How animal nutrition can contribute to sustainability

*By **Dr.** Inge Heinzl, Editor, EW Nutrition*

Nowadays, the whole world is talking about sustainability. Many efforts aim to maintain our world for future generations, creating a balance between our current needs and those of our children, grandchildren, and great-grandchildren. The right animal nutrition choices play a crucial role in achieving the challenging aim of sustainable animal production.

Animal nutrition solutions can support producers' sustainability contributions, from animal welfare to antibiotic reduction

Sustainability – an old concept now set out in writing

The idea of sustainability is not new. Already the first humans lived sustainably, taking only as much as they needed and the environment could cope with, using all parts of the animals they killed. The German Hannss Carl von Carlowitz (1645-1714) coined the term sustainability in his oeuvre "Sylvicultura oeconomica" to counter a threatening raw material crisis. Wood was one of the most important raw materials. Besides heating, it was used for shipbuilding and mining. This was the reason that extensive areas in Europe were deforested and became deserted. Observing the impending disaster, von Carlowitz " (1713) stated that only as many trees should be felled as can grow back through planned reforestation, sowing, and planting.

The Brundtland Report (1987), a document created by the World Commission on Environment and Development, is reckoned to be the starting signal for worldwide discussions about sustainability. In 2015, the result of a meeting of 193 members of the United Nations was the Agenda 2030 with 17 sustainable development goals for a "world we want" that should be achieved by 2030.

Sustainable Development Goals (SDG) of the Agenda 2030, fixed by the UN in 2015

How can the feed sector contribute to sustainability?

The animal nutrition industry's sustainability efforts play into different SDGs, notably no. 2, zero hunger, no. 3, good health and well-being, no. 12, responsible consumption and production, no. 13, climate action, no. 14, life below water, and no. 15, life on land. In addition to the overarching goal of fostering higher animal welfare (cf. Keeling et al., 2019), the feed sector's measures center on three areas:

1. Optimal use of feed **resources**, which includes optimizing feed conversion, preserving feed quality, and using alternative ingredients
2. Preserving the **environment** by reducing ammonia and methane emissions and energy requirements
3. Reducing **antibiotics** usage to maintain their efficacy for future generations

1. Make best use of available resources

One of the 17 points on the list of the United Nations is "responsible consumption and production". For the feed industry, this means making the most out of available feed sources. Improvements in feed conversion, the maintenance of feed quality, and the use of alternative ingredients are all part of this.

Optimize FCR to utilize the available feed best

The feed conversion rate shows the amount of feed consumed in relation to the outputs produced, such as weight gain, eggs, or milk. The better or lower the feed conversion rate (FCR), the less feed you need to achieve your target, and the higher the yield. Products that improve feed conversion, therefore, can help to save resources.

Good feed conversion or an optimal utilization of nutrients depends on gut health. Only a healthy gut can digest the feed and absorb the nutrients adequately. Hence, products to improve feed conversion often do so by improving gut health.

Phytomolecules: proven to improve feed conversion

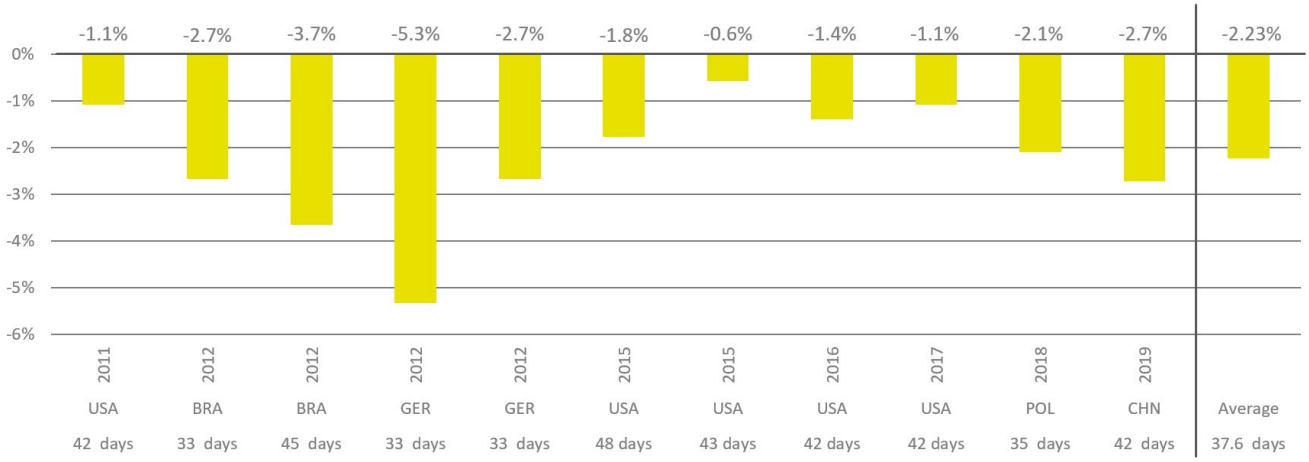
Herbs and their active components have been used in human and veterinary medicine for thousands of years to treat digestive tract diseases. Nowadays, products based on phytomolecules help improve feed conversion through their digestive, anti-inflammatory, and antimicrobial effects on the intestinal tract.

