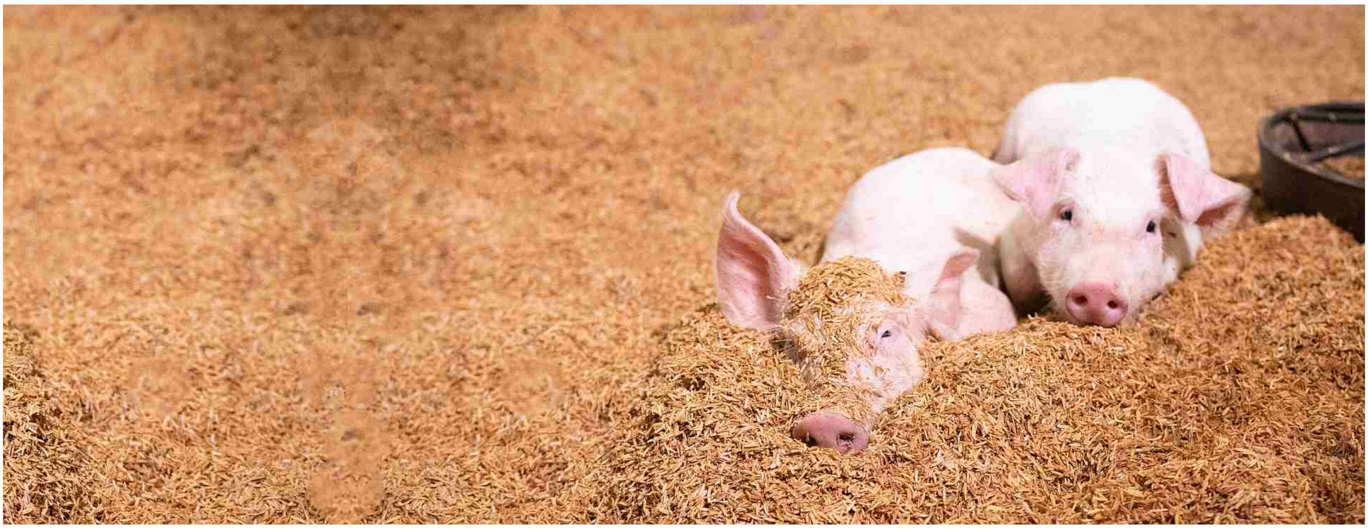
Rising feed costs? Focus on the FCR



by **Inge Heinzl**, Editor, and **Marisabel Caballero**, Global Technical Manager Poultry, EW Nutrition

What is your most crucial key feed performance indicator? We posted this question on an online professional platform and got more than 330 answers from professionals in the industry:

- 55 % of the respondents considered feed efficiency or feed conversion rate (FCR) the key indicator, and
- 35 % listed feed cost / kg produced as their most important indicator.

As feed represents 60-70 % of the total production costs, feed efficiency has a high impact on farm profitability – especially in times of high feed prices. Furthermore, for the meat industry, an optimal FCR is essential for competitiveness against other protein sources. Finally, for food economists, feed efficiency is connected to the optimal use of natural resources (Patience et al., 2015).

In this article, we explain the factors that influence feed efficiency and show options to support animals in optimally utilizing the feed – directly improving the profitability of your operation.

How to measure the feed conversion rate

The FCR shows how efficiently animals utilize their diet for maintenance and net production. In the case of fattening animals, it is meat production; for dairy cows, it is milk, and for layers, it is egg mass (kg) or a specific egg quantity.

The feed conversion rate is the mathematical relation obtained by dividing the amount of feed the animal consumed by the production it provided. The FCR is an index for the degree of feed utilization and shows the amount of feed needed by the animal to produce one kg of meat or egg mass, or, e.g., 10 eggs.

$$\text{FCR} = \frac{\text{Feed weight (kg)}}{\text{Production (kg weight gain, kg milk, or \# of eggs)}}$$

When comparing the FCRs of different groups of animals (e.g., from different houses or farms), some considerations are important:

- Feed consumed is not feed disappeared: Due to differences in feeder design and feeder adjustment, these two values can differ by 10-30 %. If FCR is calculated for economic purposes, the wasted feed must be included, as it causes costs and must be paid by the farmer. However, if FCR is calculated for scientific purposes (e.g., a performance trial), only the feed consumed should be included.
- Even if they are same-aged animals, individuals or groups differ in weight. Hence, they have different requirements for maintenance and also diverging quantity left for production. To avoid mistakes, weight-corrected FCR can be used.
- Nutrient utilization also depends on genotype and sex; thus, comparisons should consider these factors as they also influence weight gain and body composition (Patience et al., 2015).

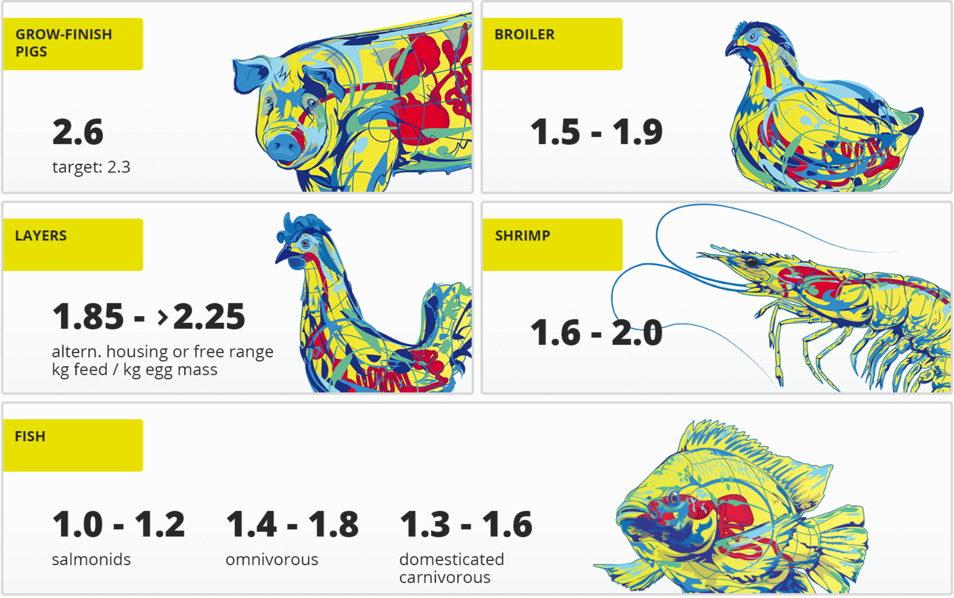
Many factors influence the FCR

There are internal and external factors that influence feed efficiency. Internal factors originate in the animal and include genetics, age, body composition, and health status. In contrast, external factors include feed composition, processing, and quality, as well as the environment, welfare enrichment, and social aspects.

1. Species

Different species have different body sizes and physiology and, therefore, vary in their growth and maintenance requirements, impacting their efficiency in converting the feed.

