



Proposed position paper on the definition of “Bio-Based Fertiliser”

This is work in progress, not yet validated, the objective being to find consensus across industry, research and other stakeholders.

V 8/1/24

Preliminary comments	1
“Fertiliser” or “Fertilising Product”	1
Definition of nutrient	1
Context	2
EU definitions of bio-based products	2
CEN and other standards.....	2
The term “nutrients of solely biological origin” as used in the EU FPR.....	3
Translations of “Bio-Based”.....	6
Points for discussion – currently different points of view expressed	3
Consideration of chemicals used in processing	3
“Bio-Based” or “Partly Bio-Based”.....	4
Non-processed biological materials	4
Operational proposals	5
Proposed examples:	7

Preliminary comments

“Fertiliser” or “Fertilising Product”

This document does not address the question of whether products should be termed “Bio-Based Fertiliser” or “Bio-Based Fertilising Product”, nor whether these two terms should mean two different things.

We note nonetheless that the EU FPR (EU Fertilising Products Regulation 2019/1009) de facto makes this distinction and provides a definition: products of PFC1 are “Fertilisers”, products under other PFCs (2-6) are not. All products (PFCs 1-6, including “Fertilisers”) are “Fertilising Products”.

Definition of nutrient

This document addresses Bio-Based Fertiliser and Bio-Based Nutrients (and not for example, organic carbon as such).

Logically, this requires defining a “nutrient”.

ESPP notes that the EU Fertilising Product Regulation (FPR) is fundamentally based on the term “Nutrient” but does not include a definition for it. This regulation defines a “Fertilising product” as having the “purpose of providing the plants or mushrooms with nutrient or improving their nutrient efficiency” (Art. 2, Definitions, point 1). This Regulation also does not define what is “nutrient efficiency”.

However, the FPR does in effect specify a limited list of recognised nutrients, in that it defines a Macronutrient fertiliser (cf. PFC1(C)(I)(a)(ii) as providing “**primary macronutrients: nitrogen (N), phosphorus (P) or potassium (K), secondary macronutrients: calcium (Ca), magnesium (Mg), sodium (Na) or sulphur (S)**” and a Micronutrient fertiliser (PFC1(C)(II)) as providing “**boron (B), cobalt (Co), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo) or zinc (Zn)**”.

The FPR also implicitly indicates that **organic carbon is not considered to be a nutrient** by the wording of PFC1(B): “one or more materials containing: organic carbon (C org); and nutrients - of solely biological origin.”

We also note that the International Standardisation Organisation (ISO) has a wider definition of Plant Nutrient: “**substance that is essential or beneficial for plant growth**” (ISO 8157:2022 Fertilizers, soil conditioners and beneficial substances — Vocabulary). This definition could be construed to include CO₂, water ...

Context

We suggest that the definition of “*Bio-Based Fertiliser*” is important for market transparency, and note that a comparable discussion is ongoing on “*nutrients of solely biological origin*” in the EU FPR (EU Fertilising Products Regulation 2019/1009, PFC definitions of Organic Fertiliser, Organo-Mineral Fertiliser, Organic Soil Improver).

The term Bio-Based Fertiliser (“BBF”) is already being used in R&D publications (see e.g. Wester-Larsen et al. Lex4Bio [2022](#)), and also in the Work Programmes of the EU Horizon R&D programmes (e.g. [Horizon Europe WP – Cluster 6](#) page 536 of 595)

The recent European Communication on the use of the term “Bio-Based Plastic” and the existence of a CEN standard “Bio-based products: vocabulary” show the importance of agreeing such definitions for industry, stakeholders and regulators.

We consider that the definition and usage of the terms “*Bio-Based Fertiliser*” and “*nutrient of solely biological origin*” are important for market clarity (product communication to users and consumers), and for a possible future European Standard on defining and measuring “Bio-Based nutrient” content (nutrients of “biological origin”) to support environmental claims and EU Fertilising Products Regulation certification.

