at www.environdec.com.

The EPD content shall:

- be in line with the requirements and guidelines in ISO 14020 (Environmental labels and declarations – General principles),
- be verifiable, accurate, relevant and not misleading, and
- not include rating, judgements or direct comparison with other products[10].

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

The content of EPDs published in machine-readable format shall correspond with the content of the underlying EPD.

## 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, also subject to the verification process.

## 5.2 UNITS AND QUANTITIES

The following requirements apply for units and quantities:

- The International System of Units (SI units) shall be used where available, 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.
  - Results of the environmental performance indicators shall be expressed in the units prescribed by the impact assessment methods, e.g. kg $CO_2$ equivalents.
- Three significant figures[11] should be adopted for all results. The number of significant digits shall be appropriate and consistent.
- Scientific notation may be used, e.g. 1.2E+2 for 120, or 1.2E-2 for 0.012.
- 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.

[10] Therefore, results of normalization are not allowed to be reported in the EPD.

[11] 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 $1.2*10^{-2}$.

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- The result tables shall:
  - Only contain values or the letters “ND” (Not Declared). It is not possible to specify ND for mandatory indicators. ND shall only be used for voluntary parameters that are not quantified because no data is available.[12]
  - Contain no blank cells, hyphens, less than or greater than signs or letters (except “ND”).
  - 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 shall 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)
- References (see Section 5.4.9)

The following sections may be included:

- Additional environmental information (see Section 5.4.6)
- Additional social and economic information (see Section 5.4.7)

The following sections shall be included, if relevant:

- 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[13]

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

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- 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."*
- A statement of conformity with ISO 14025.
- For EPDs covering multiple products: a statement that the EPD covers multiple products and a list of all products covered by the EPD.
- For Sector EPDs: a statement that the EPD is a Sector EPD.

In the case of EPDs registered through a regional hub (a regional or national programme based on and fully aligned with the International EPD System through an agreement with the programme operator), "Programme", "Programme operator", and "Logotype" shall be expanded to include a reference to the regional programme and the organisation responsible for it.

Where applicable, the cover page shall also include the following information:

- Information about dual registration of EPD in another programme, such as registration number and logotype.
- A statement of conformity with other standards and methodological guidelines.

### 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 statement on the requirements for comparability of EPDs, adapted from ISO 14025: *"EPDs within the same product category but from different programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison."*
- A statement that the EPD owner has the sole ownership, liability and responsibility of the EPD
- Information about verification[14] and the PCR in a table with the following format and contents:

| **Accountabilities for PCR, LCA and independent, third-party verification** |
|---|
| **Product Category Rules (PCR)** |
| 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>* |
| **Life cycle assessment (LCA)** |
| LCA accountability: *<name, organization>* |

[13] 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.

[14] 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.

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| **Third-party verification** |
|---|
| Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:<br><br>☐ EPD verification by individual verifier<br><br>Third-party verifier: *<name, organisation, and signature of the third-party verifier>*<br><br>Approved by: The International EPD System |
| **OR** |
| Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:<br><br>☐ EPD verification by accredited certification body<br><br>Third-party verification: *<name, organisation>* is an approved certification body accountable for the third-party verification<br><br>The certification body is accredited by: *<name of accreditation body & accreditation number, where applicable>* |
| **OR** |
| Independent third-party verification of the declaration and data, according to ISO 14025:2006 via:<br><br>☐ EPD verification by EPD Process Certification*<br><br>Internal auditor: *<name, organisation>*<br><br>Third-party verification: *<name, organisation>* is an approved certification body accountable for third-party verification<br><br>Third-party verifier is accredited by: *<name of accreditation body & accreditation number, where applicable>*<br><br>*For EPD Process Certification, an accredited certification body certifies and reviews the management process and verifies EPDs published on a regular basis. For details about third-party verification procedure of the EPDs, see GPI v4, Section 7.5. |
| Procedure for follow-up of data during EPD validity involves third-party verifier[15]:<br><br>☐ Yes ☐ No |

## 5.4.3 PRODUCT INFORMATION

The product information section of the EPD shall include:

- address and contact information of the 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),

[15] Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period (see Sections 7.3.2 and 7.4.9 of the GPI). The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update (see Section 6.5 of the GPI) is identified, the EPD shall be re-verified by a verifier.