Table 1: FCRs of different species



Compared to terrestrial animals, for example, fish and other aquatic animals have a low FCR. Being poikilothermic (animals whose body temperature ranges widely), they don't spend energy on maintaining their body temperature if the surrounding water is within their optimal range. As they are physically supported by water, they also need less energy to work against gravity. Furthermore, carnivorous fish are offered highly digestible, nutrient-dense feed, which lowers their requirements in quantity. Omnivorous fish, on the other hand, also consume feedstuffs not provided by the producer (e.g., algae and krill), which is not considered in the calculation. Broilers are the only farm animals achieving a similar FCR.

2. Sex, age, and growth phase

Sex determines gene expression related to the regulation of feed intake and nutrient utilization. Males have a better feed conversion and put on more lean meat than females and castrates, which grow slower and easier run to fat.

Young animals have a fast growth rate and are offered nutritionally dense feed; hence, their FCR is lower. When the animal grows and gains weight, its energy requirement for maintenance increases and its growth rate and the feed nutrient density diminish.

Table 2: FCR during different life phases of pigs (based on [Adam and Büttfering, 2009](#))

	Age / weight / phase	**FCR**
Piglet	0 – 2 weeks	1.1 – 1.2
	3 – 6 weeks	1.6 – 1.8
Grower-finisher	30 – 120 kg	~ 2.6
	End of fattening	4 – 5

3. Health and gut health

Health decisively impacts feed conversion. An animal that is challenged by pathogens reduces its feed intake and, thus, decreases growth. Additionally, the body needs energy for the immune defense, the replacement of damaged or lost tissue, and heat production, in case of fever. As many immune components are rich in protein, this is the first nutrient to become limited.

An imbalance in the gut microbiome also impacts feed conversion: pathogenic microorganisms damage tissues, impair nutrient digestion and absorption, and their metabolic products are harmful. Furthermore, pathogens consume nutrients intended for the host and continue to proliferate at its expense.

4. Environment

The environment influences the way the animals spend their maintenance energy. According to Patience (2012), when a 70 kg pig is offered feed *ad libitum*, 34 % of the daily energy is used for maintenance. For each °C below the thermoneutral zone, an additional 1.5% of feed is needed for maintenance. In heat stress, each °C above the optimum range decreases feed intake by 2%. Therefore, the feed needs to be denser to fulfill the requirement, or the animal will lose weight. Social stress also influences animal performance, especially chronic stress situations. Keeping the animals in their thermoneutral zone and mitigating the impact of stressors means more energy can go towards performance.

5. Feed quantity, composition, and quality

The feed is the source of nutrients animals convert into production. So, it's natural that its quality and composition, and the availability of nutrients affect feed efficiency.

Better FCR by increasing nutrient density and digestibility

Higher energy content in the diet and better protein digestibility improve FCR. Saldaña et al. (2015) assert that increasing the energy content of a diet led to a linear decrease of the average daily feed intake but improved FCR quadratically. The energy intake by itself remained equal. However, these diet improvements also increase costs, and a cost-benefit analysis should be conducted.

Feed form and particle size play an important role

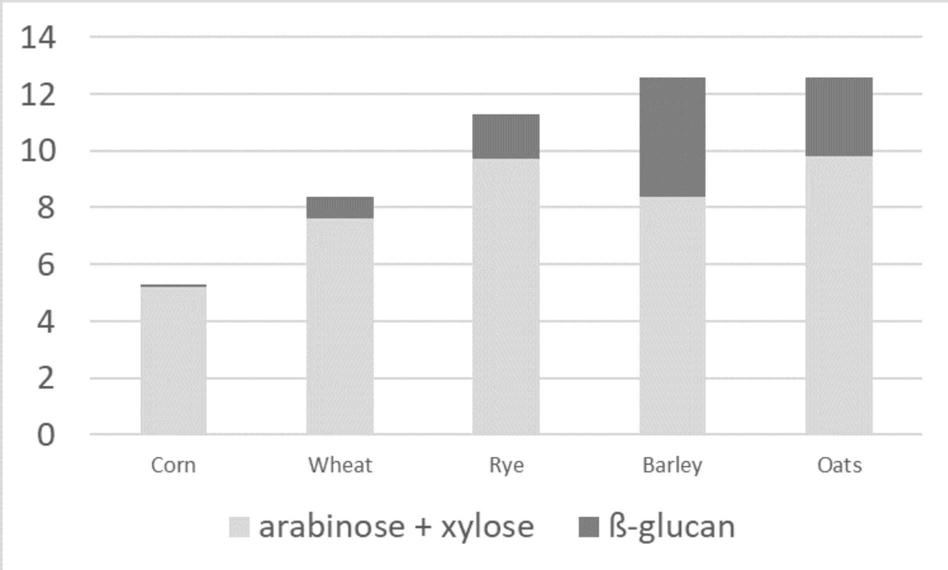
Feed processing can improve nutrient utilization. Particle size, moisture content, and whether the feed is offered as pellets or mash influence feed efficiency. Reducing the particle size leads to a higher contact surface for digestive enzymes and higher digestibility. Chewning et al. (2012) tested the effect of particle size and feed form on FCR in broilers. They found that pellet diets enable better FCRs than mash diets – one reason is the lower feed waste, another one the smaller feed particle size in the pelleted feed. Comparing the different tested mash diets, the birds receiving feed with a particle size of 300 µm performed better than the birds getting a diet with 600 µm particles.

Richert and DeRouchey (2015) show that pigs' feed efficiency improved by 1.3 % for every 100 µm when the particle size was reduced from 1000 µm to 400 µm , as the contact surface for the digestible enzymes increased. In weaning piglets of 28-42 days, the increase of particle size from 394 µm to 695 µm worsened FCR from 1.213 to 1.245 (Almeida et al., 2020). There is a flipside to smaller particle size as well, however: high quantities of fines in the diet can lead to stomach ulceration in pigs (Vukmirović et al., 2021).

Non-starch polysaccharide (NSP)-rich cereals worsen FCR

The carbohydrates in feedstuffs such as wheat, rye, and barley are not only energy suppliers, and if not managed well, the inclusion of these raw materials can deteriorate feed conversion. Vegetable structural substances such as cellulose, hemicellulose, or lignin (e.g., in bran), are difficult or even impossible to utilize as they lack the necessary enzymes.

Figure 1: Contents of arabinoxylan and ß-glucan in grain (according to Bach Knudsen, 1997)



Additionally, water-soluble NSPs (e.g., pectins, but also ß-glucans and pentosans) have a high water absorption capacity. These gel-forming properties increase the viscosity of the digesta. High viscosity reduces the passage rate and makes it more difficult for digestive enzymes and bile acids to come into contact with the feed components. Also, nutrients' contact with the resorptive surface is reduced.

Another disadvantage of NSPs is their "cage effect." The water-insoluble NSPs cellulose and hemicellulose trap nutrients such as proteins and digestible carbohydrates. Consequently, again, digestive enzymes cannot reach them, and they are not available to the organism.