The objective of this position paper is to achieve consensus on a proposed definition to submit for consideration by the European Commission and by CEN.

EU definitions of bio-based products

The European Commission (DG GROW) “Bio-based products” [web page](#) gives this informal definition: “*Bio-based products are wholly or partly derived from materials of biological origin, excluding materials embedded in geological formations and/or fossilised. ... they are derived from renewable raw materials such as plants ...*”.

The same paragraph also refers to use of “*enzymes are used ... using fermentation and bio-catalysis in processing ... instead of traditional chemical synthesis*”. It is not specified whether this is only ‘illustrative’ or whether it is intended to suggest that chemicals cannot be used in the production of a bio-based product.

The European Commission has also published a Communication ([COM\(2022\)682](#), 30th November 2022) on the use of the term “Bio-Based Plastic” which can be seen as relevant for the term “Bio-Based Fertiliser”. The Communication refers to the CEN/TC4111 definition of Bio-Based which indicates that Bio-Based plastics are made from biomass, with a preference for organic wastes and by-products, whereas conventional plastics are made from fossil resources. The Communication notes that Bio-Based Plastics can be made fully or partly from biobased feedstock, but underlines that generic claims such as “biobased” may be banned by the Green Deal proposed directive “[Empowering Consumers for the Green Transition](#)”, unless underpinned by recognised environmental performance, and therefore that the exact and measurable share of biobased content should be specified (in a Bio-Based Plastic).

CEN and other standards

The CEN European Standard [EN 16575 \(August 2014\)](#) “**Bio-based products: vocabulary**” defines (2.1, 2.5) a bio-based product as “*Wholly or partly derived from biomass. May have undergone physical, chemical or biological treatment*” and (2.4) bio-based content as “*fraction of a product that is derived from biomass. Normally expressed as a percentage of the total mass of the product*”. Biomass is defined (2.7) as “*material of biological origin excluding material embedded in geological formations and/or fossilised*”.

CEN has outlined the methodology for quantifying the bio-based content of products in [CEN/TR 16721](#). This takes as starting point the % of bio-based carbon, calculated using the C¹⁴ isotopic ratio ([EN 16640](#)). This document notes that the bio-based content may differ significantly from the bio-based carbon content due to presence of bio-based oxygen, hydrogen or nitrogen. In this case, O, H or N are considered to be “bio-based” if chemically bound to bio-based carbon. The report notes that isotopic ratios for O, H, N probably do not enable identification of bio-based content for these elements. This is clarified for bio-based plastics in [EN 16785-1](#) (radiocarbon analysis) and [EN 16785-2](#) (material balance).

Similarly, the methodology defined in the USA ([ASTM D6866-22](#)) is based on the radio-dated carbon ratio, as summarised in the USDA “BioPreferred” programme presentation 2017 [HERE](#).

The term “nutrients of solely biological origin” as used in the EU FPR

The term ‘*nutrients of solely biological origin*’ is used in the EU Fertilising Products Regulation ([FPR](#)), in PFC 1(A) Organic Fertilisers which states §1 “*shall contain: organic carbon (C-org) and nutrients of solely biological origin*” (and similarly for PFC 1(B) Organo-Mineral Fertilisers). The Commission proposed in April 2022 to add the following text to the [FPR FAQ](#) (Frequently Asked Questions = FAQ) guidance document:

“According to the FPR, both the organic fertilisers and organic soil improvers contain only nutrients and organic carbon of biological origin. The same applies to the organic moiety of organo-mineral fertilisers. In those product categories, the notion of ‘biological origin’ is put in contrast to the notions of fossilised materials, mineral materials or nutrients contained in chemically synthesised substances or mixtures. In this respect, materials of biological origin are materials that are contained in, extracted from or produced by living or dead organisms or parts thereof. When it comes to extraction, the material coming from living or dead organisms should not be broken down to single and simple chemical substances where the link with the organism is lost. So, to provide examples: amino acids extracted from seaweeds contain nitrogen (N) of biological origin, whilst this is not the case for amino acids that are chemically synthesised; a metabolite produced by a micro-organism, purified and further chemically or biochemically modified can be considered as nutrient of biological origin.”