How do these three characteristics contribute to a better FCR?

- Phytomolecules stimulate the secretion of digestive juices and the motility of the gut
- Their antimicrobial effect supports a "healthy" balance in the microbiome, preventing damages of the gut wall by harmful microbes and, therefore, maintaining an optimal nutrient absorption

- Their anti-inflammatory properties also contribute to good nutrient absorption and reduce endogenous nutrient loss

FCR improvements in broilers thanks to ACTIVO found in several studies



As phytomolecules are often volatile, EW Nutrition offers encapsulated phytomolecule-based products for the feed (ACTIVO product line). During episodes of elevated enteric challenge, e.g., weaning or following feed change, a liquid solution (ACTIVO LIQUID) can be applied via the waterline.

Enzymes help to make nutrients available

Some feed materials are hard to digest for certain animals. For example, pigs' digestive systems do not have the enzymes required to break down non-starch polysaccharides (NSPs), such as cellulose, hemicellulose (ß-glucans and xylans), pectins or oligosaccharides. However, pig feed ingredients usually contain these substances.

Besides the non-usability of NSPs, the cage effect is a further problem. Cellulose and hemicellulose, water-insoluble NSPs, encage nutrients such as proteins or digestible carbohydrates. Encaged nutrients cannot be reached by the digestive enzymes and don't become available to the animal.

Xylanases are available on the market to degrade structural substances in the feed and make them, as well as the nutrients they encaged, available for the organism.

Maintain the quality of your feed materials

Another possibility to save resources is the maintenance of feed quality. Bad weather conditions at harvest or incorrect storage can downgrade feed quality due to the development of molds and their mycotoxins or the oxidation of nutrients. Products mitigating the adverse effects of toxins, acidifiers that reduce microbial load, and antioxidants can help to keep your feed quality on a high level – or to re-establish it.

Mitigate the adverse effects of mycotoxins

Feed materials contaminated with mycotoxins harm animals in different manners and should not be used without further treatment. Mycotoxins are not visible – even if no molds are visible, mycotoxins might be present. Additionally, they are pH- and thermo-stable, meaning that mycotoxins produced in the raw materials on the field remain in the finished feed. As mycotoxins often do not cause apparent, specific symptoms but manifest in decreased performance, feed refusal or lower feed intake, and higher disease susceptibility, it is difficult to notice contamination.

Products such as SOLIS or MASTERSORB contain clay minerals (bentonite and montmorillonite) that adsorb the toxins. MASTERSORB GOLD and MASTERSORB FM also include toxin-adsorbing yeast cell walls and herbal substances to help protect the liver.

Feed spoilage through molds, yeasts, and mycotoxins wastes precious resources

Reduce microbes in the feed with acidifiers

Acidifiers based on organic acids counter harmful microbes in the feed in two ways. Most pathogenic bacteria are susceptible to low pH. The proliferation of, e.g., *E. coli*, *Salmonella*, and *Clostridium perfringens* is minimized at pH < 5 (cf. Fuller 1977). Acidic-tolerant beneficial bacteria such as *Lactobacilli* or *Bifidobacterium*, however, survive.

Other than antimicrobial activity, organic acids also cause a significant reduction in ammonia (Eriksen et al., 2014). This finding could be due to a reduction in the microbial deamination of amino acids, which would then be available for absorption, resulting in increased nitrogen digestibility and reduced ammonia excretion, as observed in monogastrics fed organic acids (Pearlin et al., 2020).

The acidifier product lines ACIDOMIX, FORMYCINE, and PRO-STABIL all help protect feed from contamination with pathogenic microorganisms.