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- 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),
  - Classification of Products by Activity (NACE/CPA),
  - Australian and New Zealand Standard Industrial Classification (ANZSIC), or
  - Global Trade Item Number (GTIN).
- a description of the product,
- a description of the technical purpose of the product, including its application/intended use,
- a description of the background system, including the main technological aspects,
- for EPDs covering multiple products: a description of the selection of products/sites, a list of contributing manufacturers (if Sector EPD), etc. (see Section 4.9),
- 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,
- declared/functional unit,
- reference service life (RSL) and/or technical/actual lifespan, if relevant,
- 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, and
- references to any relevant websites for more information or explanatory materials.
- Fertiliser produced by the company shall be described as follows:

For Fertilisers all the mandatory parameters considered in the national legislation for Organo-Mineral Fertilisers (OMF) must be considered. If a national legislation is not available you must refer to the Italian Legislative Decree 75/2010.

Furthermore, the following parameters shall be declared:

- Formulation matrix
- Total Organic Carbon standard TOC %
- Humus acid standard (C HA+FA)
- Humus rate (HR)
- For fertilisers with polymers all the mandatory parameters considered in the national legislation must be considered. If a national legislation is not available you must refer to the Italian Legislative Decree 75/2010.

Also the Agronomic Efficiency Index (AEI), and the Uptake Index (UI) may be indicated if specific test is possible (see Section 5.4.3.1 and 5.4.3.1). Any claims made about the product shall be verifiable.

This section may also include:

- name and contact information of organisation carrying out the underlying LCA study,
- any additional information about the underlying LCA-based information, such as cut-off rules, data quality, allocation methods, and other methodological choices and assumptions,

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- a description of the material properties of the product with a declaration of relevant physical or chemical product properties, such as density, etc., and
- if end-of-life treatment is not included, the EPD shall contain a statement that it shall not be used for communicating environmental information to consumers/end users of the product.

5.4.3.1. Agronomic Efficiency Index (AEI)

The AEI expresses the increase of the production of useful dry substance for each given Fertilizing Unit (FU). The AEI is used to evaluate the efficiency of the fertilization of the ground/plant system in order to define the right input of nutrients for the specific ground/plant system. AEI is calculated as follows:

$$AEI = (yield\ nC - yield\ 0C)/nFU$$

where:

nC = yields obtained in fertilized parcels

0C = yields obtained in unfertilized parcels

nFU = applied Fertilizing Units

5.4.3.2. Uptake Index (UI)

The Uptake Index constitutes the easiest methodology to face the evaluation of the nutritive capacities of a fertiliser. It is based on the calculation of the plant uptakes, for the specific nutrient, with relation to what is established in the unfertilized witness.

UI is calculated as follows:

UI = [nutrient element up-taken from the cultivation in the fertilized option (kg/ha) – nutrient element ep-taken from the cultivation in the unfertilized option (kg/ha)]/nutrient unit (kg/ha) * 100.

The AEI and UI indexes will have to be determined for at least two or three herbaceous cultivations through the methodologies included in Annex 1. Such tests must be carried out by bodies and with personnel who is expert in the agriculture experimentation field.

In accordance with the fertiliser technical characteristics, that often influence the use, the scattering modalities (localized or at full field) and the possible split modalities in the administration (for instance for in-door fertilization) shall be declared. For UI an average value must be declared while for AEI the values of each single shall be declared.

The UI index shall be determined for nitrogen (N), phosphorus ($P_2O_5$) and potassium (K2O) when present.

If the EPD includes more than one formulation of the same kind of fertiliser (refer to paragraph 10), the IE average index will be the same and shall be calculated according to the above mentioned tests. Such tests can be carried out with one or more formulations, declared in the EPD, and will be representative of all the declared formulations. Relevant information such as specific manufacturing processes beneficial from the environmental point of view can be described. Self-declared environmental claims about environmental performance of the product shall not be declared within the EPD document. In applicable cases information about the concentration of the product shall be included

## 5.4.4 CONTENT DECLARATION

The content declaration section shall declare the weight of one unit of product, as purchased, and contain information about the content of the product in the form of a list of materials and chemical substances including information on their environmental and hazardous properties. The gross weight of each material/substance shall be declared, including a minimum of 99% of the materials/substances in one unit of product.