Molds and mycotoxins impair feed quality, but also animal health

Molds reduce the nutrient and energy content of the feed and negatively impact feed efficiency. They are dependent on active water in the feed and feed ingredients. Compared to bacteria, which need about 0.9-0.97 Aw (active water), most molds require only 0.86 Aw.

Table 3: Comparison of 28-day-old chicks performance fed not-infested and molded corn

	Weight gain (g)	FCR
Non-infested corn	767 [a]	1.79 [a]
Molded corn	713 [b]	1.96 [b]

Besides spoiling raw materials and feed and reducing their nutritional value, molds also produce mycotoxins which negatively impact animal health, including gut health. They damage the intestinal villi and tight junctions, reducing the surface for nutrient absorption. In a trial with broiler chickens, Kolawole et al. (2020) showed a strong positive correlation between the FCR and the exposure to different mycotoxins. The increase in levels of toxin mixtures resulted in poor FCR. Williams and Blaney (1994) found similar results with growing pigs. The animals received diets containing 50 % and 75 % of corn with 11.5 mg nivalenol and 3 mg zearalenone per kg. The inclusion of contaminated corn led to a deterioration of feed efficiency from 2.45 (control) to 3.49 and 3.23.

Oxidation of fats also affects feed quality

DDGS (distiller's dried grains with solubles), by-products of corn distillation processes, are often used as animal feed, especially for pigs. The starch content is depleted in the distillation process and thus removed. The fat, however, is concentrated, and DDGS reach a similar energy content as corn.

Pigs also receive fats from different sources (e.g., soybean or corn oil, restaurant grease, animal-vegetable blends), especially in summer. Due to heat, the animals eat less, so increasing energy density in the feed is a possibility to maintain the energy intake. The high fat content, however, makes these feeds susceptible to oxidation at high temperatures.

The oxidation of feedstuffs manifests in the rancidity of fats, destruction of the fat-soluble vitamins A, D, and E, carotenoids (pigments), and amino acids, leading to a lower nutritional value of the feed.

Use adequate supplements to enhance FCR

The feed industry offers many solutions to improve the FCR for different species. They usually target the animal’s digestive health or maintain/enhance feed quality, including increasing nutrient availability.

1. Boost your animals’ gut health

Producers can improve gut health by preventing the overgrowth of harmful microorganisms and by mitigating the effects of harmful substances. For this purpose, two kinds of feed additives are particularly suitable: phytomolecules and products mitigating the impact of toxins and mycotoxins.

Phytomolecules help stabilize the balance of the microbiome

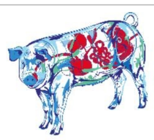
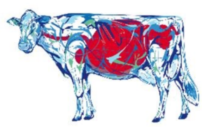
By preventing the proliferation of pathogens, phytomolecules help the animal in three ways:

1. They prevent pathogens from damaging the gut wall
2. They deter and mitigate inflammation
3. By inhibiting the overgrowth of pathogens, they promote better nutrient utilization by the animal

Only a healthy gut can optimally digest feed and absorb nutrients.

In trials testing the phytogenic Activo product range, supplemented animals showed the following FCR improvements compared to non-supplemented control groups (Figure 2). Note that phytomolecules also have a digestive effect that contributes to the FCR improvements:

Figure 2: FCR improvements for animals receiving Activo

	Layers (feed / egg mass) **11 points**		Broilers **3 to 8 points**
	Finishing pigs **17 points**		Dairy cows (milk / DMI) **10 points**

Products mitigating the adverse effects of toxins

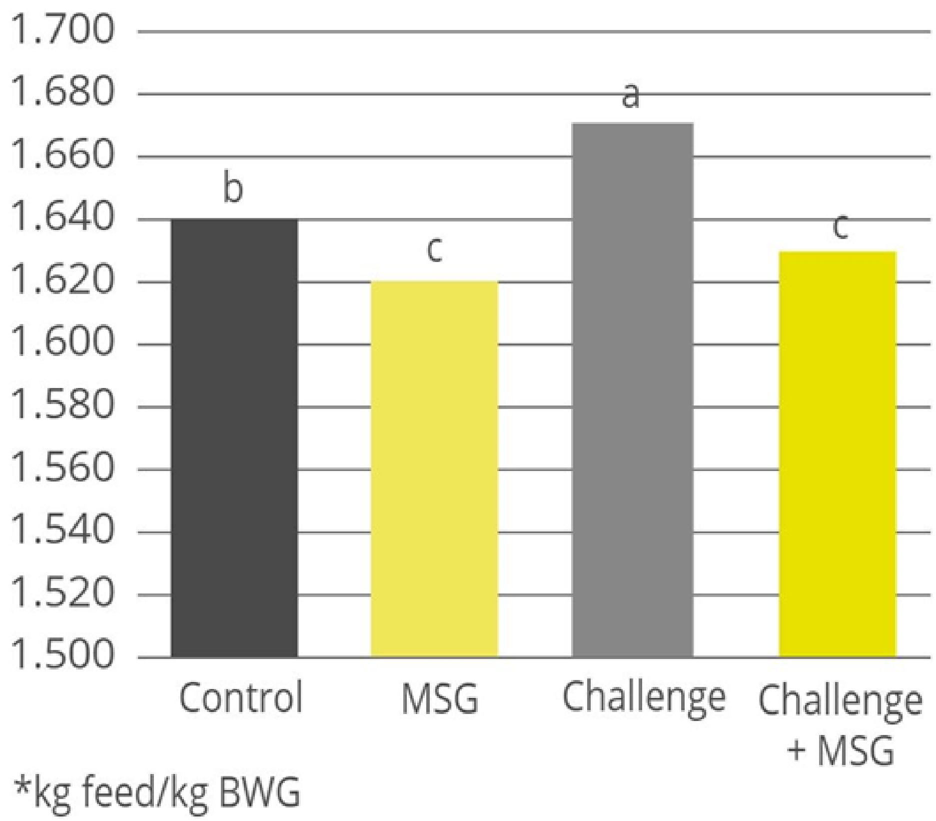
Both mycotoxins and bacterial toxins negatively impact gut health. Mycotoxins are ingested with the feed; bacterial toxins appear when certain bacteria proliferate in the gut, e.g., gram-negative bacteria releasing LPS or *Clostridium perfringens* producing NetB and Alpha-toxin.

Products that mitigate the harmful effects of toxins help to protect gut health and maintain an optimal feed efficiency, as shown with a trial conducted with Mastersorb Gold:

Table 4: Trial design, the impact of Mastersorb Gold on broilers challenged with zearalenone and DON-contaminated feed

	Control	Mastersorb Gold	Challenge	Challenge + Mastersorb Gold
Challenge	—	—	300ppb zearalenone and 6000ppb DON	300ppb zearalenone and 6000ppb DON
Additive	—	MSG (2 kg / MT of feed)	—	MSG (1 kg / MT of feed)

Figure 3: Average FCR for broilers, with or without zearalenone and DON challenge, with or without Mastersorb Gold supplementation



2. Improve nutrient utilization

Maximum use of the nutrients contained in the feed can be obtained with the help of feed additives that promote digestion. Targeting the animal, selected phytomolecules are used for their digestive properties. Focusing on the feed, specific enzymes can unlock nutrients and thus improve feed efficiency.