However, opinions differed within the Fertilisers Expert Group concerning other examples, showing that there are currently varying and contradictory positions as to what should be considered or not considered to be a nutrient of “biological origin”. This discussion is ongoing and the above text has not yet been integrated, (as such or modified), into the FPR FAQ.

Translations of “Bio-Based”

The following are based on national standards organisations website translations of CEN « Bio-sourced products » and on EU FPR translation of « Fertiliser »

Finnish : Biopohjainen lannoite

[French](#) : Engrais biosourcé

German : Biobasierte Düngemittel

Points for discussion – currently different points of view expressed

Consideration of chemicals used in processing

Relevant Horizon 2020 project participants have suggested that the definition of “Bio-Based fertiliser” (BBF) should consider not only the origin of the nutrients in the final product, but also the chemicals used in processing.

Processing chemicals are not considered in the CEN definitions of bio-based products , except in as much as these chemicals may contribute non bio-based content of the final product.

The EU DG GROW [web page](#) cited above mentions “*enzymes are used ... using fermentation and bio-catalysis in processing ...instead of traditional chemical synthesis*”. It is not specified whether this is illustrative or definitive. It seems however improbable that the intention is to exclude all materials produced by routes other than those cited. We note that the cited routes can also be used with non bio-based raw materials.

We underline that if use of industrial chemicals in processing is excluded, then recovered struvite would not be a BBF (use of industrial magnesium chemicals), nor would recovered ammonium sulphate (use of industrial sulphuric acid), nor would mineral phosphate fertilisers obtained by chemically processing ashes, nor calcined phosphates from sewage sludge incineration ash ...

Some of these products could be allowed if “by-products” were allowed in industrial chemical processing (sulphuric acid is usually an industrial by-product from oil refining, in some cases magnesium materials used in struvite production are magnesium rock processing byproducts). We do not recommend this, because the definition of a “by-product” is interpreted differently in Member States (a material can be a by-product in one

MS, a waste in another, a product in a third) and depends on market factors (today's by-product can become tomorrow's product if market demand changes).

Also, a complete 100% exclusion of industrial chemicals is not feasible: it would be necessary to define rules specifying which industrial chemicals are nonetheless allowed in processing, at what levels. For example, the EU FPRP allows certain chemical additives up to specified maximum input % in CMCCs 3-5 (composts and digestates).

Most importantly, this is contrary to the CEN definitions (recognised international standard). These are based on the origin, and industrial processing is allowed. For example, many bio-based plastics involve extracting a specific molecule from a plant (e.g. processing castor oil to polyester ...).

“Bio-Based” or “Partly Bio-Based”

We suggest that if <80% of nutrients in a material are bio-based, then the term “Partly Bio-Based” should be used. The number 80% is an initial suggestion, this could be higher or lower.

Otherwise, for example, if Haber Bosch nitric acid is used to recover ammonia stripped from digestate, then the resulting ammonium nitrate solution (in which 50% of the N is bio-sourced, 50% synthetic) would be not distinguished from 100% bio-sourced nitrogen in an organic fertiliser produced by drying manure: both would be considered “Bio-Based”. Or if rock-derived phosphoric acid were reacted with sewage sludge incineration ash (acidulation), resulting in a product in which 75% of the P was rock-derived, this would still be “Bio-Based”.

It seems to be generally agreed that the term “Partly Bio-Based” should apply to mixtures and blends (combining bio-sourced and synthetic nutrient products). In this case, it is difficult to see why it should not also apply if there is a chemical reaction? It would be also problematic to implement such a distinction: how to clearly distinguish between the two cases: mixtures/blends versus chemicals used in processing. What if nitric acid is used for ammonia stripping but in excess (say 25% more N in the final product from the nitric acid than from ammonium): is this considered a mixture (“Partly Bio-Based”) or is it a reaction (“Bio-Based”)?