The content declaration does not apply to proprietary materials and substances covered by exclusive legal rights including patent and trademarks. In general, an indication that a product is “free” of a specific hazardous material or substance should be done with caution and only when relevant, following the rules in ISO 14021 on self-declared environmental claims.

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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),[16] issued by the 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); and
- 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, Section 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, Section 2.2.7).

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 weight of the packaging per product, and the type and function of the 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

Below subsections list the mandatory environmental performance indicators to declare in the EPD. LCA results based on additional indicators may be declared, if they are relevant for the product category, their inclusion is justified in the EPD, appropriate methods[17] are used, and the results are verifiable. If the additional indicators appear to the reader to display duplicate information, the EPD shall contain an explanation of the differences between the declared indicators.

#### 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, impact assessments methods and characterisation factors available at www.environdec.com/indicators. The source and version of the impact assessment methods and characterisation factors used shall be reported in the EPD.

Alternative regional life cycle impact assessment methods and characterisation factors may be calculated and displayed in addition to the default list. If so, the EPD shall contain an explanation of the differences between the declared sets of indicators, as they may appear to the reader to display duplicate information.

[16] The GHS document is available at www.unece.org.

[17] If any of the following impact categories are declared in the EPD, the corresponding characterisation methods listed in EN 15804 should be used: particulate matter emissions, ionizing radiation (human health), eco-toxicity (freshwater), human toxicity (cancer effects), human toxicity (non-cancer effects) and land use related impacts/soil quality. If these impact categories and characterisation methods are used, the corresponding disclaimers listed in EN 15804 shall be declared in the EPD.

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#### 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 stage 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 may declare the optional indicators for waste production and output flows as listed at www.environdec.com/indicators per declared unit, per life-cycle stage and in aggregated form.

### 5.4.6 ADDITIONAL ENVIRONMENTAL INFORMATION

Additional environmental information is voluntary.

An EPD may declare additional environmentally relevant information, in addition to the LCA results of the section on environmental performance results.

Any additional environmental information declared shall be substantiated and verifiable, and be derived using appropriate methods and be specific, accurate, not misleading, and relevant to the specific product. Quantitative information is preferred over qualitative information.

### 5.4.7 ADDITIONAL SOCIAL AND ECONOMIC INFORMATION

The EPD may also include other relevant social and economic information as additional and voluntary information. This may be product information or a description of an organisation's overall work on social or economic sustainability, such as activities related to supply chain management or social responsibility.

Any additional social and economic information declared shall be substantiated and verifiable, and be derived using appropriate methods and be specific, accurate, not misleading, and relevant to the specific product. Quantitative information is preferred over qualitative information.

### 5.4.8 DIFFERENCES VERSUS PREVIOUS VERSIONS

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

- a description of the differences versus previously published versions, and
- a revision date on the cover page.

### 5.4.9 REFERENCES

A reference section shall be included, including a list of all sources referred to in the EPD, including the GPI (including version number), and PCR (registration number, name, and version) used to develop the EPD.

### 5.4.10 EXECUTIVE SUMMARY IN ENGLISH

The executive summary, if included (see Section 5.1), shall contain relevant summarised information related to the programme, product, environmental performance, information related to pre-certified EPDs, and information related to sector EPDs. Besides this, further information may be added such as additional environmental, social or economic information, references as well as differences versus previous EPD versions.

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# 6 LIST OF ABBREVIATIONS

| | |
|---|---|
| ANZSIC | Australian and New Zealand Standard Industrial Classification |
| CPC | Central product classification |
| CPV | Common procurement vocabulary |
| EPD | Environmental product declaration |
| GPI | General Programme Instructions |
| GTIN | Global trade item number |
| ISO | International Organization for Standardization |
| LCA | Life cycle assessment |
| LCI | Life cycle inventory |
| NACE/CPA | Classification of products by activity |
| ND | Not declared |
| PCR | Product category rules |
| REACH | Restriction of chemicals |
| RSL | Reference service life |
| SI | The International System of Units |
| UN | United Nations |
| UNSPSC | United Nations standard products and services code |

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# 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.

