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MARCH/APRIL 2021

## 2021 Poultry Feed & Nutrition Survey

# Poultry producers brace for high feed costs, uncertainty

Asian feed outlook: China's resurgence, consumer power

How to manage feed costs amid high corn and soy prices

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# FeedStrategy

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Poultry, feed industry survey respondents are cautiously optimistic about business in 2021, but also preparing to bear challenges ahead.
JACKIE ROEMBKE

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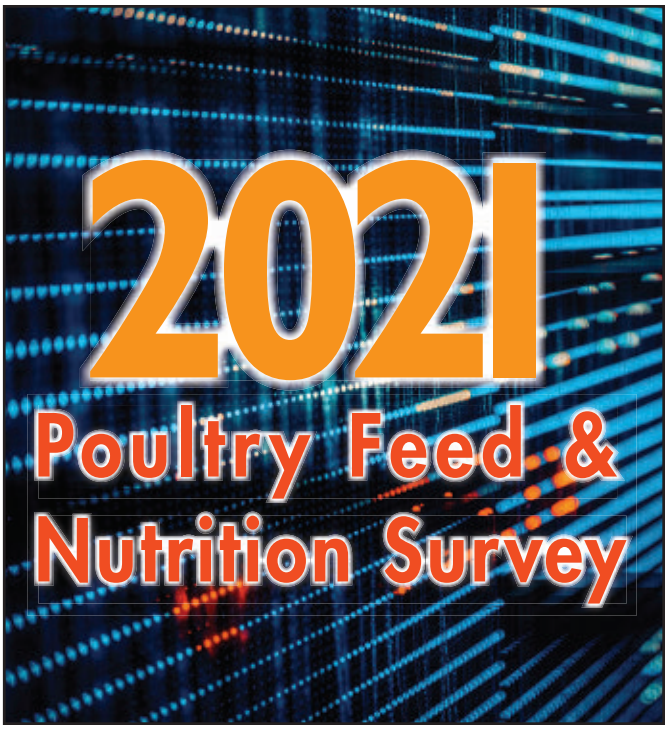


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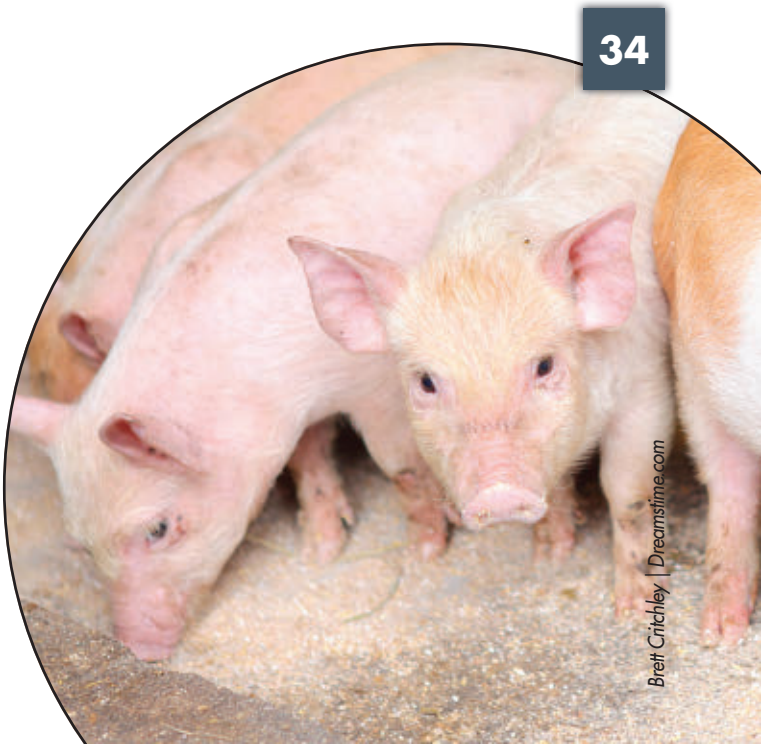


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## FS IN THE MIX

BY JACKIE ROEMBKE, EDITOR

# Raw material, additive prices strain 2021 feed production

According to the result of Feed Strategy's annual Poultry Feed & Nutrition Survey, 66% of poultry and feed producers cite that supply chain disruptions posed the greatest challenge to their business in 2020. Several months into the new year, many regions are still grappling with the fallout and navigating these effects; others are revamping their supply channels and partnerships to prevent future shocks.

In the first quarter of 2021, as raw material supplies tighten and demand rises, feed producers have watched corn and soybean costs soar to prices not seen since 2014.

Eighty-five percent of the stakeholders polled cite their raw materials costs as their primary business challenge in 2021. In fact, 38% of survey respondents anticipate their grain costs increasing by between 1% and 5% in 2021, and 32% fear they will increase by more than 10% this year. Eight percent feel they will remain flat.