Non-processed biological materials

It is questioned whether a non-processed biological material can be termed a “Bio-Based Fertiliser”.

The logic of this is to exclude unprocessed materials, such as raw manure.

The difficulty would be to define what is processed and what is not. Dried manure (drying could involve simply leaving in the sun ...)? Separately collected urine - is the separation a process? Granulation? Liquid/solid separation? What if there is a process, but its intention is not to produce a fertiliser, for example ashes or food industry wastes?

We note that the EU Fertilising Products Regulation does not exclude unprocessed materials to be CE-marked, subject to fitting both CMC and PFC criteria. This is applicable to minerals (e.g. phosphate rock) but, for bio-based materials, given the constraints of the CMC and PFC criteria, is probably only applicable to plant parts.

Operational proposals

1. This position paper discusses the **definition of the term “Bio-Based” as concerning nutrients only**, and as used in “Bio-Based fertiliser” or “Bio-Based fertilising product” or “Bio-Based nutrient” etc. This position paper does not discuss the definition of “Fertiliser”. We note that the term “fertiliser” is defined in the EU Fertilising Products Regulation [2019/1009](#) by the criteria for PFC1, but that Member States may have different definitions for National Fertilisers.

This paper does not discuss the definition of “Bio-Based” for NON-nutrient “fertilising products” because (a) this is outside ESPP’s competence, (b) the Fertilising Products Regulation refers specifically to organic carbon and nutrients of “solely biological origin” (c) carbon materials are already covered by existing CEN and other standards (carbon radio-dating) and (d) widening to other materials would further complexity. The logic developed for nutrients may also be applicable to other materials, such as liming elements.

2. In this document, **“Organic Carbon” (C_{org}) is defined as in the EU Fertilising Products Regulation PFC1(A) §1** (exclusion of “material which is fossilized or embedded in geological formations”) and Annex III, part II §4(a) (chelating agents, urea, etc. are not concerned).
3. The general principle should be that a “Bio-Based fertiliser” is defined as a fertiliser in which organic carbon (C_{org}) and nutrients are **“solely of biological origin”**, as defined in the EU Fertilising Products Regulation PFCs 1(A) and 1(B). However, this should be applicable only to relevant nutrients/organic carbon, with the possibility to also define “Partly Bio-Based fertilisers” (see below).
4. **“Of biological origin”** should be defined as is “Bio-based” in [CEN 16575 \(August 2014\)](#): “*derived from biomass ... excluding material embedded in geological formations and/or fossilised ... May have undergone physical, chemical or biological treatment*”. It should be clarified that this includes derived from municipal wastewater, food industry processing wastewaters, etc., which are mainly of biological origin but also include some non-biological inputs (e.g. phosphates in cleaning products or phosphate food additives), but not purely industrial wastewaters (e.g. phosphates recovered from metal processing or microchip etching).
5. In coherence with the European Commission Communication ([COM\(2022\)682](#)), the priority should be Bio-Based Fertilisers derived **from organic wastes and by-products**.
6. A fertiliser in which only part of the organic carbon AND/OR only part of the nutrients are of biological origin (as defined above) should be defined as a **“Partly Bio-Based fertiliser”**. That is, a fertiliser should only be termed “Bio-Based fertiliser” if the totality of both its relevant nutrients / organic carbon (see below) are of biological origin.
7. **A minimum level of bio-based nutrients should be specified**, below which the term “Bio-Based” or “Partly Bio-Based fertiliser” should not be used. This minimum should apply **ONLY** to the nutrient content (not including organic carbon). This minimum could be 5%? 20% ?.
8. A **tolerance** should be defined: if the organic carbon and/or the nutrients of NON biological origin are < X%, then the term “Bio-Based” remains applicable. Outside this tolerance, the material should be termed **“Partly Bio-Based”**. We suggest that this tolerance (X) could be 5% ? 20 %.
9. For defining the “Bio-Based content”, we suggest to follow [EN 16575 \(August 2014\)](#) (2.4) “*fraction of a product that is derived from biomass. Normally expressed as a percentage of the total mass of the product*”. As above, the fraction coming from municipal and similar wastewaters should be considered to be totally derived from biomass.
10. **Calculation of the “Bio-Based” % in “Partly Bio-Based fertilisers”**.
We propose that:
 - where a material is termed “inorganic fertiliser” or “mineral fertiliser”, this calculation should address the total mass of all nutrients present in the product and declared on the label (N, P, K, Ca, Mg, S, micronutrients).
 - where the material is termed “organic” or “organo-mineral” fertiliser, this calculation should apply to the total mass of these (declared) nutrients plus to the mass of C_{org}.Should not be considered non-nutrient elements such as Si, Na.
The calculation method should follow [EN 16575](#) modified as follows: the mass of O and H (but NOT N) are considered to be “Bio-Based” if chemically bound to a bio-based nutrient.