CEN (2019) EN 15804:2012+A2:2019, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

EPD International (2021) General Programme Instructions for the International EPD System. Version 4.0, dated 2021-03-29. 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 (2014) ISO 14046:2014, Environmental management – Water footprint – Principles, requirements and guidelines.

ISO (2015a) ISO 14001:2015, Environmental management systems – Requirements with guidance for use.

ISO (2015b) ISO 9001:2015, Quality management systems – Requirements.

ISO (2016a) ISO 21067-1:2016, Packaging – Vocabulary – Part 1: General terms.

ISO (2016b) ISO 14021:2016, Environmental labels and declarations - Self-declared environmental claim (Type II environmental labelling).

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

ISO (2018a) ISO 14024:2018, Environmental labels and declaration – Type I environmental labelling – Principles and procedures.

ISO (2018b) ISO/TS 14067:2018, Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification and communication.

Effect of different organic matrices on the flow of N, P, K in the soil-plant system, Coppola E., 1993.

Organo-mineral fertilisers for corn, Tassan Mazzocco G., Contin M. 2000.

Life Cycle Assessment (LCA) of different fertiliser product types, K.Hasler, S.Broring, S.W.F.Omta, H.-W.Olfs, 2015.

Life Cycle Assessment of organic and mineral fertilisers in a crop sequence of cauliflower and tomato, R. Quiros, G.Villalba, X. Gabarrell, P.Munoz, 2015.

Melone e pomodoro da industria: efficienza della concimazione con Organo Minerali liquidi, P.P.Pasotti, M. Pelliconi, V.Tisselli, S. Tagliavini, 2017 Colture Protette N° 4 aprile 2017

Nitrogen uptake by crops soil distribution and recovery of urea-N in a sorghum whit rotation in different soils under Mediterranean conditions di P. Nannipieri et al., Plant and soil, 208: 43-56, 1999).

Cordell D, Drangert J-O & White S (2009). The story of phosphorus: global food security and food for thought. Global Environmental Change 19: 292-305.

Cordell D, Rosemarin A, Schröder JJ & Smit AL (2011). Towards global phosphorus security: A systems framework for phosphorus recovery and reuse options. Chemosphere, 84: 747-758.

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# 8 VERSION HISTORY OF PCR

## VERSION 1.0, 2010-12-10

Original document replacing the expired PCR 2006:08 Fertilisers.

## VERSION 2013-07-23

- Update of UN CPC classification to version 2.0 (UN CPC 3461, 3462, 3463, 3464 & 3465)
- Minor editorial changes
- Use of the PCR template

## VERSION 2.0, 2016-01-11

- Compliance with to the PCR Basic module UN CPC 34, Basic Chemicals version 2.0 dated 2013-10-24
- Compliance with to the General Programme Instructions, Version 2.5.
- Use of the latest template

## VERSION 2.1, 2019-01-30

- Updated in accordance with GPI 3.0 and new PCR basic module.

## VERSION 2.11, 2019-09-06

- Clarified terms of use
- Editorial changes

## VERSION 3.0, 2020-06-02

- Compliance with to the PCR Basic module UN CPC 34, Basic Chemicals version 3.02.
- Compliance with to the General Programme Instructions, Version 3.01.
- Editorial changes
- Added some references

## VERSION 3.0.1, 2022-04-06

- Editorial changes in Sections 5.4.5.1 to 5.4.5.3, to clarify the indicator list at www.environdec.com applies also for the indicators of resource use, waste production and other output flows.

## VERSION 3.0.2, 2023-09-06

- Editorial changes in Sections 5.4.5.2 and 5.4.5.3 and updated E-mail address of the PCR Moderator in Section 2.1.

## VERSION 4.0.0, 2024-XX-XX

- Compliance with to the General Programme Instructions, Version 4.0
- Changes in 4.7.3.3 Downstream for use stage
- Changes in 5.4.3 Product information.