Sixty-three percent of respondents fear rising feed additive and micro-ingredient prices will further increase their feed costs. And they are not wrong.

Coming at a time when producers are looking to offset high soybean meal and corn prices, sources report complications with Chinese shipping logistics, which will result in price increases for vitamins and amino acids into the second quarter.

Naturally, 2021 survey respondents have a much less optimistic outlook for their company's profitability this year than in previous editions of the survey, with less than 40% believing it will improve and 28% bracing for it to drop.

Despite volatility challenges, the worst of the COVID-19 pandemic is behind the agrifood industry and, hopefully, 2021 delivers positive results — a bountiful harvest — and a strong rebound. ■

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## High feed prices affecting broiler, livestock production

Broiler feed prices are expected to be 7% to 20% higher this year than last year, which could result in a ...
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## ASF, COVID-19 remain key issues for global pork markets

The combination of African swine fever (ASF) and COVID-19 will continue to affect global pork ...
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2021 Poultry Feed & Nutrition Survey

# Poultry producers brace for high feed costs, uncertainty

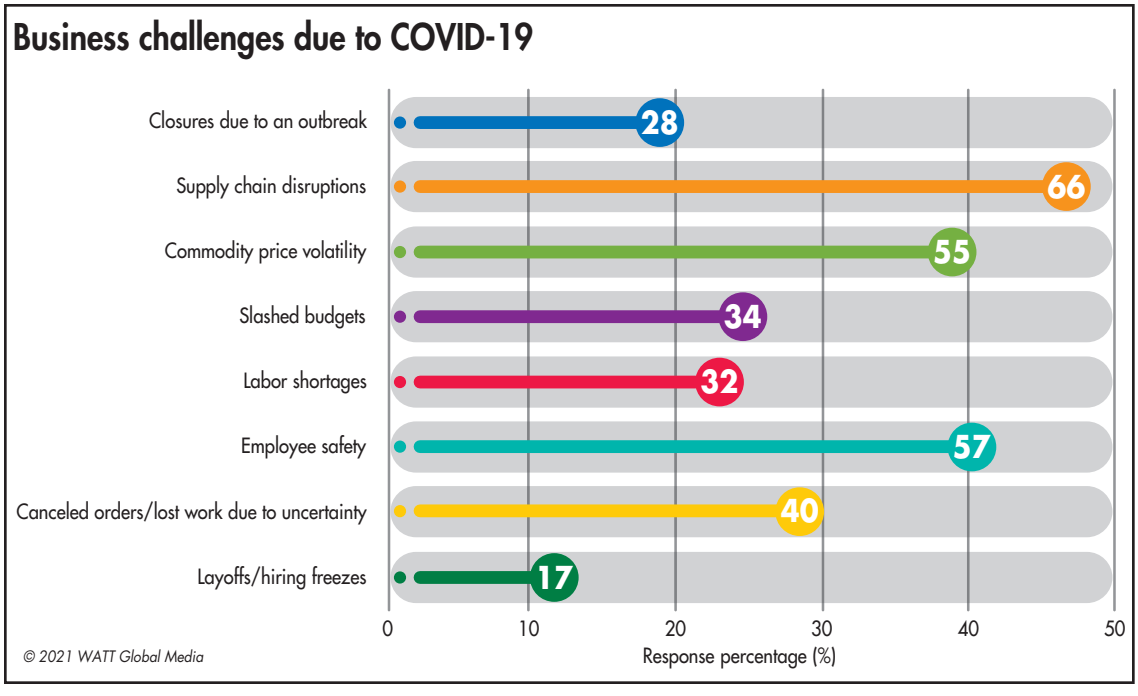
## Poultry, feed industry survey respondents are cautiously optimistic about business in 2021, but also preparing to bear challenges ahead

JACKIE ROEMBKE

WATT Global Media's annual Poultry Feed & Nutrition Survey offers a firsthand look at the macro trends impacting the poultry industry worldwide, providing a glimpse into the ways poultry producers, nutritionists and feed manufacturers are adapting to these changes and challenges.