Phytomolecules support the animal’s digestive system

Phytomolecules promote optimal digestion and absorption of nutrients by stimulating the secretion of digestive juices, such as saliva or bile, enhancing enzyme activity, and favoring good GIT motility (Platel and Srinivasan, 2004). FCR improvements thanks to the use of a phytomolecules-based product (Activo) are shown in figure 2.

Enzymes release more nutrients from feed

Enzymes can degrade arabinoxylans, for example. Arabinoxylans are the most common NSP fraction in all cereals – and are undigestible for monogastric animals. Enzymes can make these substances available for animals, allowing for complete nutrient utilization. Additionally, nutrients trapped due to the cage effect are released, altogether increasing the energy content of the diet and improving FCR.

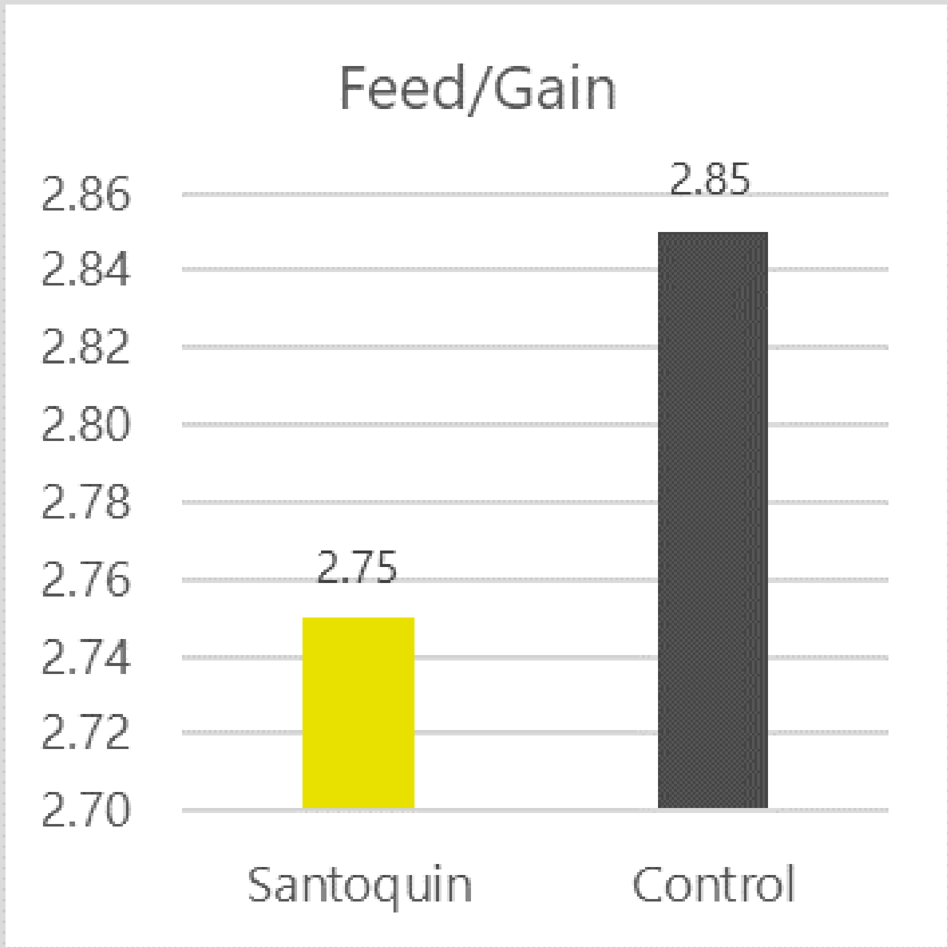
3. Be proactive about preserving feed quality

The quality of feed can deteriorate, for instance, when nutrients oxidize, or mold infestation occurs. Oxidation by-products promote oxidative stress in the intestine and may lead to tissue damage. Molds, in turn, take advantage of the nutrients contained in the feed and produce mycotoxins. Both cases illustrate the importance of preventing feed quality issues. Feed additives such as antioxidants and mold inhibitors mitigate these risks.

Antioxidants prevent feed oxidation

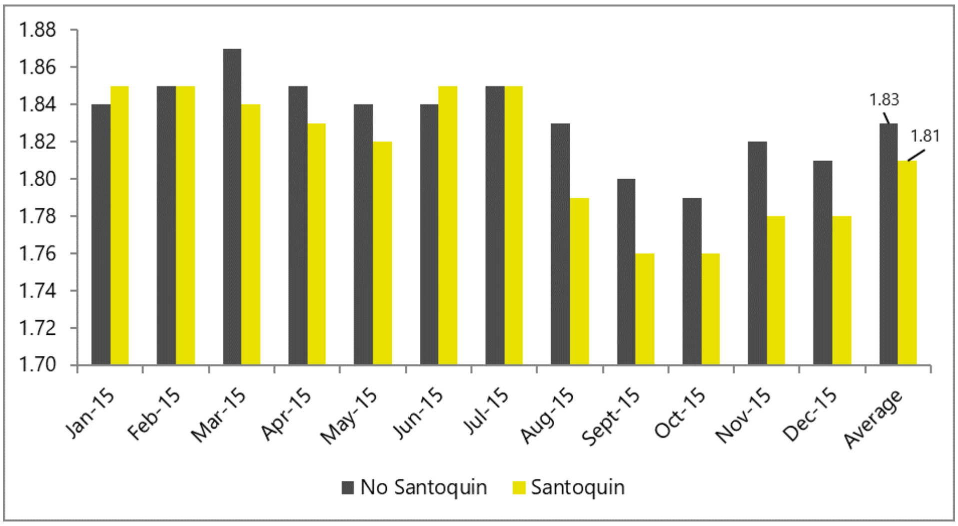
Antioxidants scavenge free radicals and protect the feed from spoilage. In animals, they mitigate the adverse effects of oxidative stress. Antioxidants in pig nutrition can stabilize DDGS and other fatty ingredients in the feed, maintaining nutrient integrity and availability. Figure 4 shows the FCR improvement that a producer in the US obtained when using the antioxidant product Santoquin in pork finisher diets containing 30% DDGS.

Figure 4: FCR improvement in pigs receiving Santoquin (trial with a Midwest pork producer)



In DDGS-free diets, which are more common in poultry production, antioxidants also help optimize FCR, as shown by the results of a comprehensive broiler field study in 2015 (figure 5).

Figure 5: FCR in broilers receiving Santoquin, compared to a non-supplemented control group



Inhibiting molds and keeping feed moisture

To round off the topic of feed quality preservation, one should consider mold inhibitors, which also play an essential role. Used at the feed mill, these products blend two types of ingredients with their different modes of action: surfactants and organic acids. Surfactants bind active water so that the moisture of the feed persists, but fungi cannot survive. Organic acids, on the other hand, have anti-fungal properties, directly acting against molds. Both actions together prevent the reduction of energy in the feed, keeping feed efficiency at optimal levels.

