Applying consequential life cycle assessment to evaluate whether bio-based fertilisers would yield environmental benefits

B-Ferst

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Fertiberia, Universidad de León, Novamont, aqualia, FKuR, AgriSat, vito, AgFutura, Arcadia, ICONS, IUNG, BBI JU, Bio-based Industries Consortium, Horizon 2020 European Union Funding for Research & Innovation

This project has received funding from the Bio Based Industries Joint Undertaking (JU) under grant agreement No 837583. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio Based Industries Consortium.

Objective

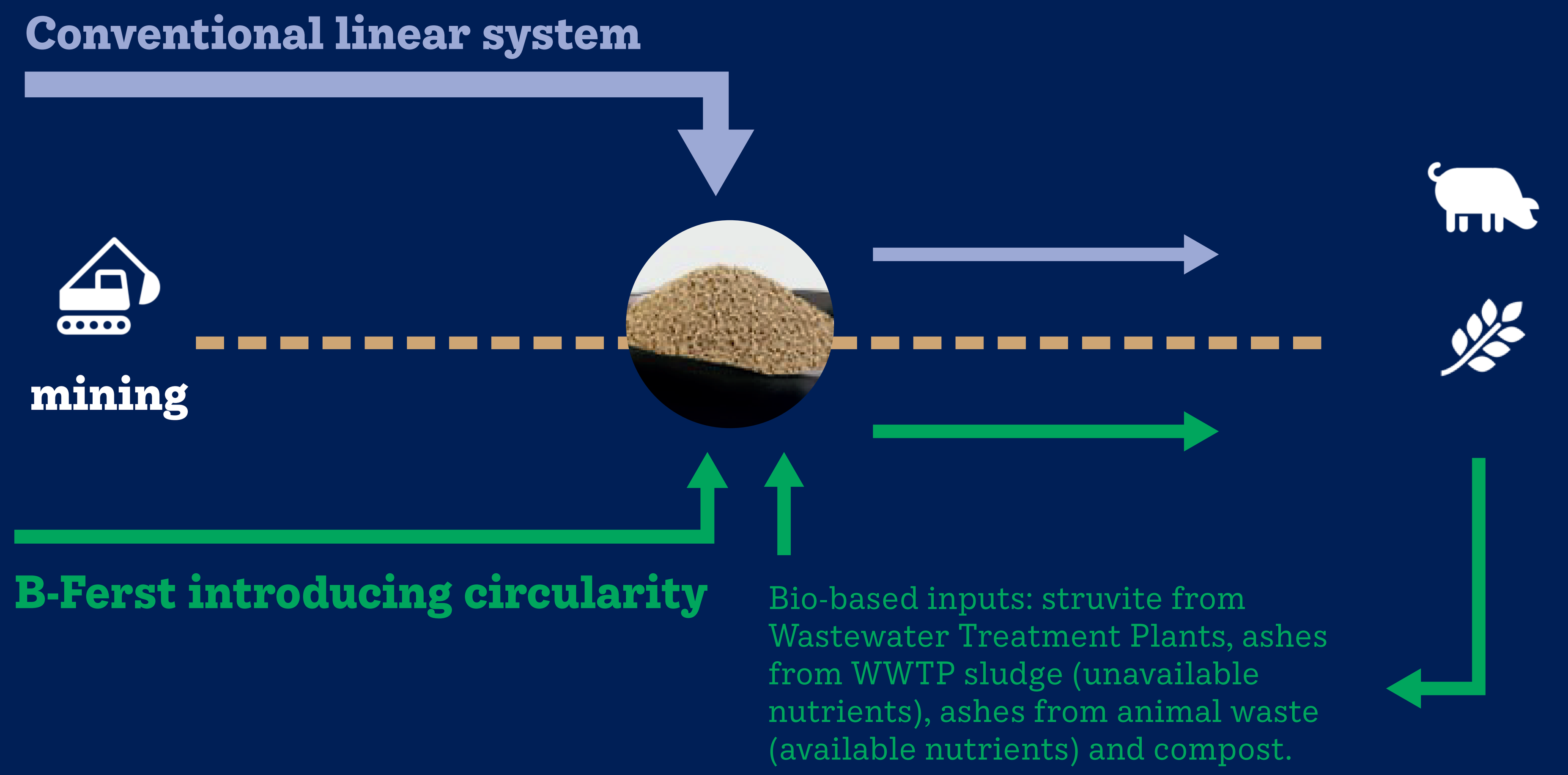
Compare the environmental footprint of bio-based fertilisers developed within B-Ferst to the environmental footprint of conventional fertilisers, from cradle-to-gate using consequential life cycle assessment