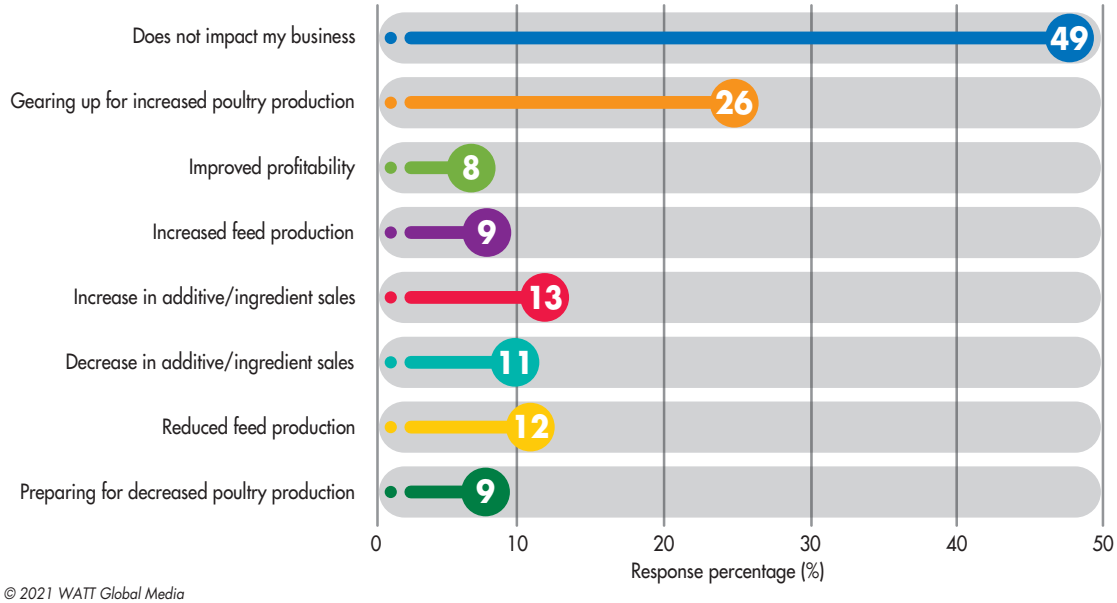
The 2021 edition of the survey includes input from 560 respondents from around the world. More than half of survey participants are nutritionists, consultants and veterinarians; 16% work in live production management or own a poultry farm.

Dominating the discussion this year are the lingering effects




**Aside from the employee safety challenges (57%) posed by the COVID-19 pandemic, supply chain disruptions (66%), commodity price volatility (55%) and lost business (40%) further taxed poultry and feed companies in 2020.**

## African swine fever's (ASF) impact over the next 12 months





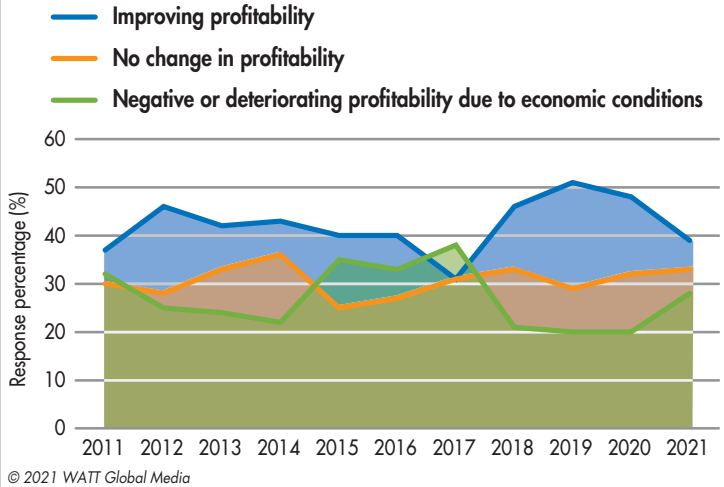

**Most survey respondents report being unaffected by the African swine fever (ASF) outbreak, but 26% think it will be the reason they ramp up poultry production in 2021.**

of the COVID-19 pandemic and grain price volatility. However, evergreen issues, such as the challenges of antibiotic-free (ABF) poultry production and feed additives alternatives for antibiotic growth promoters (AGPs), remain hot topics.

### The impact of COVID and ASF

When asked about the main difficulties their company faced in 2020 due to the COVID-19 pandemic, survey respondents (66%) cited that supply chain disruptions posed the greatest challenge to their business. In addition, the struggle to keep employees safe by securing personal protective equipment (PPE) and establishing social

## Profitability outlook, 2011-21






**Less than 40% of survey respondents are optimistic about their company's 2021 profitability, a 10% dip from 2019, the exact amount that shifted to reflect a negative revenue outlook.**

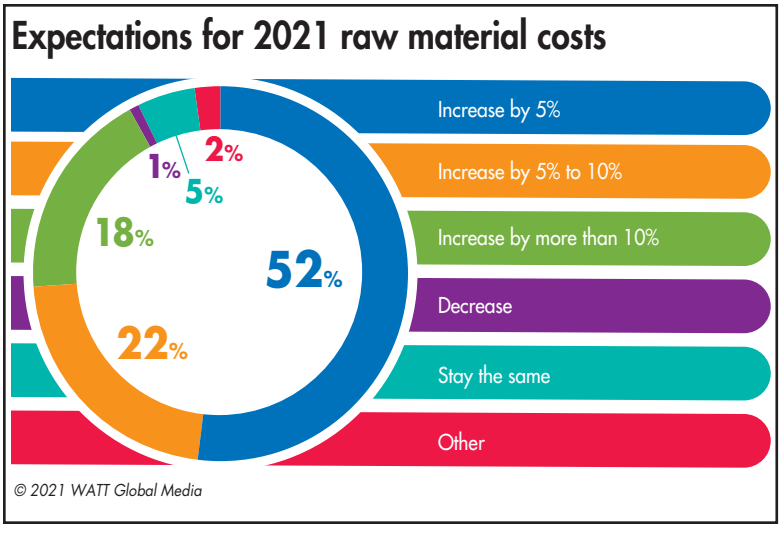
@ 2021 Poultry Feed Outlook: Prepare for market volatility: **bit.ly/3rFAqBL**