Conclusion

The improvement of feed efficiency ranks as one of the most, if not the most, critical measures to cope with rising feed costs. By achieving optimal nutrient utilization, producers can make the most out of the available raw materials.

The feed industry offers diverse solutions to support animal producers in optimizing feed efficiency. Improving gut health, mitigating the negative impact of harmful substances, and maintaining feed quality are crucial steps to achieving the best possible FCR and, hence, cost-effective animal production.

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How to develop phytogenic feed additives

*by **EW Nutrition Phytogenics** team*

Modern feed additives are now commonly used as a critical tool to improve animal health. Among these, phytogenic feed additives are increasingly widely adopted. Consequently, more and more products are entering the market, leaving producers to wonder how these products differ from one another and which product performs best. To better understand the benefits that phytogenic feed additives can bring to operations, one must understand the development process feed additives undergo.

Not all feed additives are born equal

Feed additives are products that are added into an animal feed to improve its value. They are typically used to improve animal performance and welfare and consequently to optimize profitability for livestock producers.

Their purpose should not be confused with that of veterinary drugs. Feed additives provide additional benefits *beyond* the physiological needs of the animals and should be combined with other measures to improve production efficiency. Those measures include improvements in management, selection of genetics, and a constant review of biosecurity measures.

Several categories of feed additives exist. They all have in common that they are mixed into the feed or premix or the drinking water in relatively low inclusion rates to serve a *specific* purpose. Examples of feed additives are organic acids, pre- and probiotics, short and medium chained fatty acids, functional yeast products, and phytogenic feed additives. Modern feed additives also blend those different additives into combination products, increasing the value of the final products.

Phytogenic feed additives are a sub-category of additives containing phytomolecules, active ingredients which originate from plants and provide a unique set of characteristics. These molecules are produced by plants to protect themselves from molds, yeasts, bacteria, and other harmful organisms. Depending on the type of molecule, phytomolecules have different properties, ranging from antimicrobial to antioxidant and anti-inflammatory.

EW Nutrition's approach to developing Ventar D: 6 steps

The development of best-in-class phytogenic feed additives is a complex process. For Ventar D, EW Nutrition divided the process into the following steps, which can serve as a template for a successful development process:

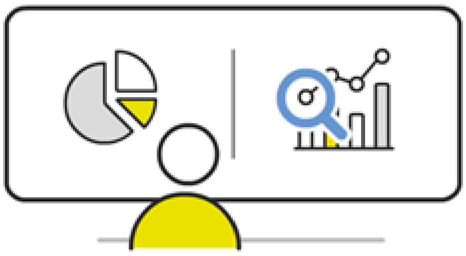
1. Reviewing customer needs
2. Active ingredient selection
3. Technical formulation
4. Application development and scale-up
5. Performance tests
6. Safety and regulatory validation

Understanding customer needs

The most important point in developing a feed additive is customer-centricity. Understanding the challenges and needs of producers is crucial to developing feed additive solutions.

In a first step, additive producers need to evaluate and *quantify* customer needs wherever possible. This is achieved through communication and literature review: Producers, key opinion leaders, and research partners are interviewed, and their challenges are listed. In the next step, those challenges are further analyzed using scientific literature. In a final step, the customer needs are ranked according to their impact on the customer's profitability.

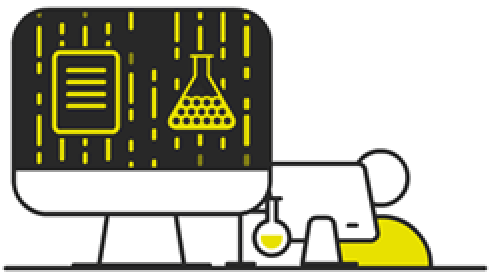
Subsequently, the *minimum requirements* for the new feed additive are derived. For phytogenic feed additives, this might be, for instance, something like "Improving animal performance and reducing antibiotic use while increasing profitability". The selected key performance parameters might be, for example, feed efficiency improvements in broilers.



Market research

Meeting unmet needs

Once the customer needs have been understood, the next phase of the development starts. Based on the intended mode of action, certain phytomolecules are chosen based on their described properties. In our example, this might be an antimicrobial mode of action that targets enteropathogenic bacteria in broilers, supporting gut health.



Laboratory research

In this *in-vitro* process, the selected individual compounds will be tested for their respective antimicrobial efficacy using MIC and MBC testing. Those tests are run using high-purity compounds.

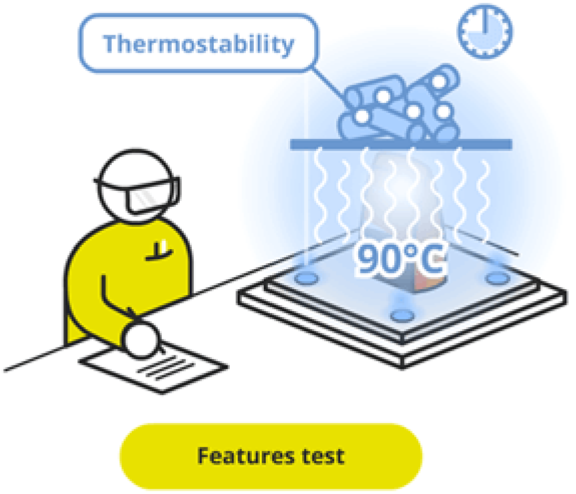
Features test

The tests will be conducted using various relevant field strains like *E. Coli, S. enterica* or *C. perfringens*. In the next step, the testing will be repeated with commercially available ingredients. The most promising compounds will be tested in more complex mixtures.

Modern phytogenic feed additives are based on the concept of combining different phytomolecules to attack bacteria in diverse ways, with their antimicrobial effects being multi-modal. This mode of action is crucial because it makes it very unlikely that bacteria can develop resistance to combinations of phytomolecules, as they do to antibiotics.

Selecting the right form of application

Feed processing is often a challenge for additives. Many phytomolecules are highly volatile and prone to volatilization and high temperatures. Especially non-protected phytogenic products are negatively affected by high pelleting temperatures and long retention times of the feed in the conditioner. The results are losses in activity.

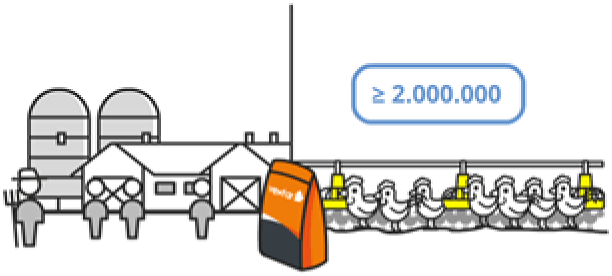


Therefore, the development of appropriate delivery systems is a preemptive method to ensure the release of the effective compounds where they should be released – in the gut of the animals. Those delivery systems can utilize emulsifiers when applying the additive via the water for drinking, or encapsulation technologies when the new additive is administered via feed.