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# 9 ANNEX 1A

The experimental scheme for full field tests shall comply with the requirements set by IPCC for Tier 3 methodology for assessing emissions from managed soils such as Chapter 11 " N2O Emissions from Managed Soils, and CO2 Emissions from Lime and Urea Application" of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Tier 3 inventories are advanced systems using measurements and/or modelling, with the goal of improving the estimation of greenhouse gas (GHG) emissions and removals, beyond what is possible with Tier 1 or 2 methods.

Inventories can be based on direct measurements from which emissions and removals of carbon are estimated. Purely measurement-based inventories, e.g., based on repeated measurements using a national forest inventory or similar estimation methods can produce carbon stock change estimates but still rely on appropriate statistical models, such as allometric models or volume and wood density functions. Inventories using measurement-based methods also need to select appropriate statistical sampling estimators to produce an inventory from the plot estimates. Moreover, inventory plot remeasurements will typically require additional data or methods to arrive at estimates of GHG emissions from disturbance events, in particular for non-CO2 GHG.

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# 10 ANNEX 1B

## INDEXES, INDICATORS AND PARAMETERS

The development of indexes is particularly elaborated, as long experimentations are necessary as much as a quite high number of replies to get results which may be statistically reliable and, as a consequence, generalizable. In full field the experimentations should be carried out for a period not lesser than three cultivation cycles, thus to assure the conditioning of the experimental parcels.

Nevertheless, such an exigency is often in contrast to the general schemes of the agronomic tests that, most o times, do not foresee the mono-cultivation and insert the fertilizing tests, for cultivations with yearly cycle, in more generalized contests of multi-yearly rotations. In such a case, it I necessary that the fertilizing plan, object of the evaluation, is in any case homogeneous for the whole examined rotation.

Nevertheless, the necessity of an experimentation activity that is prolonged in several years might be overcome if some precautions are respected during the planning of the unbalancing agronomic test of the fertility conditions. In fact, if during the preparatory phase we use exigent cultivations from a nutritional point of view (generally cereals, better if well-watered), just to level and reduce the differences of residual fertility of the ground, the multi-yearly bond of the experimentation may be duly reduced to two years (for details see Annex 1A).

## AGRONOMIC EFFICIENCY

The term “efficiency” related to the vegetable production, is defined, in the easiest meaning, as the “quantity of useful dry substance (commercial production) got from each nutrient unit that is given or from each nutrient unit that is assimilated” (Coppola, 1993; Buondonno et al., 1994, 1997; Coppola et al., 1997).

The concept of efficiency has been differently used to characterize the relations that link the contribution of nutrients to the productive yield in different situations (full field, checked environment, cultivations under glass) with relation to the specific experimental exigencies or to the different application fields. In the context of full field experimentation, which purpose is to calibrate a ground/fertiliser/plant system for the elaboration of fertilizing models with a high yield and a low environmental impact, first of all it is suitable to take into consideration two different indexes: the Index of Agronomic Efficiency (I.A.E.) and the Uptake Index (U.I.) (Talibudeen, 1974; Craswell and Godwin, 1984; Coppola, 1993; Buondonno et al., 1994, 1997; Coppola et al., 1997).

## AGRONOMIC EFFICIENCY INDEX (A.E.I.)

The Agronomic Efficiency Index (A.E.I.) expresses the increase of the production of useful dry substance for each given Fertilizing Unit (F.U.). The (A.E.I.) allows, in particular, to evaluate the production/economic aspects of the efficiency of ground/plant systems wherein the yield of the cultivation is the consequence of the different use of technical means or of cultivation techniques.

For example, the (A.E.I.) is applied in the comparison amongst fertilizing plans that are different for given doses (in multiples of definitive relations among nutritive elements expressed in kg/ha), for fertiliser typology (mineral, organic-mineral, organic), for administration typology (fractioned, integrated), for cultivation treatments and techniques (improvement of the soil, works, use of phyto-sanitary products and herbicides, irrigation), for characteristics of the vegetable (cultivar, graft holder), or in the comparison among the yields in different pedo-climatic environments, or in the comparison among the yield of different cultivar grown at same conditions.