# 2021 Poultry Nutrition & Feed Survey

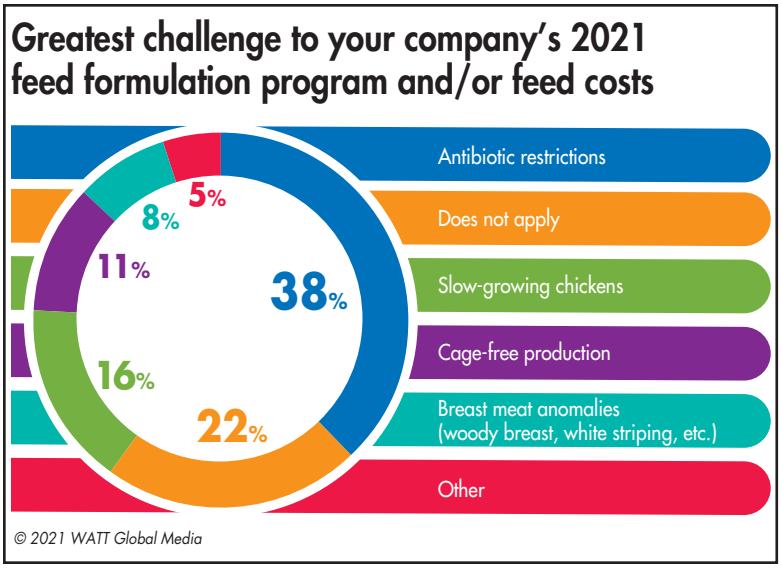
distancing procedures ranked as the second biggest obstacle (57%).

Commodity price volatility (55%), lost work or canceled orders due to market uncertainty (40%) and slashed budgets (34%) rounded out the respondent's top 5 COVID-related stressors.

In 2021, 38% of survey participants believe their feed production will increase, and 40% feel it will stay the same as in 2020.




**Antibiotic reduction and elimination efforts continue to be the No. 1 production trend to challenge feeding programs.**




**Thirty-eight percent of respondents believe raw material costs will increase by 5% to 10% in 2021 and 32% anticipate increases of 10% or more. Virtually none of respondents (>2%) expect grain prices to decrease.**

Twenty-six percent of respondents believe the continued fallout from the African swine fever (ASF) virus, which has plagued Chinese and Southeast Asian pig herds since mid-2018, will be the reason they ramp up their poultry production in 2021; 13% feel it will result in increased feed additive sales this year. Meanwhile, 12% believe ASF will be to blame for their decreased 2021 feed production.

## 2021 profitability outlook

Coming off 2020, survey respondents have a much less optimistic outlook for the year ahead than in previous editions of the survey, with less than 40% believing profitability will improve, 28% bracing for deteriorated profitability, and 33% feeling profits will remain flat. This is compared with 2019, for example, when more than 50% of respondents felt profitability would improve.

When asked to weigh in on the primary challenges their business faces in 2021, 85% cited the cost of grain and its quality (68%) as two of their top concerns. In fact, 38% of survey respondents anticipate their grain costs increasing by between 1% and 5% in 2021; 32% fear they will increase by more than 10% this year. Only 8% are optimistic they will stay the same as in 2020.

Sixty-three percent of respondents believe rising feed additive and micro-ingredient prices will become their No. 3 biggest challenge, which likely relates to supply