Due to the importance of mixability, flowability, and pelleting stability for the performance of the feed additives, the exact types of emulsifiers, carrier, and technologies used in their production is often considered corporate intellectual property.

The importance of *in-vivo* evaluations

In one of the last steps of the development, the newly developed feed additive prototype needs to prove its safety and efficacy in the animal. Hence the need to run evaluation studies to confirm the mode of action chosen in the initial lab phase. Typically, the additive will be tested in the target species in in-house and external research institutes.



Farm test

For a phytogenic feed additive, that might entail comparing its effect on body weight gain, feed efficacy, and gut health against different control groups. Additionally, the newly developed feed additive might be compared to existing additives to get a better understanding of its capabilities.

Safety test

Dose-finding studies are conducted to verify the chosen dose recommendation and additional overdosing studies are conducted to prove the safety of the additive for both animals and consumers. In certain markets or regulatory environments, additional studies might be required. Those can contain environmental safety assessments or proof that the new additive does not create residues in animal products.

Case study: Ventar D

For Ventar D, the process followed these steps meticulously, in agile iterative development loops that went from the customer need to formulation, testing, scale-up, in-house and external trials, and finally production.

These steps ensured that the final product that reaches the customer's doorstep delivers on the expectations – and more.

Scale-up & Distribution

Choose your phytogenic products wisely

The plethora of (phytogenic) feed additives in the market leaves producers with many options to choose from. However, only scientifically developed feed additives can be relied upon to optimize both animal health and production profitability. It is important to select reliable feed additive producers who developed their phytogenic product with the customers' challenges in mind and went through all the steps necessary to create a high-performing and safe additive.

Want better poultry performance? Focus on gut health

by **Ruturaj Patil**, Product Manager Phytogenic Liquids, EW Nutrition

Commercial poultry operations have undergone enormous changes in production practices over the last 50 years. Genetic selection for high production rates, along with upgraded management techniques and dietary measures, have led to increased performance standards in all poultry operations (Kogut et al., 2017). However, it is sensible to now look into whether poultry performance may soon reach a ceiling due to genetic and/or physiological limits. So, aiming at further performance optimization, poultry researchers and producers are now focusing on gut health.

Gut health management is key to sustainably improve poultry performance

The caveat, of course, is that, due to concerns about antimicrobial resistance, antimicrobial growth promoters (AGPs) no longer offer the easy answer to gut health issues they once were. To preserve antibiotics' efficacy for cases where they are indispensable, gut health-oriented performance enhancement needs to come from other sources. This article reviews the principles of gut health management in poultry and shows how Activo liquid, a phytomolecules-based in-water solution, strengthens poultry performance by targeting gut health.

Gut health: the cradle of poultry performance

Gastrointestinal health in poultry birds encompasses three dimensions: microflora balance, gut structural integrity, and immune system status. The gut plays a vital and diverse role as it hosts most microorganisms in the body, contains more than twenty different hormones, digests and absorbs the nutrients, and accounts for 20% of body energy expenditure (Choct, 2021). When gut health is compromised, digestion and nutrient absorption are affected, with likely detrimental effects on feed conversion, followed by economic loss and greater disease susceptibility. Disease resistance and nutrient utilization largely depend on maintaining a beneficial gut antioxidant status, improving gut integrity, and modulating the gut microbiota (Oviedo-Rondón, 2019).

In birds, the gut is separated into five distinct regions (Figure 1): crop, proventriculus, gizzard, small intestine (duodenum, jejunum, and ileum), and large intestine (ceca, cloaca, and vent). Each of these regions has a specific role in the secretion of digestive juices and enzymes, the grinding of feed particles and then the digestion and absorption of nutrients (Bailey 2019).