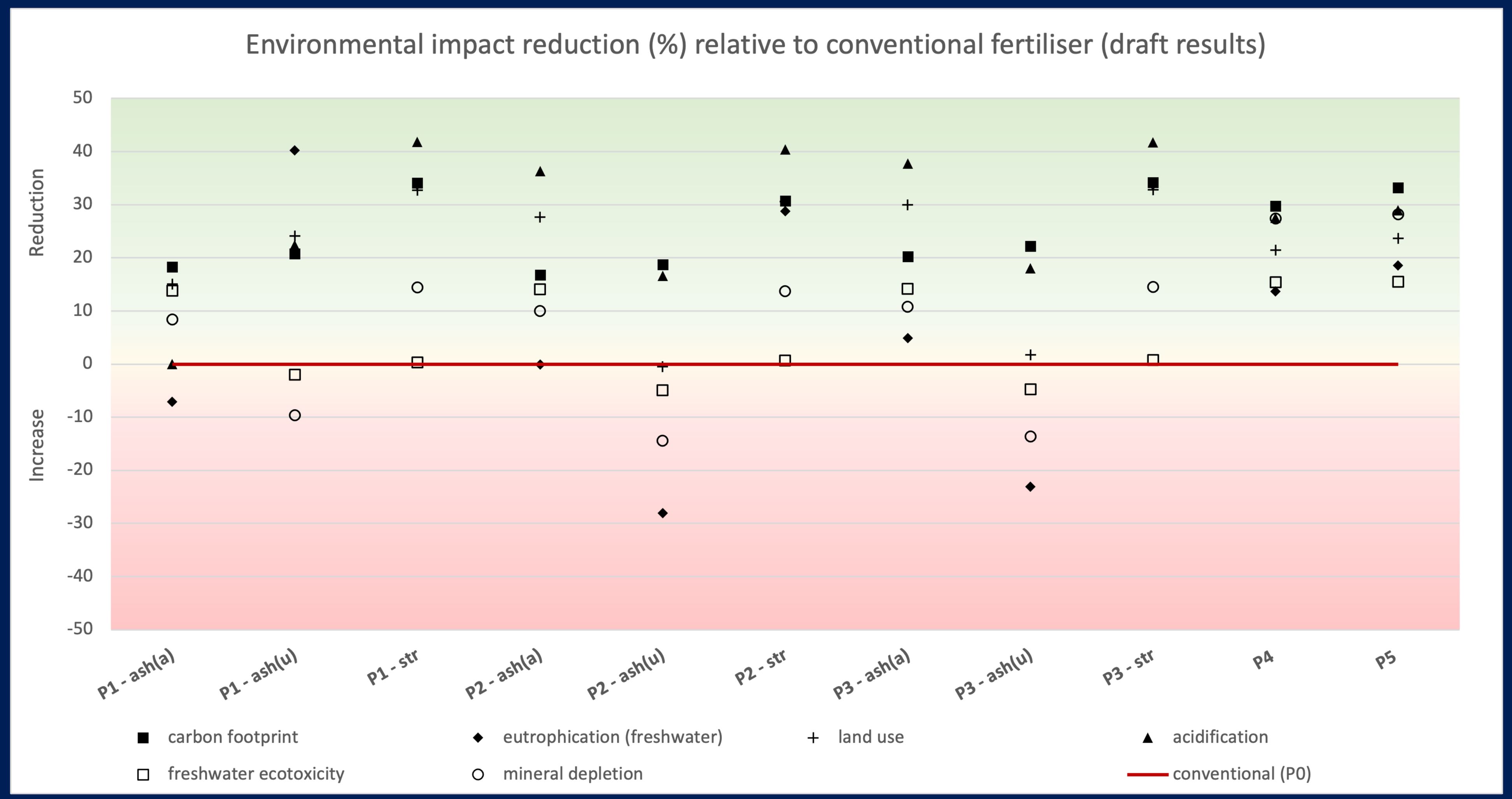
Draft results

- Carbon footprint reduction of bio-based fertilisers ranges from ca. 15% to 35%, depending on type of fertiliser and bio-based input.
- Fertilisers with bio-based input 'ashes with available nutrients - ash(a)' show the smallest reduction – the market is constrained and their use leads to a shift to inorganic sources, while this is not the case for bio-based fertilisers using ashes with unavailable nutrients – ash(u).
- Fertilisers using struvite or compost as a bio-based inputs generally yield the highest benefits.