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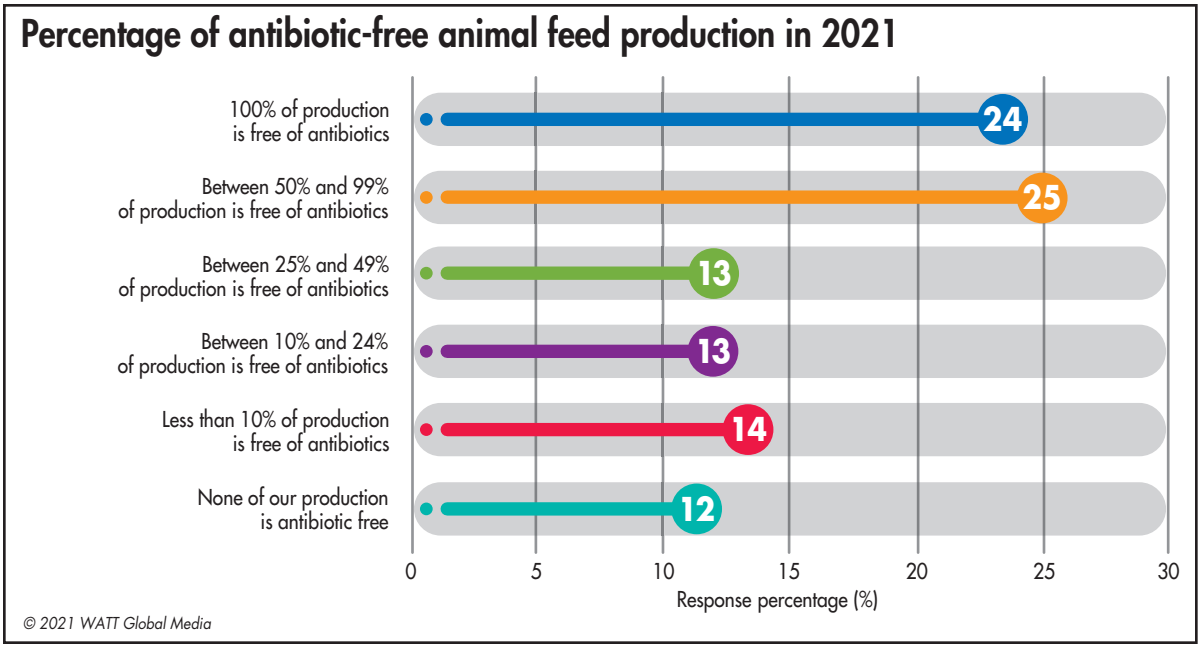
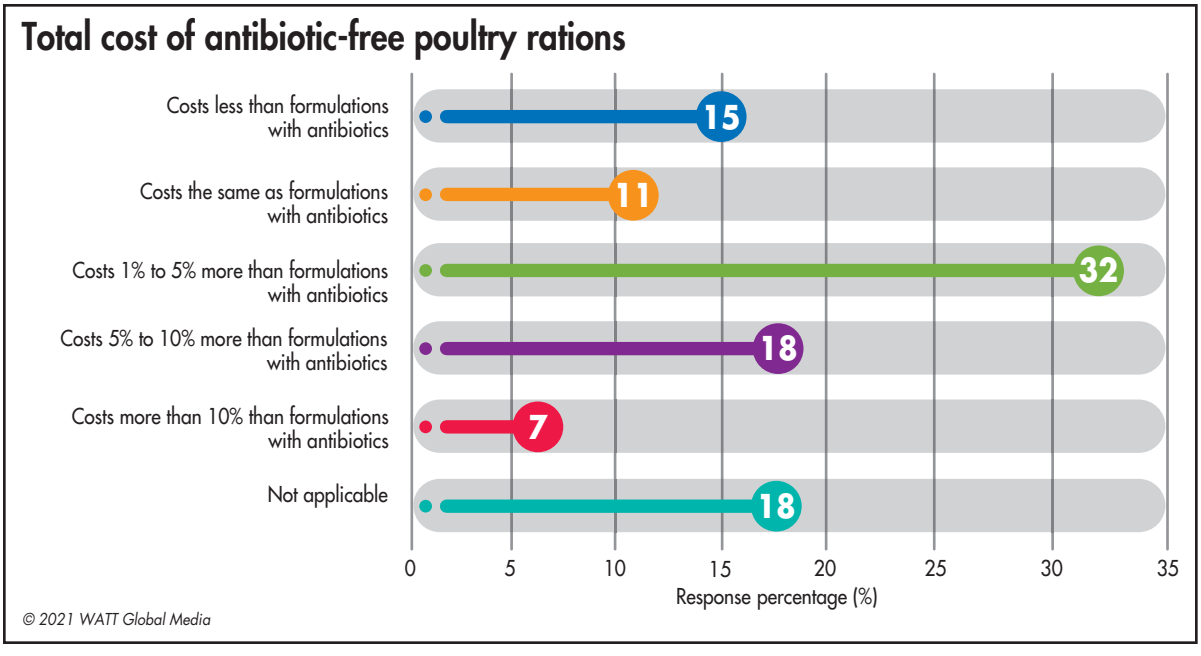
chain risk (60%), one of their top No. 4 greatest concerns. Tied for fourth place, poultry and feed producers foresee tightened or deteriorating margins (60%) on the horizon this year.

## Antibiotic reduction, elimination challenges

Asked to identify which poultry




Twenty-four percent of respondents report their operation(s) being 100% antibiotic free; 25% say between 50% and 99% of their poultry production is free of antibiotics.




Most respondents (32%) report moderate increases to feed costs — 1% to 5% — when formulating antibiotic-free rations; 18% cite cost increases between 5% and 10%.

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1 Data on file.