11. We suggest that where only one or two of the nutrient elements in a fertiliser are “Bio-Based” it should be acceptable to **indicate “Bio-Based” for these elements only**, subject to the points above concerning minimum bio-based content and the use of the term “Partly Bio-Based” for each concerned nutrient.
12. As noted in CEN/TR 16721, **isotopic radio-dating cannot generally be used to identify nutrients of “biological origin”** because, e.g., P and K in plants or animals may come from uptake of mineral fertilisers (directly or indirectly) or from mineral animal feed additives, and atmospheric N is “fixed” into fertilisers both by plants and by chemical synthesis.
13. We note that, according to the C¹⁴ methodology for quantifying the bio-based content of products proposed under [CEN/TR 16721](#), a plastic manufactured from CO₂ captured from organic waste incineration would be identified as “Bio-Based” (a plastic manufactured from CO₂ captured from a coal-burning plant would not). By analogy, We suggest that P in phosphoric acid extracted from organic waste incineration ash should also be considered to be “Bio-Based”. Similarly for the N in ammonium sulphate recovered by stripping/scrubbing of manure digestate. We thus propose that **an INORGANIC nutrient chemical can be “Bio-Based”**, so also an Inorganic Fertiliser (EU FPR PFC 1(C)), or indeed a “Mineral Fertiliser” (as defined in the EU FPR Annex III, part II §4(a), that is C_{-org} < 1%).
14. We note that this requires **clarification of interpretation of the wording of the EU FPR PFCs 1(A) and 1(B)** where it is stated “*An Organic Fertiliser shall contain: organic carbon (c.org) and nutrients of solely biological origin. An Organic Fertiliser may contain peat, leonardite and lignite, but no other material which is fossilized or embedded in geological formations*”. Phosphorus recovered from biomass or manure may partly or mostly originate from phosphate rock (uptake of mineral fertilisers by plants), so is initially of fossil origin before having moved through the biological cycle.
15. We therefore consider that the **CEN/TR 16721 proposed method (binding to bio-based carbon) for assessing bio-based content is not appropriate for nutrients** because bio-based nutrients are often not bound to carbon (e.g. recovered phosphoric acid, ammonium nitrate ...) and in some cases are not bound to O, H or N (elemental sulphur ...).
16. **P₄ (white phosphorus)** is not as such a “nutrient” and recovered P₄ is not expected to be used in fertiliser, animal feed or human food & beverage additive production (these can be supplied by purified wet-acid route P). However, by extension of the above, ESPP suggests that P₄ recovered from sewage sludge, bone meal ash or other organic materials could be termed “Bio-Based chemical”.
17. We suggest that if the above principles are adopted then **detailed guidance on terminology and labelling should be developed**, including examples, possibly via a CEN standard or a European Commission Communication.