Next steps

- Include demo plant data
- Include field trial results
- Investigate additional fertiliser types
- Uncertainty analysis
- Integrate availability and logistic aspects of bio-based inputs





P1: bio-based nutrients mineral fertiliser
P2: bio-based nutrients mineral fertiliser with Microbial Plant Biostimulant (MPB) and biodegradable coating
P3: bio-based nutrients mineral fertiliser with Non-Microbial Plant Biostimulant (NMPB)
P4: bio-based organo-mineral fertiliser with MPB and biodegradable coating
P5: bio-based organo-mineral fertiliser with NMPB

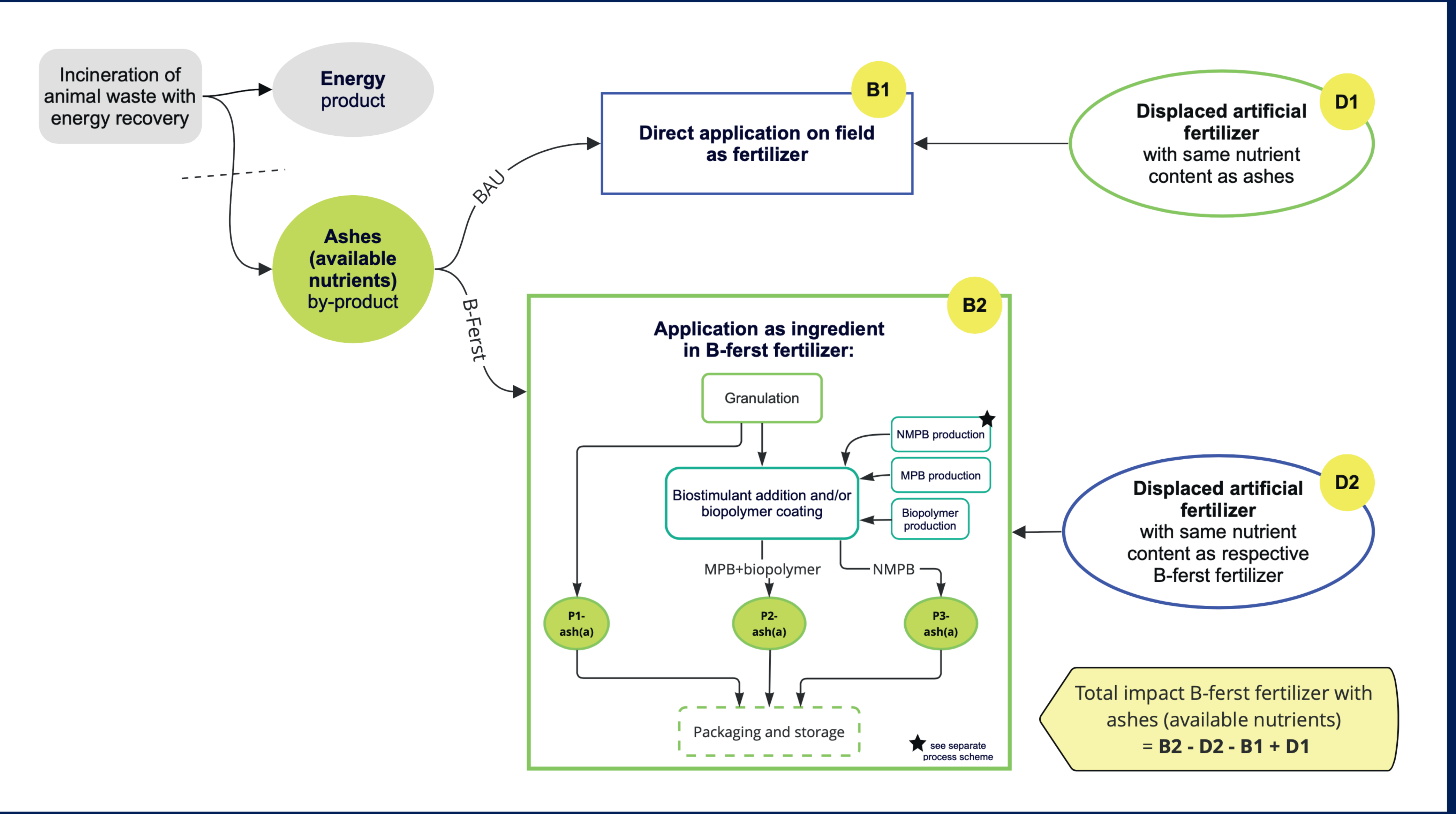
ash(a): ashes with available nutrients
ash(u): ashes with unavailable nutrients
str: struvite
comp: compost

Methodology

Consequential LCA:

- Evaluation of environmental changes due to use of the new fertilisers.
- The use of waste or by-products as raw materials implies that their former use or waste disposal is avoided.
- Data on actual supplier are used in the foreground as long as not constrained; marginal technologies are used in the background system.
- Framework based on van Zanten et al. (2013)

Functional unit: "the production of 1 tonne fertiliser with an NPK ratio of 10-10-10".



Example: applying the consequential approach to the value chain with ashes from animal waste with available nutrients. Business-as-usual (BAU) situation: ashes are applied on the field as a fertilizer (impact B1), displacing an artificial fertilizer with the same nutrient content as the ashes (D1). B-Ferst: ashes used in bio-based fertiliser (impact B2), which displaces an artificial fertiliser (impact D2) and the BAU application, implying the need for substitution there (impact D1).

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