## SUSTAINABILITY



## Rethinking Sustainability: THE HIDDEN IMPACT OF FEED ADDITIVES

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The Product Environmental Footprint Category Rules (PEFCR) were updated in 2025 to standardize how the feed environmental impact is measured. With this update, the EU framework ensures that sustainability claims are transparent and comparable, giving producers a stronger foundation to communicate the compound feed footprint.

What role do feed additives play in making animal nutrition more sustainable?

A nimal protein production - meat, eggs, and dairy - is a major source of greenhouse gas emissions. As sustainability becomes a key priority, consumer awareness and regulatory pressure are reshaping the agricultural industry. Even as early as 2009, 72% of European consumers supported mandatory carbon footprint labels on food packaging. While sustainability efforts in the agricultural industry are advancing, feed production remains a major contributor to emissions. In swine production alone, it accounts for 46.5% of the total carbon footprint (Yang et al., 2023). This impact largely stems from key ingredients like cereals, oils, and premixes, which vary in their environmental footprint.

The industry is actively addressing this challenge, for example with initiatives like the Code for Green Labelling for Feed. One often-overlooked solution is the use of feed additives, included in small amounts yet capable of delivering significant sustainability gains. When formulated strategically, these additives can reduce emissions, improve resource utilisation efficiency, and enhance overall environmental performance.

## SMALL INCLUSION, LARGE CONTRIBUTION

Feed additives are "products used in animal nutrition for purposes of improving the quality of feed and the quality of food from animal origin, or to improve the animals' performance and health, e.g. providing enhanced digestibility of the feed materials" (European Commission). Unlike classical feed ingredients such as cereals, feed additives are incorporated at very low inclusion levels (generally less than 1%). As a result, the role of feed additives in improving sustainability is often overlooked and multiple studies confirm their importance.

The influence of feed additives on the environmental impact of animal nutrition can be assessed with a life cycle assessment (LCA). LCA is a "pivotal method for evaluating the environmental impacts of a product, process, or service across its entire life cycle" (PRé Sustainability BV). Orffa Additives BV has completed LCAs for several of its feed solution products with expert, independent consultants. These assessments evaluate the impact of feed additives from cradle-to-farm gate, measuring their

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contribution to the total carbon footprint per kilogram of animal live weight. For example, the carbon footprint of Excential Energy Plus, a digestibility promoter enhancing feed efficiency, was found to contribute only 0.02% of the total carbon footprint of the poultry feed. In broiler production, the inclusion of 0.035% of Excential Energy Plus reduced the carbon footprint of meat production by 4.22% and contributed only 0.02% to the carbon balance (Figure 1). Similar results have been observed in swine and turkey production (a 3.27% reduction in fattening pigs with a contribution of 0.05%).

The reduction in the carbon footprint of animal production when supplementing Excential Energy Plus is due to its impact on feed formulation and animal performance. By improving the digestibility of nutrients (fat, protein, and fiber), this feed additive reduces dietary energy by decreasing the incorporation of vegetable oils and animal fats. For example, soybean oil cultivated in Brazil has a high carbon footprint due to its impact on land use change (94% of the total carbon footprint). From a recent meta-analysis, it was shown that the inclusion of Excential Energy Plus can reduce metabolizable energy by 79.4 kcal/kg, resulting in a 1.5% reduction of dietary crude fat (in the form of soybean oil, for example). Additionally, feed additives that improve the feed conversion ratio may enhance sustainability, result-



Figure 1. Carbon footprint per kg of broiler live weight, with or without Excential Energy Plus

ing in less feed consumed and a lower impact from crop cultivation. Similar meta-analyses have shown improved feed efficiency by 4% in broilers and 5% in growing-fattening pigs with Excential Energy Plus.

# HOW TO SELECT A SUSTAINABLE FEED ADDITIVE?

The feed additive market is characterized by a wide variety of products, many with similar characteristics or actions. For example, betaine is available from different origins (natural or chemically produced) and in different types (betaine anhydrous or



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betaine hydrochloride). All betaine sources deliver identical betaine, and the supplemented betaine is metabolized in the same way in the animal's body. This has been proven in two recent trials, performed at independent research laboratories, where different betaine samples were analysed using advanced analytical techniques:

- UHPLC – HRMS (Ultra High-Performance Liquid Chromatography – High Resolution Mass Spectrometry);

- 1D 1H NMR spectroscopy (one Dimensional proton Nuclear Magnetic Resonance).