For the calculation, the comparison must be done among the yields that have been got through the use of fertilized parcels (nC) and through the use of unfertilized parcels (0C), with relation to the nutrient units or, more exactly, to the applied F.U. Fertilizing Units (nF.U.). The F.U. represent, as already remembered, multiples of relations defined among nutritive elements expressed in kg/ha (for example one F.U. got by the relation N: 2P2O5:K2O=1:1,5:2 represents an administration of 100, 150 and 200 kg/ha for N, P2O5 and K2O) and translatable into easy numbers (1, 2, 3).

The A.E.I., according to the expression of Craswell and Godwin, (1984) and subsequently drawn by Coppola (1993), Buondonno and coll. (1997) and by Coppola and coll. (1997) is calculated as follows:

$$A.E.I. = (\text{yield nC} - \text{yield 0C})/\text{nF.U.}$$

The variations of the A.E.I. are related to the increase of the nF.U. (from Craswell and Goodwin, 1984; Coppola, 1993).
The A.E.I. presents a parabolic trend, characterized by initial large positive variations, for small increases of the administrated fertilizing units. In the right experimental conditions, the top point of the curve identifies the *optimum* of the relation between A.E.I. and nF.U.

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Such a type of index represents one of the conceptual basis, together with the calculation of the uptakes, for the drawing up of the fertilizing plans adopted in the production regulations of the single cultivations. Therefore, its adoption is useful to define the efficiency of the fertilizing intervention. Such an efficiency is even underlined by meaningful increases of the productions with which presence the A.E.I. allows to evaluate the increase or decrease of the production marginal growth related to the increase of the fertilizing input.

## UPTAKES OF THE CULTIVATION

In most cases, as for the cereals or for the most common fruit vegetables, only a part of the plant is the real aim of the fertilizing intervention. The other parts of the plant (roots, trunk, leaves) constitute a physiologic framework, which is functional for the production, but they are not quite often object of the production evaluation and represent a residue which weight on uptakes should be evaluated each time.

Nevertheless, a part of such residues and thus of the contained nutrient elements is nor generally removed from the ground (just think of the roots) or is intentionally given back (with planting of the stubbles and, partially, with the burning of the straws and of other cultivation residues).

On the other hand, the administration of a fertiliser to the ground has not the only purpose to increase the quantity of one or more nutritive elements of the ground. In fact, the ground has a considerable quantity of the same elements in more or less available types. Such quantities may be used by the plant in synergy with the other quotas that have been added of fertiliser and determine uptakes that, in the whole, can even overcome the administrated quantities.

The rationality of the fertilizing intervention consists in reaching the balance point that is made of the minimum difference, in quantitative terms, of the input/output, which aim is not to decrease the inherent potential of the ground chemical fertility.

## UPTAKE INDEX (UI)

The uptake index constitutes the easiest methodology to face the evaluation of the nutritive capacities of a fertiliser. It is based on the calculation of the plant uptakes, for the specific nutrient, with relation to what is established in the unfertilized witness.

UI (x) = nutrient element (x) up-taken from the cultivation in the fertilized option (kg/ha) - nutrient element up-taken from the cultivation in the unfertilized option (kg/ha) / nutrient unit (kg/ha) * 100.

For a right calculation, it is necessary to compare the up-takes, referred to the single element, in the plant parts that have been considered as to be taken away from the system, got in fertilized parcels (nC) with those got in unfertilized parcels (0C), with relation to the applied nutrient units.

In most case, during the agronomic tests, of conventional type, there is not the execution of the analysis, about the vegetable composition, in order to evaluate the up-takes as they are excessively expensive. Nevertheless, such information can be got from bibliographic fonts and can be used, mentioning the font, for the up-takes calculation (for example “Plant Analisys – an interpretation manual” – ed. D.J. Reuter and J.B. Robinson – Inkata Press).