Project under discussion

Proposed examples:

NOTE: in all cases, the term “Fertiliser” as defined in the EU Fertilising Products Regulation (FPR) is only application if the criteria of this regulation are met (input materials, contaminants, minimum nutrient content, etc ...). For example, ammonium sulphate solution from digestate stripping would only be “Fertiliser” under the EU FPR if concentration is sufficient to achieve PFC1(C) minimum nutrient contents.

<p>Struvite recovered from sewage or from other biological streams (food processing, digestate, manure ...)</p> <p>And similarly for vivianite, calcium phosphate, etc, subject to these being classified as “fertilisers”</p>	<p>Partly Bio-Based fertiliser.</p> <p>Because the P and N are bio-based, but much of the Mg is not.</p> <p>If generated by dosing magnesium which is derived from mineral sources (product or by-product from magnesium rock processing, by-product from salt (NaCl) production), the bio-based content would be the mass of the P and N (from sewage) and bound O, H over the total mass (molecular weight of NH_4PO_4) / (molecular weight of NH_4MgPO_4).</p> <p>The water of crystallisation ($6\text{H}_2\text{O}$) is discounted.</p> <p>Product communication could also state “100% bio-based P and N”.</p> <p>“Bio-Based phosphorus fertiliser” would however be misleading, as this would suggest that the whole fertiliser is Bio-Based which is not the case.</p> <p>The bio-based fraction could be higher if part of the magnesium in the final product comes from magnesium in sewage sludge, not for dosed magnesium. In this case, the total bio-based fraction could be above the ‘tolerance’ suggested above in which case the product could be termed “Bio-Based”</p>
<p>Ammonium sulphate stripped from digestate</p>	<p>Partly Bio-Based fertiliser</p> <p>(if nutrient concentration is sufficient to qualify as a fertiliser)</p> <p>Because the N is bio-based but the S is not.</p> <p>If the stripping process uses sulphuric acid which is an oil refinery by-product, then the bio-based content would be the mass of the N and bound O, H over the total mass: (molecular weight of $(\text{NH}_4)_2$) / (molecular weight of $(\text{NH}_4)_2\text{SO}_4$).</p> <p>If the sulphur is recovered from biogas desulphurisation, however, then the SO_2 would be included in the bio-based content calculation.</p> <p>Water content is discounted.</p> <p>Product communication could also state “100% bio-based N”</p>
<p>P₄ recovered from sewage sludge or other ash</p>	<p>Bio-Based chemical</p> <p>100% bio-based content</p>
<p>Phosphoric acid recovered from sewage sludge incineration ash</p>	<p>Bio-Based chemical</p> <p>100% bio-based content: as per EN 16675 the mass of O and H are considered to be “Bio-Based” if chemically bound to a bio-based nutrient.</p>
<p>Triple super phosphate derived from recovered phosphoric acid</p>	<p>Partly Bio-Based fertiliser</p> <p>If produced by reaction of the recovered phosphoric acid (100% bio-based, as above) with mineral rock derived calcium, the bio-based content would be the mass of the P (recovered) and bound O, H over the total mass : (molecular weight of H_2PO_4) / (molecular weight of $\text{Ca}(\text{H}_2\text{PO}_4)$)</p> <p>Product communication could also state “100% bio-based P”</p>
<p>Compost with added synthetic mineral fertiliser</p>	<p>If the % of nutrients coming from the compost is above the minimum proposed above: “Partly “Bio-Based fertiliser”. If the % of nutrients coming from the compost is below the minimum proposed above (with the remainder coming from the synthetic fertiliser), then NOT “Bio-Based” (despite the C_{org} may be 100% bio-based)</p>
<p>Manure biochar.</p>	<p>Bio-Based fertiliser.</p> <p>(if nutrient content and availability are sufficient to qualify as a fertiliser)</p> <p>Both organic carbon and nutrients are 100% bio-based.</p>