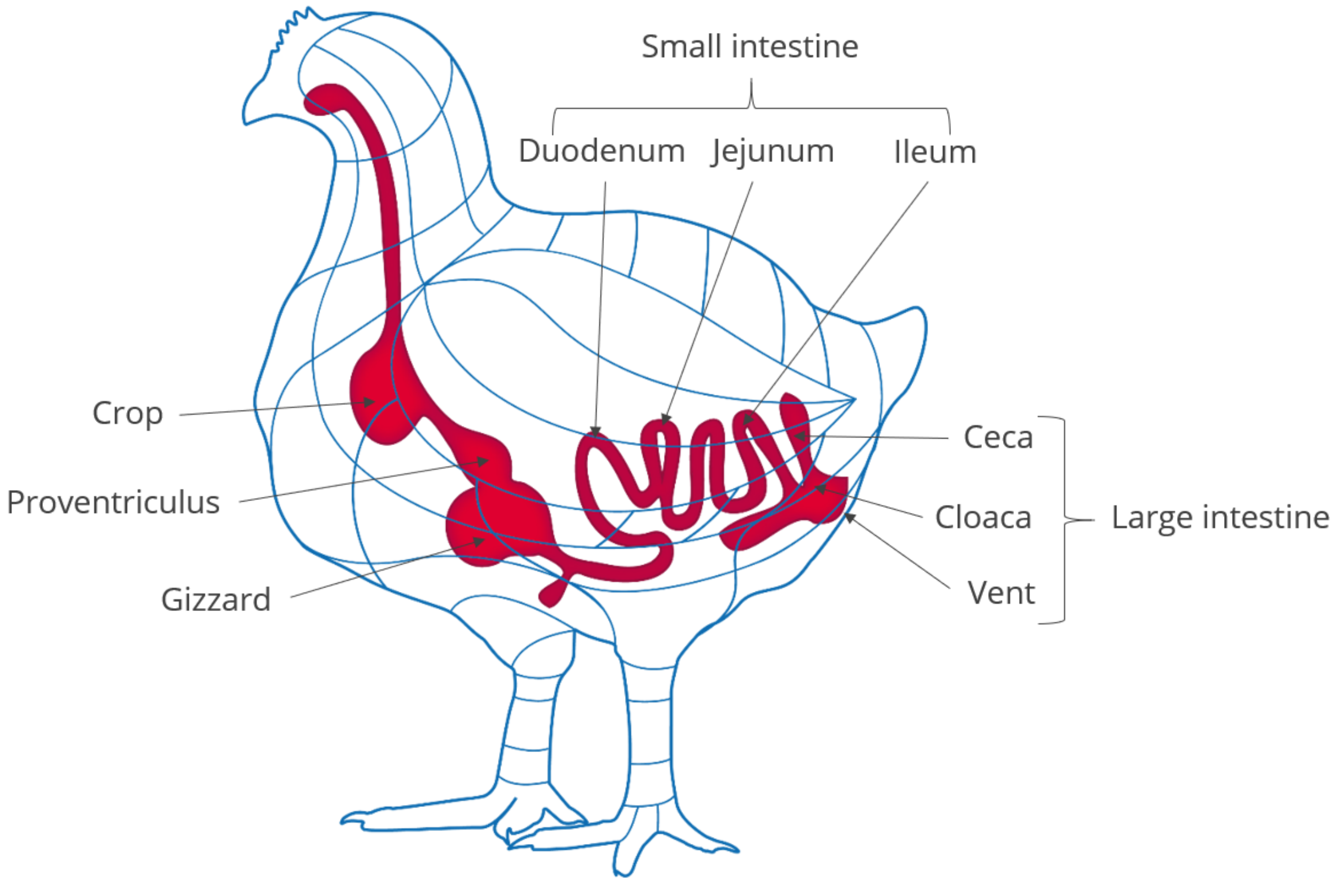


Figure 1: Schematic overview of poultry gastrointestinal tract

Factors affecting gut health

Gut health is influenced by the balance between the physiological health status of host, the gut microbiota, and a range of specific factors, all of which producers need to consider. From a management perspective, key factors encompass deprived gut health, biosecurity, and production stress, which is elevated during certain critical stages (see table 1). Environmental factors include humidity, temperature, and ventilation. Dietary factors, such as feed and water quality, feed composition, and mycotoxin contamination, also impact the development and ongoing state of poultry birds' intestinal microbiota.

Critical stages		**Signs and symptoms**
Broilers • Vaccination • Feed change • Heat/cold stress • Finisher stage	Layers/breeders • Vaccination • Feed change • Transition from grower to laying house • Point of lay to peak production • Late laying phase	• Diarrhea • Undigested feed in feces • Subclinical necrotic enteritis / cocci • Wet litter condition / food pad lesions • Increased mortality

Table 1: Critical stages for gut health issues in poultry birds

The future is here: antibiotic reduction through improved gut health

There is a strong trend towards antibiotic-free (ABF) poultry production, fueled by AGP bans in certain regions (such as the European Union) and increasing consumer interest in avoiding products containing traces of AGPs. ABF systems can be profitable as long as the prices for the final ABF products can cover the investment costs necessary to produce these products. Larger-scale, sustainable ABF production will depend on developing a more profound understanding of intestinal health alongside the development of practical applications that foster gut health throughout each step of the production system.

Feed additive solutions to support birds during challenging situations

Feed additive manufacturers are looking into accessible alternatives to mitigate the need for antibiotics in ABF systems, requiring enormous research and development efforts. At EW Nutrition, our approach is to offer a holistic antibiotic reduction program for gut health management in poultry. The program comprises feed- and water-based solutions to support gut health during high-challenge periods. Activo liquid, an in-water solution containing standardized amounts of selected phytomolecules, is a key component of our program. Based on its three-fold mode of action, Activo liquid provides gut health support that improves livability and feed efficiency:

- **Antimicrobial** activity hinders the growth of potential pathogens
- **Better gut integrity and positive microbiota** optimize feed efficiency and gut health
- **Antioxidant** activity at the gut level prevent free radical formation and oxidative stress

As a water-based solution, Activo liquid provides a quick and flexible option for gut health control on poultry farms. The benefits of Activo liquid supplementation have been demonstrated through several scientific and field studies globally.

Activo liquid reduces mortality and improves feed conversion in broilers

Numerous field studies for antibiotic-free broilers across different countries and breeds show: on average, the inclusion of Activo liquid reduces mortality by 0.6% and improves FCR by 5%, compared to non-supplemented control groups (Figure 2).

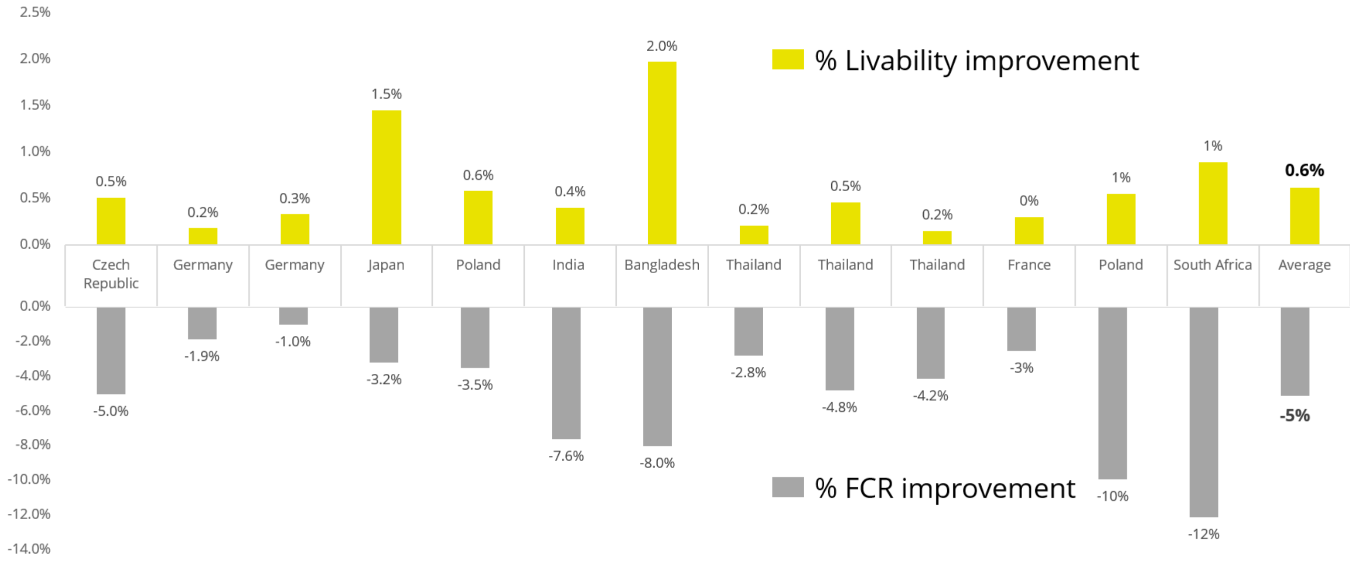


Figure 2: Changes in livability and feed conversion rate in Activo liquid-supplemented broilers

Activo Liquid supports broiler breeders from start of lay to pre-peak production

Broiler breeders are prone to gut-related issues from the start of lay to pre-peak production (age 24 to 32 weeks). This period is characterized by sudden changes in feed consumption and high production stress. Field studies from Thailand show that Activo liquid supplementation in this phase leads to improved livability and higher laying rates.

A of 34,000 female broiler breeders during the first 9 weeks of production found that for the group receiving Activo Liquid (200 ml / 1000 L, 5 days per week, 6 hours per day):

- The average laying rate/HH increased by 7.2 % during the trial period,
- Nearly 3 more hatching eggs per hen housed and about 5 more hatching eggs than the genetic standard were produced, and
- Mortality decreased by 0.2 % points compared to the control.

Another study, again evaluating the first 9 weeks of production using 20,000 birds, also found that broiler breeders supplemented with Activo Liquid show reduced mortality, a higher laying rate, and more hatching eggs per hen housed (Figure 3).