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# 11 ANNEX 1C

## DEFINITION OF THE EXPERIMENTAL TESTS

The experimental scheme for full field tests must use a scheme with randomized blocks with a sufficient number of repetitions (3 as a minimum) on cultivable surfaces which are homogeneous as morphology (flat or sub-flat) and as typology of ground profile (with particular reference to the width and to the physical, chemical and physical-chemical characteristics of the superficial and deep horizons) into the limits of the special variability, typical of the area (and in any case verified and declaimed through specific pedological study).

The parcels must have a suitable dimension and able to get enough vegetable material to carry out those samplings that will be useful for the following analysis on the plant and the evaluation of the productions.

In accordance with the fertiliser technical characteristics, that often condition the use, the scattering modalities (localized or at full field) must be declared, as much as the possible fractioning modalities in the administration (for example indoor fertilizing).

In any case, together with the fertilizing test, also the execution of an equivalent number of observations on control parcels (witnesses) wherein no fertilization is applied must be foreseen. Such witnesses represent a irremissibly part of the test itself and are indispensable for the right calculation of the proposed indexes.

It is superfluous to remember that the cultivation actions (irrigation, phytosanitary treatments), even if not completely linked to the test purpose, must be as homogeneous as possible on the enquiry area.

In any case, it is necessary to avoid the placement of the single replies and, as a consequence, of the tested areas, in the external strips of the used surface (thus close to the longitudinal ditching or of the transversal heads of the cultivated surfaces).

In fact, these strips are subject to strong variations of the ground conditions, due to the draining effects of the drains, to the major compression due to the frequent crossing of the farming vehicles and, not least, due to the different administration of fertilisers, phytosanitary products and irrigation water as an effect of the difficult operative conditions of the single farming vehicles.

Generally, these indications are respected during the agronomic tests correctly carried out (under such an aspect it is preferable to carry out these tests by bodies and personnel with a long experience and practice in the field of the farming experimentation).

Nevertheless, it is better to point out the necessity of having a preconditioning of the surface to be used for the experimentation, thus to get the most possible homogeneous fertility levels, intrinsic to the soil. In fact, generally such tests are carried out on surfaces appointed to such a use in the agronomic experimentation bodies where the adoption of plans of differentiation of the answer for the use of technical means are a repeated practise and soon strongly penalized for the conditions of homogeneity of the experimental surfaces.

Such an aim can be reached in making the test, object of the evaluation, precede by cultivations with highly impoverishing yearly cycle. As an alternative, the fertilizing conditions which have been prepared for the test must be repeated for various years (three at least) and the evaluation must be led at the end of the tesJust as an example here following are the information got for the characterization of the soil used for the experimental test carried out on corn cultivation for the triennium 1991-1993 (Coppola, 1993).

*“The described pedon can be ascribed to the order fo the Entisols, with profile type A-C.*

*The particular water system, with temporary hydro-morphism due to the resilient of the aquifer during the winter period (Buondonn et al. 1987), together with the climatic characteristics of the territory, define the taxonomic level of the big group “Xerofluvent”. The high presence of deep cracking of the surface (confirmed by the identification of clay terms of expandable type) also specifies the classification at a level of subgroup “Vertic Xerofluvent”.*

*The lithological substrate is made of alluvial and Holocene sediments, with the presence of pyroclastics and secondary limestones, alternated by pumice lapillus and swamp residues (Buondonno and Violante, 1987).*

*Therefore, the classification “Vertic Xerofluvent, mesic, mixed, calcareous”.*

*The average structure of the Ap horizon is loamy-clay. The reaction level is neutral-sub-alkaline. The total contents of organic carbon and of nitrogen are into the limits of the sufficiency. On the contrary, the heterogeneous composition of the matrix determines a high availability of potassium, meanwhile associated to a limited mobility of the phosphorus.*

*The waters used for watering, got at different deepness of the aquifer, are strongly salted, with prevalence of Na+ ions. Nevertheless, because of the presence of free carbonate and of their buffer action on the reaction of alkaline hydrolysis of the sodic salts, the value of the soil pH is within the limit of the physiologic alkalinity.”*

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FERTILISERS
PRODUCT CATEGORY CLASSIFICATION: UN CPC 3461, 3462, 3463, 3464 & 3465

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