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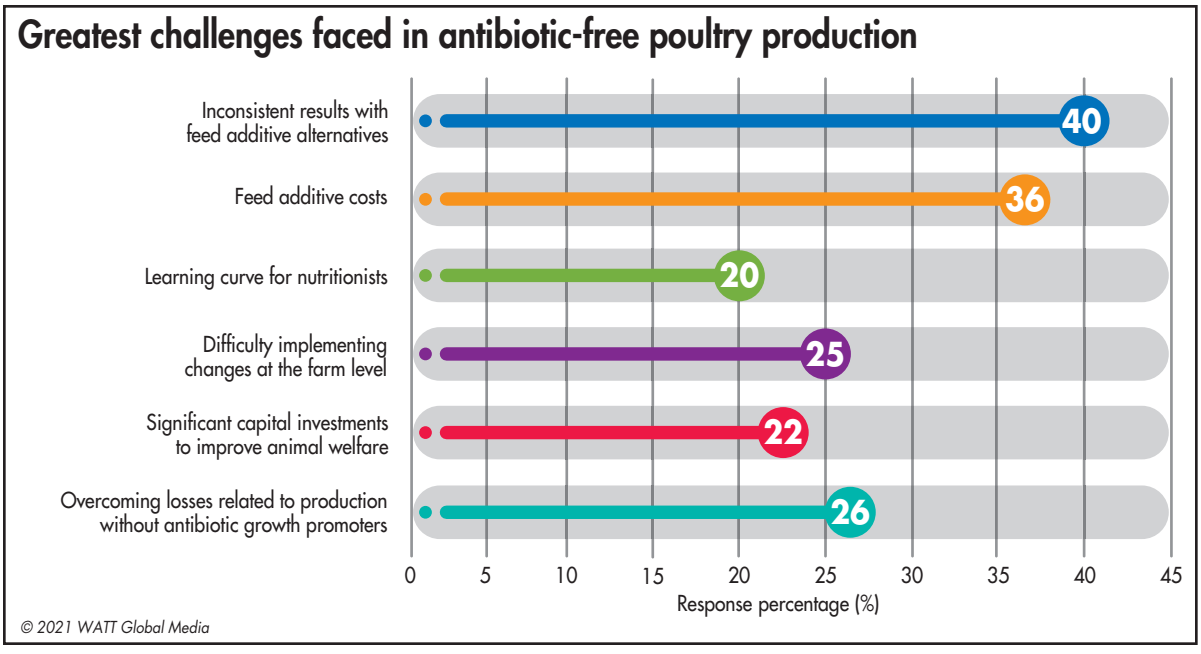
# 2021 Poultry Nutrition & Feed Survey



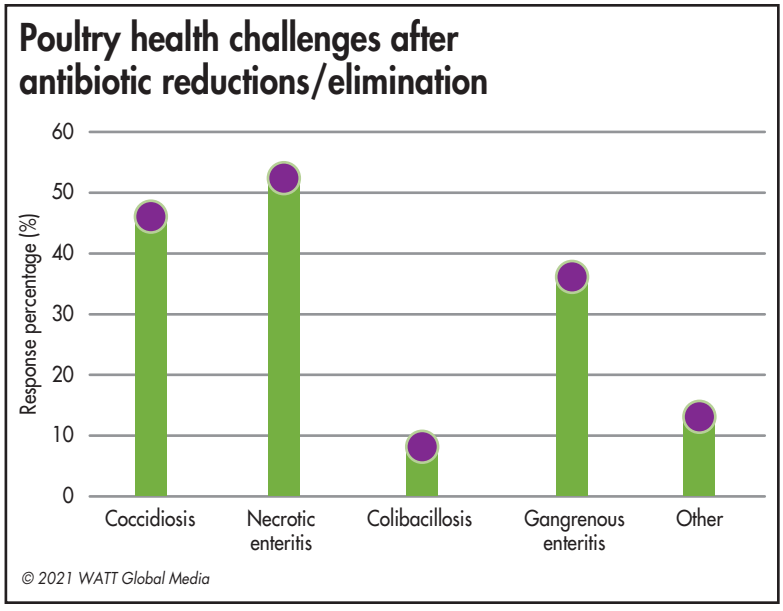

**Unreliable antibiotic alternatives, high feed additive costs and overcoming the losses related to AGP-free production continue to challenge poultry producers who have reduced or eliminated their antibiotic usage.**

production trends have the most significant impact on their feed costs and formulation programs, 38% of respondents cited antibiotic restrictions as their No. 1 production challenge in 2021 and 15% point to slow-growing chicken production.

Eighty-eight percent of 2021 survey participants report having some degree of ABF production in their poultry operations, with 25% stating that 100% of their production is ABF.

According to 32% of respondents, ABF poultry rations cost between 1% to 5% more than traditional formulations; 19% say their costs for ABF feeds have increased by 5% to 10%. In contrast, 15% note that their company's formulations actually cost less without them; and 11% say it stayed the same.