Protect the feed's nutrients from oxidation

The oxidation of nutrients in the feed decreases its nutritional value and, thereby, the value of the whole diet. Fat, proteins, fat-soluble vitamins, pigments, and other biologically active molecules, including sugars and phospholipids, can get oxidized. Metal ions and other pro-oxidative factors can affect the ingredients of the feed during mixing, storage, and feeding. The oxidation of fats and fat-soluble vitamins results in color changes or odors and – this is even more serious – in the production of harmful substances such as aldehydes and ketones. An oxidized feed can lead to oxidative stress in the animals, reduce their immunity, productivity, and livability.

To protect valuable ingredients, the timely addition of effective antioxidants such as STABILON is

recommended.

Use alternatives to natural protein sources

Soybeans are an excellent source of protein in animal nutrition. During the last 50 years, soy production has increased from 27 million tons to 269 million tons, causing environmental degradation of forests and savannas (WWF, 2021). The use of alternative protein sources helps protect our environment.

Ruminants partly cover their protein requirements with the help of rumen bacteria. These bacteria can turn nitrogen from urea into bacterial protein, provided they receive enough energy available from carbohydrates. Thanks to its encapsulation, PROTE-N, a feed-grade urea-based nitrogen source, slowly releases nitrogen into the rumen, synchronized with the energy supply. PROTE-N affords producers a degree of independence from soybean protein without compromising nutritional quality.

Reducing soybeans in ruminant feeds helps to lower their environmental impact

2. Preserve the environment

Animal production generates gases such as ammonia and methane that negatively impact the environment. Measures to reduce these gases help to protect plants, animals, us, and our globe.

Reduce ammonia by improving protein digestion

Besides nitrogen oxides, ammonia is one of the primary sources of nitrogen pollution. Ammonia damages ecological systems through acidification and nutritional oversupply. Fast-growing plants that need high amounts of nitrogen or plants that tolerate low soil pH proliferate, whereas more susceptible plants disappear, decreasing biodiversity. According to Max-Planck-Gesellschaft (2017), reducing ammonia emissions by 50 % could prevent 250.000 deaths caused by fine dust worldwide per year.

Improved protein digestion in animals reduces their ammonia production. Decreasing the intestinal pH through using organic acid-based products such as ACIDOMIX or FORMYCINE is essential for the activation and correct functioning of the enzymes responsible for protein digestion.

Reduce methane, the second most abundant greenhouse gas

Together with CO_2, N_2O, and three fluorinated gases, methane belongs to the greenhouse gases listed in the Kyoto protocol. Being over 25 times more potent than carbon dioxide at trapping heat in the atmosphere, it dramatically affects the earth's temperature and the climate system (United States Environmental Protection Agency). Methane is a final product of feed fermentation in the rumen and is produced by methanogenic bacteria. Ruminants can produce 250-500 L methane per day (Johnson & Johnson, 1995).

Reducing methane production in ruminants is a critical step towards climate protection. Herbal substances can change the microbiome, leading to improved protein and fiber degradation and reduced methane production (Ku-Vera et al., 2020). ACTIVO PREMIUM is a phytomolecules-based product for ruminants that helps reduce their methane emissions.

Energy savings

To preserve the environment, reducing energy needs is also an important topic. Using the surfactant SURF-ACE in the pelletizing process, feed mills can cut 10-15 % of their energy consumption or produce up to 10-15 % higher pellet output without increasing their energy consumption. When moisture is added together with the surfactant, the emulsion of the dietary fat and the added water leads to better general lubrication of the machinery and improved press throughput.

Feed mill efficiency is key to animal nutrition's carbon footprint

3. Reduce antibiotic use in animal production to keep this tool effective

Point 3 on the UN's Agenda 2030 is good health and well-being. For many years, antibiotics, a very effective weapon, have been used to fight bacterial diseases. However, the occurrence of resistance is increasing. One of the reasons is the inappropriate use of antibiotics. These substances are often used preventively or for viral diseases against which they are ineffective. Also, the use of antibiotics as growth promoters at low dosages in animal production strongly contributed to the development of antimicrobial resistance.

