

Advanced feeding strategies for enhanced and circular sustainable livestock and aquaculture production

How do they work?



ALL FARM SPECIES

FEFAC asked in autumn 2022 to its members what they can do to support the European livestock and aquaculture in the transition towards more sustainable production practice. This consultation showed that **animal nutrition has the potential to address many challenges** that may be common to all species or species specific and are applicable to all or some production systems (intensive, extensive, organic, etc.).

The purpose of this factsheet is to provide general information on **how animal nutrition solutions work** to address key priority challenges, broken down in three categories: **environment, animal health and animal welfare**. This factsheet is dedicated to challenges and solutions common to **all species**. Other factsheets are dedicated to challenges that may be more specific to ruminants, monogastrics or fish or to techniques to address common challenges which are more specific to a category of animals.

In addition, a number of **specific techniques, strategies and formulations**, supported by strong scientific evidence have been selected by FEFAC members and **showcased on the FEFAC website**, with detailed information on the conditions of use, the trade-offs, the economic aspects, the regulatory limitations when exist, as well as bibliographic references (mostly meta-analysis) for those who want to learn more.

ENVIRONMENTAL CHALLENGES

Environmental challenges concern both the impact on the environment from **the production of feed materials** and the impact of **feed following its digestion**. The livestock sector is a source of GHG emissions and therefore an important factor to take into account in tackling climate change. LCA science has determined clearly that the majority share of GHG emissions related to animal production lies with how feed materials were cultivated and what their origin is. In particular for soy, when the origin is not secured as not contributing to deforestation, the impacts of 'land use change' are a significant driver of the **carbon footprint**. After the stage of feed digestion, for all animal species the **emissions from ammonia** in manure are a challenge. Through manure excretion, livestock production also has to deal with **nutrient losses**.

The origin of feed materials is also a factor in determining the impacts **on resource depletion** and the competition between food and feed production. The current use of certain minerals, such as phosphorus, depends on sources that are finite as well as highly geographically concentrated. The supposed **use of feed that could have been consumed directly by humans** is a societal and political concern increasingly presenting itself as a challenge that needs to be tackled.

The key environmental challenges identified by FEFAC members where animal feeding strategies can play a role the same way for all species are: i) the use of **low-carbon footprint ingredients**, ii) the assurance of using **deforestation-free soy** and iii) **increased circularity** through feed production.

How can animal feeding strategies help tackle environmental challenges?

As regards identifying the **GHG emissions** related to feed materials production, a key first step is obtaining data. Together with global feed industry partners, FEFAC invested in the development of the **GFLI Database**, which currently contains the most comprehensive information source for datasets on the environmental impacts of the feed materials sourced by compound feed manufacturers.

Securing the **deforestation-free** status of soy is possible through the use of certified responsible soy production. The **FEFAC Soy Sourcing Guidelines** provide a comparison level for producers of responsible soy and thereby facilitate the linking of market supply and demand for this environmental challenge.

Although **the competition between food and feed** consumption for the same resources is a debate that requires a lot of nuances, the feed industry has access to a large variety of **co-products** from food and non-food primary processing and former foodstuffs, which are demonstrably contributing to **closing cycles** and examples of **circular economy practices**.

ANIMAL HEALTH CHALLENGES

Feed is a potential **carrier of hazards** of various nature: microbiological (e.g. Salmonella), chemical (cadmium, mycotoxins, dioxins, etc.) or physical (glass or metal fragments), which can have deleterious effects on animal health. Sick animals need treatment and the **use of antimicrobials in case of bacterial infections**. In addition, suboptimal nutrition and (subclinical) diseases prevent reaching the full genetic potential of animals. Certain physiological stages can translate into health issues, for example, milk fever for dairy cows. And not to forget, the health status of farm animals is a primary factor determining **the quality, safety and wholesomeness of foods** of animal origin for human consumption.

The key animal health challenges identified by FEFAC members where animal feeding strategies can play a role the same way for all species are: i) **feed safety** and ii) **antimicrobial resistance**.

How can animal feeding strategies support animal health?

The first leverage is to **minimize the risk of exposure of animals to hazards**: most of the physical and chemicals hazards are introduced in the feed chain via feed ingredients. It is therefore essential to secure the supply chain from the supplier of feed ingredients to the farm. The feed industry was pioneer in developing **feed safety assurance schemes** in order to intercept hazards at the earliest stage of the chain. This is illustrated by the FEFAC concept of “top-of-the-pyramid”¹ which is the cornerstone of effective feed safety management along the chain.

Microbiological contamination can also find its origin in feed ingredients but may also occur in feed mills and during transport to the farm. Selection of feed ingredients may not be sufficient and a **treatment (chemical or thermal)** at the feed mill is often an effective tool to control the risk of pathogens such as Salmonella.

The other major leverage is **to help animals to cope with pathogens**. This is what is referred to as tertiary prevention by EFSA and EMA in the so-called RONAFA report². The tertiary prevention therefore built on the natural ability of animals to resist stressors, up to a certain level. In particular, the gastrointestinal tract of animals provides a natural defence to avoid the development and activity of deleterious microorganisms and substances. Recent research indicates that **nutrition is interlinked with the animal’s microbiome and gut & immune function**. Animal health & well-being, and as a result animal performance, is therefore always related to a proper balance of those three domains. This new paradigm is often referred to as ‘**eubiosis**’. Animal strategies will consist in using micro-ingredients contributing to enteral stimulation (e.g. dietary fibres), microbiota management (probiotics, organic acids, Medium Chain Fatty Acids, bacteriophages), support of the mucosal barrier function (Short Chain Fatty Acids), immune modulation (plant extracts, essential oils, yeast products, prebiotics, synbiotics, chitosan), etc.

ANIMAL WELFARE CHALLENGES

Freedom from hunger is among the 5 freedoms used to characterised animal welfare. Access to nutritionally balanced and safe feed is therefore among the prerequisites for animal welfare. Beyond that, animals experience stressful situations inherent to their life cycle and the onset of productivity (such as milk, growth and reproduction). These **physiological and metabolic stressors**, which are usually species-specific may affect the welfare of an individual. They may end up in typical (sub)clinical symptoms, usually not related to infectious diseases. Another attempt at animal welfare is with **mutilations** performed for food quality reasons (e.g. castration) or to minimize the risk of injuries (e.g. beak trimming) inherent to group housing.

The key animal welfare challenge identified by FEFAC members where animal feeding strategies can play a role the same way for all species and which can be tackled by the same solution is the **presence of mycotoxins** at low levels in feed.

How can animal feeding strategies support animal welfare?

Maximum limits and guidance values are set for mycotoxins in complete feed at No Observed Adversed Effect Level (NOAEL) in terms of animal health in particular. However, the presence of mycotoxins at low levels may still create some discomfort which may interfere with the animal’s ability to process and absorb nutrients, particularly energy. Certain feed additives help reduce the contamination of feed by mycotoxin, e.g. by preventing the absorption of the mycotoxins from the intestinal tract of the animal by adsorbing the toxins to their surface.

¹ FEFAC (2016). [Vision on feed safety management 2030](#).

² EMA and EFSA (2016). Joint Scientific Opinion on measures to reduce the need to use antimicrobial agents in animal husbandry in the European Union, and the resulting impacts on food safety ([RONAFA](#)).