Proposed ESPP position paper on the definition of "Bio-Based Fertiliser"

Context

ESPP suggests that the definition of "*Bio-Based Fertiliser*" is important for market transparency, and notes that a comparable discussion is ongoing on "*nutrients of solely biological origin*" in the EU FPR (EU Fertilising Products Regulation 2019/1009). The term Bio-Based Fertiliser ("BBF") is already being used in R&D publications (see e.g. Wester-Larsen et al. Lex4Bio 2022). 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.

ESPP considers 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. ESPP therefore proposes a Position Paper, which is open to comments and input from industry and stakeholders. The objective is to achieve consensus on a proposed definition to submit for consideration by the European Commission and by CEN.

EU Communication on "Bio-Based Plastic"

The European Commission has published a Communication (COM(222)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 standard "Bio-based products: vocabulary"

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 C^{14} isotopic ratio. 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.

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) 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 positions as to what should be considered or not 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.

ESPP draft Position Paper

1. This position paper discusses the **definition of the term "Bio-Based" as concerning nutrients**, 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". ESPP notes that the term "fertiliser" is defined in the EU Fertilising Products Regulation 2009/1009 by the criteria for PFC1, but that Member States may have different definitions for National Fertilisers.
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*".
5. In coherence with the European Commission Communication (COM(222)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 **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". ESPP suggests that this tolerance (X) could be <5%.
8. For defining the "Bio-Based content", ESPP suggests 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*".
9. **Calculation of the "Bio-Based" % in "Partly Bio-Based fertilisers". fertilisers.**
   ESPP proposes that:
   - where a material is termed "inorganic fertiliser" or "mineral fertiliser, this 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 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.
   As in EN 16575, mass of O and H (but NOT N) are considered to be "Bio-Based" if chemically bound to a bio-based nutrient.
10. ESPP suggests 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**.
11. 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.
12. ESPP notes that, according to the C^{14} methodology for quantifying the bio-based content of products proposed under CEN/TR 16721, a plastic manufactured from CO_2 captured from organic waste incineration would be identified as "Bio-Based" (a plastic manufactured from CO_2 captured from a coal-burning plant would not). By analogy, ESPP suggests 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. **ESPP's thus proposes 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%).
13. ESPP notes 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.

14. ESPP therefore considers 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 …).
15. **P_4 (white phosphorus)** is not as such a "nutrient" and recovered P_4 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 P_4 recovered from sewage sludge, bone meal ash or other organic materials could be termed "Bio-Based chemical".
16. ESPP suggests 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.

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.

Struvite recovered from sewage And similarly for vivianite, calcium phosphate, etc, subject to these being classified as "fertilisers"	**Partly Bio-Based fertiliser**. If generated by dosing magnesium which is a by-product of magnesium rock processing and sodium hydroxide, 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). The water of crystallisation ($6H_2O$) is discounted. Product communication could also state "100% bio-based P and N". "Bio-Based phosphorus fertiliser" would however be misleading, as this would suggest that the whole fertiliser is Bio-Based which is not the case. 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.
Ammonium sulphate stripped from digestate	**Partly Bio-Based fertiliser** (if nutrient concentration is sufficient to qualify as a fertiliser) 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 $(NH_4)2$) / (molecular weight of $(NH_4)2SO_4$). Water content is discounted. Product communication could also state "100% bio-based N"
P_4 recovered from sewage sludge or other ash	**Bio-Based chemical** 100% bio-based content
Phosphoric acid recovered from sewage sludge incineration ash	**Bio-Based chemical** 100% bio-based content
Triple super phosphate derived from recovered phosphoric acid	**Partly Bio-Based fertiliser** 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 $Ca(H_2PO_4)$) Product communication could also state "100% bio-based P"
Compost with added synthetic mineral fertiliser	NOT "Bio-Based fertiliser" because the nutrient content will be principally not bio-based (despite the C_{-org} may be 100% bio-based)
Manure biochar.	**Bio-Based fertiliser.** (if nutrient content and availability are sufficient to qualify as a fertiliser) Both organic carbon and nutrients are 100% bio-based.

Language versions

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

Frenchs : Engrais biosourcé

German : Biobasierte Düngemittel