Limiting antibiotic use to therapeutic treatment is possible through good farm management and feed supplements that support animals' gut health, immune systems, and respiratory health. For this purpose, solutions ranging from phytomolecules (ACTIVO products, GRIPPOZON) to egg immunoglobulins (GLOBIGEN products, PROTEGG), products mitigating the impact of toxins (MASTERSORB products, SOLIS), beta-glucans/MOS (BGMOS), and acidifiers (ACIDOMIX, FORMYCINE) are available.

The feed sector has the tools to achieve

more sustainability!

The animal nutrition industry provides many products to support animal producers in coping with their main challenges, including the shift to more sustainable production practices. Solutions exist to save feed resources, better protect the environment, and keep antibiotic tools effective. As an additional reward, implementing sustainability solutions leads to healthy animals with high performance. Let's all help to preserve this planet for our next generations!

References

Eriksen, J., Nørgaard, J. V., Poulsen, H. D., Poulsen, H. V., Jensen, B. B., & Petersen, S. O. (2014). Effects of Acidifying Pig diets on emissions of AMMONIA, methane, and sulfur FROM Slurry during storage. *Journal of Environmental Quality*, *43*(6), 2086–2095. https://doi.org/10.2134/jeq2014.03.0108

Fuller, R. (1977). The importance of lactobacilli in maintaining normal microbial balance in the crop. *British Poultry Science*, *18*(1), 85–94. https://doi.org/10.1080/00071667708416332

Johnson, K. A., & Johnson, D. E. (1995). Methane emissions from cattle. *Journal of Animal Science*, *73*(8), 2483–2492. https://doi.org/10.2527/1995.7382483x

Keeling, Linda, Håkan Tunón, Gabriela Olmos Antillón, Charlotte Berg, Mike Jones, Leopoldo Stuardo, Janice Swanson, Anna Wallenbeck, Christoph Winckler, and Harry Blokhuis. "Animal Welfare and the United Nations Sustainable Development Goals." Frontiers in Veterinary Science 6 (October 10, 2019). https://doi.org/10.3389/fvets.2019.00336.

Ku-Vera, J. C., Jiménez-Ocampo, R., Valencia-Salazar, S. S., Montoya-Flores, M. D., Molina-Botero, I. C., Arango, J., Gómez-Bravo, C. A., Aguilar-Pérez, C. F., & Solorio-Sánchez, F. J. (2020). Role of secondary plant metabolites on enteric methane mitigation in ruminants. *Frontiers in Veterinary Science*, *7*. https://doi.org/10.3389/fvets.2020.00584

Max-Planck-Gesellschaft. (2017, October 27). *Reducing manure and fertilizers decreases atmospheric fine particles*. Max-Planck-Gesellschaft. https://www.mpg.de/11667398/agricultural-emissions-fine-particulate-matter.

Pearlin, B. V., Muthuvel, S., Govidasamy, P., Villavan, M., Alagawany, M., Ragab Farag, M., Dhama, K., & Gopi, M. (2020). Role of acidifiers in livestock nutrition and health: A review. *Journal of Animal Physiology and Animal Nutrition*, *104*(2), 558–569. https://doi.org/10.1111/jpn.13282

United Nations. (n.d.). *How your company can advance each of THE SDGS: UN Global Compact*. How Your Company Can Advance Each of the SDGs | UN Global Compact. https://www.unglobalcompact.org/sdgs/17-global-goals.

United States Environmental Protection Agency. (n.d.). *Importance of methane*. EPA. https://www.epa.gov/gmi/importance-methane.

von Carlowitz, H. C. (1713). *Sylvicvltvra oeconomica, oder, Hausswirthliche Nachricht und Naturmässige Anweisung zur Wilden BAUM-ZUCHT: Nebst gründlicher darstellung, wie Zu FÖRDERST durch Göttliches Benedeyen Dem allenthalben und insgemein einreissenden Grossen Holtz-mangel: Vermittelst Säe-pflantz- und Versetzung Vielerhand Bäume zu prospiciren …: Worbey zugleich eine Gründliche nachricht von den in Churfl. Sächss. Landen gefundenen Turff Dessen Naturliche beschaffenheit, Grossen NÜTZEN, Gebrauch und nutzlichen verkohlung, Aus Liebe Zu BEFÖRDERUNG des Algemeinen Bestens beschrieben*. Verlegts Johann Friedrich Braun.

World Wildlife Fund. (2021). *Soja – die Nachfrage steigt*. WWF Startseite. https://www.wwf.de/themen-projekte/landwirtschaft/produkte-aus-der-landwirtschaft/soja/.