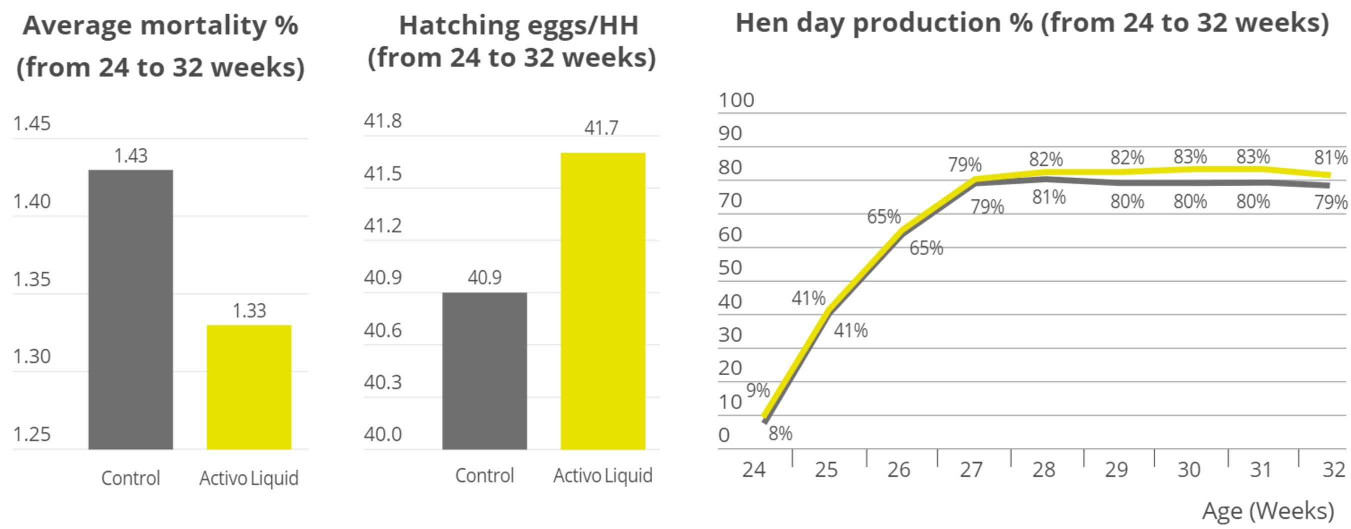


Figure 3: Performance results from Cobb broiler breeders, Activo liquid supplementation vs. control

Activo program improves layer productivity

Commercial layers often becomes challenged due to stress originating from management issues, gut pathogens, and an improper assimilation of nutrients. The negative impact on gut health can result in poor uniformity, low livability, and impaired body weight gain. The Activo program (a combination of Activo powder and liquid) has been found to improve layer performance, likely because its phytogenic components foster better intestinal integrity and microbiome diversity.

A study of 8 replicates with 36 Hy-line brown laying hens was conducted in China, for instance, testing the inclusion of both Activo (100 g / MT of feed) and Activo Liquid (250 ml / 1000 L for 4 days, every 2 weeks, from week 15 to week 25). It found that the Activo program can effectively support the animals in coping with NSP-rich diets (Figure 4). Supplemented layers showed 3.36% higher egg production, representing more than 3.5 eggs and more than 150 grams of additional egg mass per hen housed during the period. Better gut health in the Activo Program gut was evidenced by a better hen body weight , as well as higher yolk color, lower FCR, and improved intestinal morphology parameters.

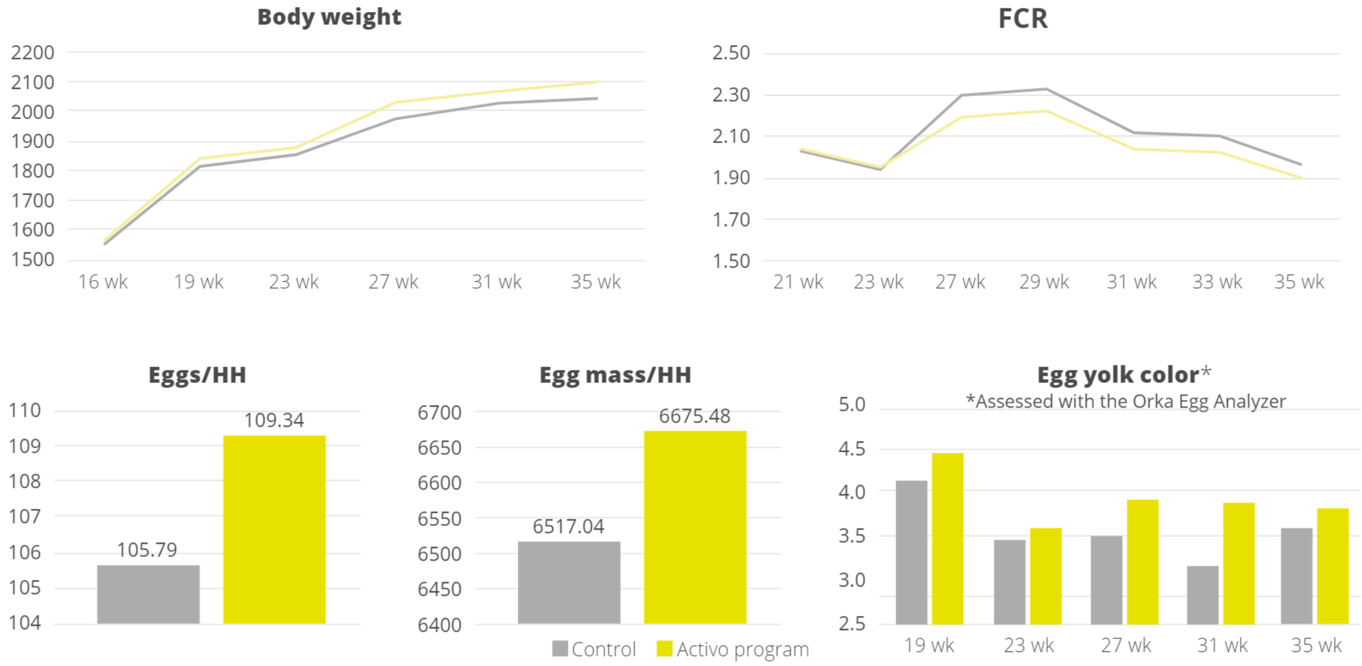


Figure 4: Performance results from Hy-line layers, Activo program vs. control

Conclusion: future improvements in poultry performance will come from the gut

As the trend towards ABF poultry production gains momentum, a concerted focus on supporting birds' gut health is key to achieving optimal performance. Multiple field studies of Activo liquid application demonstrate that, due to their antimicrobial and antioxidant properties, the phytomolecules present in Activo liquid effectively support birds' intestinal health during challenging periods.

In combination with good dietary, hygiene and management practices, phytomolecules offer a potent tool for reducing the use of antibiotics. The inclusion of Activo liquid in their birds' diets allows poultry producers to achieve better gut health and, thus, stronger performance results in a sustainable way.

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