

MetAMINO® Product Carbon Footprint

Methodology for Product Carbon Footprint Assessment



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1 Purpose and Nature of the Claim

This methodology describes the approach used to substantiate a comparative environmental claim concerning the Product Carbon Footprint (PCF) of MetAMINO® (DL-methionine produced by Evonik) relative to a benchmark representing comparable methionine sources from other manufactures.

The methodology supports relative performance comparisons only. It does not claim absolute environmental superiority. The comparative scope, limitations, and assumptions are disclosed in accordance with EU Unfair Commercial Practices Directive (UCPD) transparency requirements.

2 Applicable Standards and Methodological Framework

The assessment is conducted using globally recognized and verifiable standards, ensuring methodological robustness and traceability, including:

- ISO 14040 / ISO 14044
- ISO 14067
- Together for Sustainability (TfS) Product CarbonFootprint Guidelines
- Product Environmental Footprint Category Rules (PEFCR), where applicable

The same methodological framework is applied consistently to Evonik and non Evonik products, ensuring comparability and avoiding methodological bias.

3 Comparative Functional Unit

The comparison is based on the following functional unit:

1 kg of bioavailable methionine
(functional equivalence)

To ensure technically and nutritionally meaningful comparability, methionine derivatives (in particular methionine hydroxy analogue, MHA-FA) are adjusted using a 65% bioefficacy factor relative to DL-methionine. This adjustment is disclosed, scientifically justified, and applied uniformly across the entire benchmark.

This adjustment ensures that products are compared on the amount required to achieve the same nutritional effect, rather than on a simple mass basis.

Clarification: The resulting differences in product carbon footprint are not solely driven by efficacy differences, but also reflect differences in production technology, energy use, and raw material inputs.

4 System Boundary and Relevance

The assessment applies a cradle-to-gate product carbon footprint (PCF) boundary.

This includes:

- Raw material extraction and processing
- Upstream supply chains
- Energy and utility generation
- Manufacturing processes
- Treatment of by-products and waste

This assessment therefore quantifies greenhouse gas emissions associated with the production of methionine sources rather than emissions directly released by the products themselves.

The following life cycle stages are excluded:

- Transport to customers
- Feed formulation
- Downstream use
- Emissions from animal metabolism or digestion
- End-of-life impacts

These exclusions are applied consistently across all products and do not affect the comparative outcome.

5 Data Sources and Transparency

The assessment is based on transparent and traceable data sources, including:

MetAMINO®

- Primary, site-specific production data from Evonik
- Site-specific energy and utility inputs
- Verified emission factors

The Benchmark (excluding Evonik volumes) is derived from publicly available information that is considered relevant for the assessment of greenhouse gas emission:

- Sustainability reports: 2020-2024 from (Adisseo)
- Sustainability report 2024 NHU
- Sustainability report CJ CheilJang 2022
- Financial reports of all competitors
- PCF publication and explanation of contributors from CJ in „Journal of Clean Production“
- Information on power plants (source of fuel), chemical verbund sites (fuel used to generate utilities) relevant for supplying our competitor
- Information on raw materials supply

No confidential competitor data is used. Where primary data is unavailable, conservative and transparent assumptions based on public information are applied.

6 LCA Modelling and Emissions Factors

The life cycle inventory is modelled using recognized life cycle assessment (LCA) software and databases (e.g. GaBi/Sphera). Region specific electricity grid intensities are applied to reflect geographical differences in energy supply. Technology specific emission factors are used where publicly known, while background data is used only where primary data is unavailable. This modelling approach is designed to prevent methodological distortion of comparative results.

7 Allocation Approach

Where processes generate multiple products or by-products, emissions are allocated using economic allocation, based on relative market values.

This approach:

- ✓ Complies with ISO standards
- ✓ Is applied consistently across all modelled producers
- ✓ Avoids speculative allocation outcomes

Substitution or avoided product allocation is not applied, and this methodological decision is disclosed.

8 Applicable Standards and Methodological Framework

All results are reported excluding biogenic carbon (i.e. no uptake or release is credited).

This approach:

- ✓ Reflects current ambiguity in international guidance
- ✓ Avoids inconsistent or selective accounting
- ✓ Is applied uniformly across all compared products

9 Construction of the Industry Benchmark

The benchmark used for comparison is calculated as a volume-weighted average Product Carbon Footprint (PCF) of comparable methionine sources from other manufacturers, based on publicly available information.

The benchmark includes:

- DL-methionine (DLM)
- L-methionine (L-Met)
- Methionine derivatives (in particular MHA)

The underlying dataset represents more than 90% of global methionine production capacity.

Evonik production volumes are expressly excluded from the benchmark calculation.

Accordingly, the comparison represents:

MetAMINO® versus the average of comparable methionine sources from other manufacturers (non-Evonik products).

10 Interpretation and Claim Boundaries

The methodology substantiates statements such as:

“One unit of MetAMINO® has 65% of the carbon footprint of comparable Methionine sources”

Key clarifications:

- The claim refers to a product carbon footprint (PCF) and does not imply that the product itself directly “emits” CO₂.
- The comparison reflects greenhouse gas emissions associated with production, calculated under a cradle-to-gate life cycle approach.
- The benchmark is a volume-weighted average of comparable methionine sources from other manufacturers and excludes Evonik production volumes.
- The comparison is based on bioavailable methionine (functional equivalence) and includes a nutritional efficacy adjustment.

The results should not be interpreted as indication that all methionine sources have identical carbon footprints per kilogram and differ only in required dosage.

Instead, the observed difference reflects a combination of:

- Production process
- Energy sources
- Raw material inputs
- And efficacy-adjusted product requirements

It reflects differences in technology, energy mix, and raw materials — not selective methodology

- Absolute PCF values may differ from product declarations
- Results are subject to data validity and disclosed assumptions

Key clarifications for UCPD compliance:

- The claim is relative, not absolute
- It reflects differences in technology, energy mix, and raw materials — not selective methodology
- Absolute PCF values may differ from product declarations
- Results are subject to data validity and disclosed assumptions

11 Data Validity

Data and assumptions are valid as of February 2026.

Material changes in technology, energy supply, or applicable standards may require reassessment.

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