In their opinion, the No. 1 challenge in making the transition to ABF poultry production can be attributed to the inconsistent results they have experienced with feed additive alternatives (40%). In addition, the cost of feed additives (35%), the losses




**Respondents note increases in necrotic enteritis (55%) and coccidiosis (49%) in their flocks once antibiotics were reduced or eliminated from production.**

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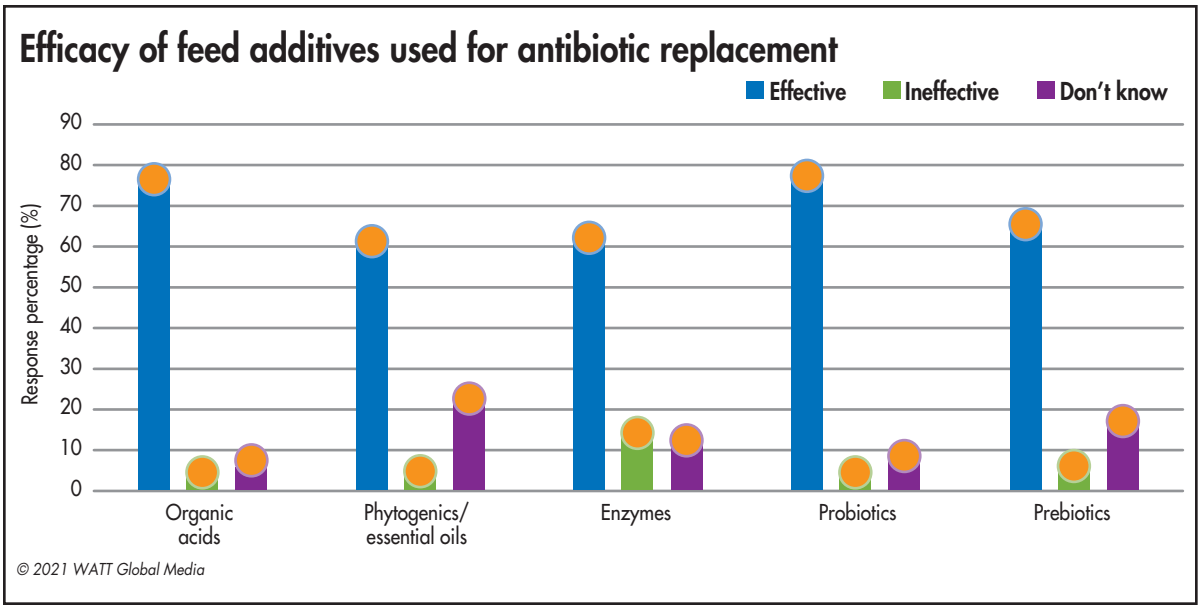
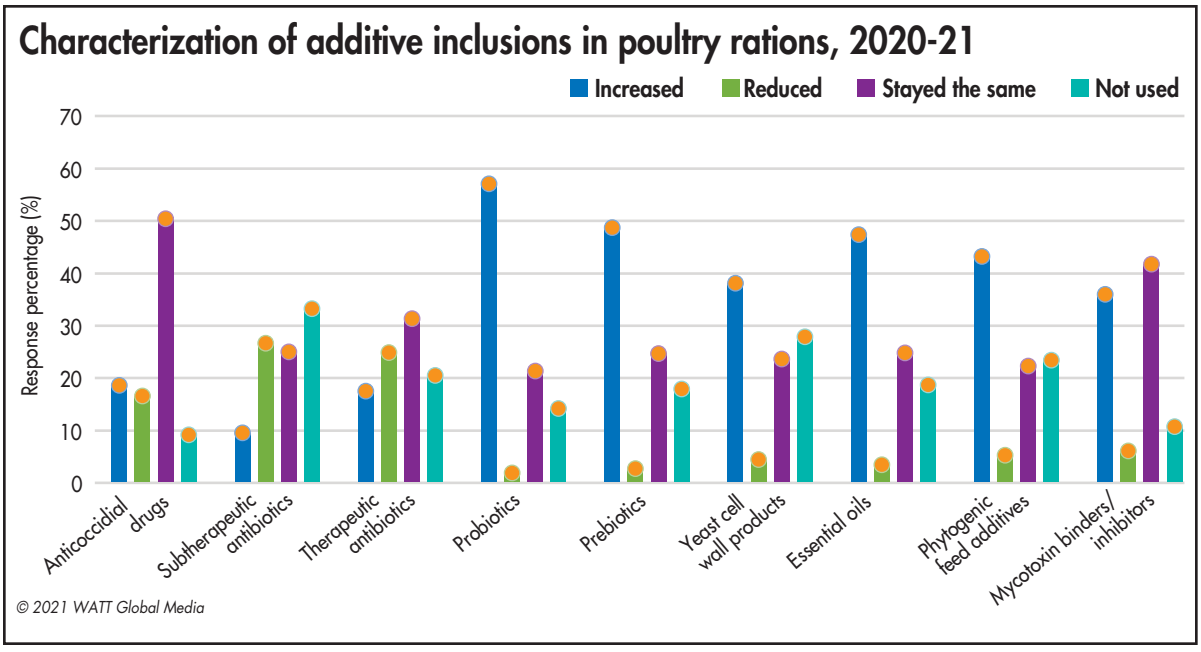
# 2021 Poultry Feed & Nutrition Survey