While the nutritional value of betaine from different origins and types is equal, other product characteristics are important for selecting the most suitable product. LCA is a valuable tool for comparing the environmental contribution of feed additives, but assessments must follow the same methodology (database, software, scope) for valid comparisons.

Orffa conducted an LCA to compare Excential Beta-Key (synthetic betaine hydrochloride) with synthetic anhydrous betaine with regards to the different environmental impact categories per kilogram of feed additive. Excential Beta-Key outperformed anhydrous betaine in all parameters studied, mainly due to a less environmentally damaging production process and a lower footprint of the used raw materials (Figure 2). While all betaine sources



and synthetic anhydrous betaine

provide the same nutritional value, Excential Beta-Key stands out for its lower environmental footprint, making it a more sustainable choice.

#### SUSTAINABILITY IS MORE THAN CARBON FOOTPRINT

As seen in Figure 2, LCAs do not focus solely on carbon footprint but on many other important parameters such as land use. Understanding these factors is essential for assessing sustainability and the role of feed additives in reducing their impacts. Some of these parameters, included in the ReCiPe method for life cycle impact assessment, are:

- **Terrestrial acidification;** refers to deposition of atmospheric acidifying substances (nitric oxide, nitrogen dioxide, ammonia, sulfur dioxide) during animal rearing and feed cultivation. These emissions can lead to soil acidification, negatively impacting ecosystems and plant species.

- Freshwater and marine eutrophication; refers to the enrichment of water bodies with nutrients. Excess nitrogen (in marine environments) and phosphorus (in freshwater) from fertilizers can cause algae growth, depleting oxygen and suffocating aquatic life.

- Land use; refers to the area of land occupied for feed crops and animal rearing. Reducing land use positively affects biodiversity.

> - Land use change; refers to transforming natural land into productive land, such as reclaiming forests for vegetable oil production.

> Orffa, as a pioneer in sustainability, strongly commits to sustainable, environmentally friendly agriculture and integrates all relevant factors to assess the environmental impact of its feed solutions. For instance, Excential Energy Plus demonstrated reductions not only in carbon footprint but also in terrestrial acidification, freshwater eutrophication, and land use (up to -1.4%, -3.9%, and -3.0%, respectively).

#### TAKE HOME MESSAGE: ENVIRONMENTAL IMPACT OF FEED ADDITIVES

Investing in sustainability strengthens the animal nutrition industry, reducing environmental impact while meeting regulatory and market demands. Despite their low inclusion rates, feed additives play a crucial role in reducing environmental impact, by lowering carbon footprint, terrestrial acidification, eutrophication, and land use. Moreover, accurate life cycle assessments are essential for measuring and comparing the true environmental impact of feed additives. Transparency and data-driven communication are key to advancing sustainability in animal nutrition.

In 2023, Orffa was awarded with an Eco-Vadis gold medal, ranking in the top 3% of Best Performing Companies globally. EcoVadis is the world's largest and most trusted provider of business sustainability ratings, creating a global network of more than 100,000 rated companies. EcoVadis is a recognized reference system that aims to encourage and accelerate ethical, social, and environmental performances throughout the supply chain. EcoVadis is supported by "Together for Sustainability", an industry initiative representing the supply chain in chemicals, including the animal nutrition industry, with a total turnover of 600 billion euros. The assessment focuses on several criteria, grouped into four themes: Environment, Labor & Human Rights, Ethics, and Sustainable Procurement.

#### Literature references available on request.

#### About Aurélie Montagnon

Aurélie Montagnon is Global Solution Manager – Feed Efficiency at Orffa Additives BV. She graduated from ISARA, France in 2020, with an engineering master's degree in Agriculture, environment and resources management, with specialty in breeding, nutrition, environment and health.



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