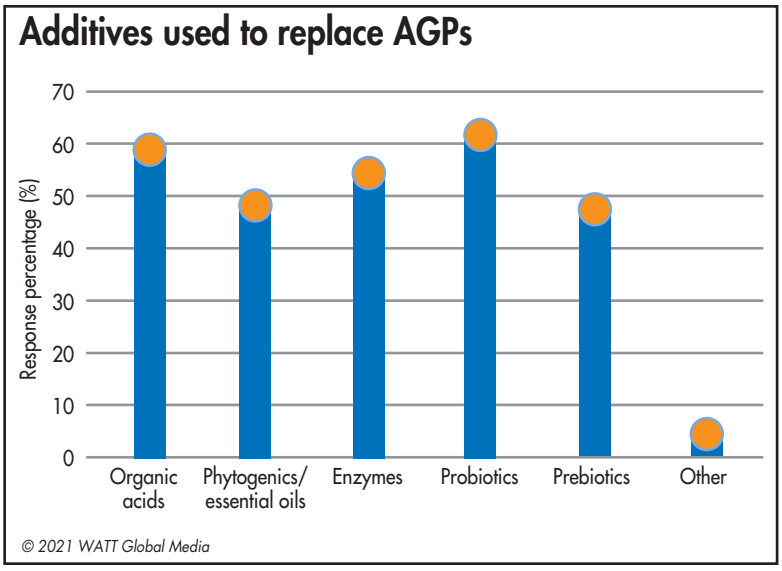

**Probiotics and organics acids — when used alone or in combination with other additives — rank highly as effective solutions in antibiotic-free diets. Eighteen percent feel enzymes are ineffective as an AGP replacement solution.**




**Survey respondents report plans to increase their use of probiotics (59%), prebiotics (50%), essential oils (49%) and phytogenic feed additives (44%) in 2021.**

related to the elimination of AGPs and the difficulty implementing changes on the farm level (25%) further complicate the effort.

Since eliminating or reducing antibiotic usage in their poultry feed, respondents cite increased incidents of necrotic enteritis (55%), coccidiosis (49%) and colibacillosis (39%).




**As part of their AGP replacement strategy, respondents report utilizing and/or combining probiotics (64%), organics acids (61%) and enzymes (57%). Fifty-one percent include phytogenic feed additives.**

## Exploring AGP alternatives

Seventy-three percent of respondents report that their company is actively exploring, testing or using feed additives as antibiotic alternatives or replacement solutions.

In an attempt to recapture the production gains AGPs provided, survey respondents incorporate different feed additives into their rations to bridge the gap. Probiotics (65%) and organic acids (62%) ranked as the most popular AGP alternatives, followed by enzymes (58%) and phytogenic feed additives (51%).

Respondents found organic acids (81%), probiotics (81%) and prebiotics (69%) to be the most effective feed additives alternatives for in-feed antibiotics. Phytogenic feed additives and essential oils were deemed effective by 65% of respondents; however, 27% felt they could not comment on the efficacy of the category.

Comparing their outlook for 2021 inclusions against 2020, respondents will increase their use of probiotics (59%), prebiotics (50%) and essential oils (49%) this year. Twenty-eight percent will decrease their use of subtherapeutic and therapeutic (26%) antibiotics. ■

## Who's behind the formulations?

Respondents indicate that 44% of the companies represented in the 2021 survey employ in-house nutritionists, 14% rely on independent consultants and 27% utilize both in the development of their company's nutrition program.

## Survey response breakout

The 2021 Poultry Feed & Nutrition Survey includes input from 560 poultry and feed industry stakeholders worldwide. This WATT Global Media special report seeks to identify the feeding and external trends shaping these sectors during the last 12 months. It was conducted in English and Spanish.

### Participants included:

- Nutritionists: **26%**
- Consultants: **13%**
- Veterinarians: **18%**
- General administration: **5%**
- Poultry farm owner/grower: **9%**
- Live production management: **7%**
- Marketing and sales: **10%**
- Feed mill/plant operations: **3%**
- Quality control, purchasing agent, other: **9%**

### Responses from:

- Latin America: **38.5%**
- United States/Canada: **17%**
- Asia/Pacific: **18%**
- Europe: **12%**
- Africa: **10%**
- Middle East: **4.5%**

### Sectors:

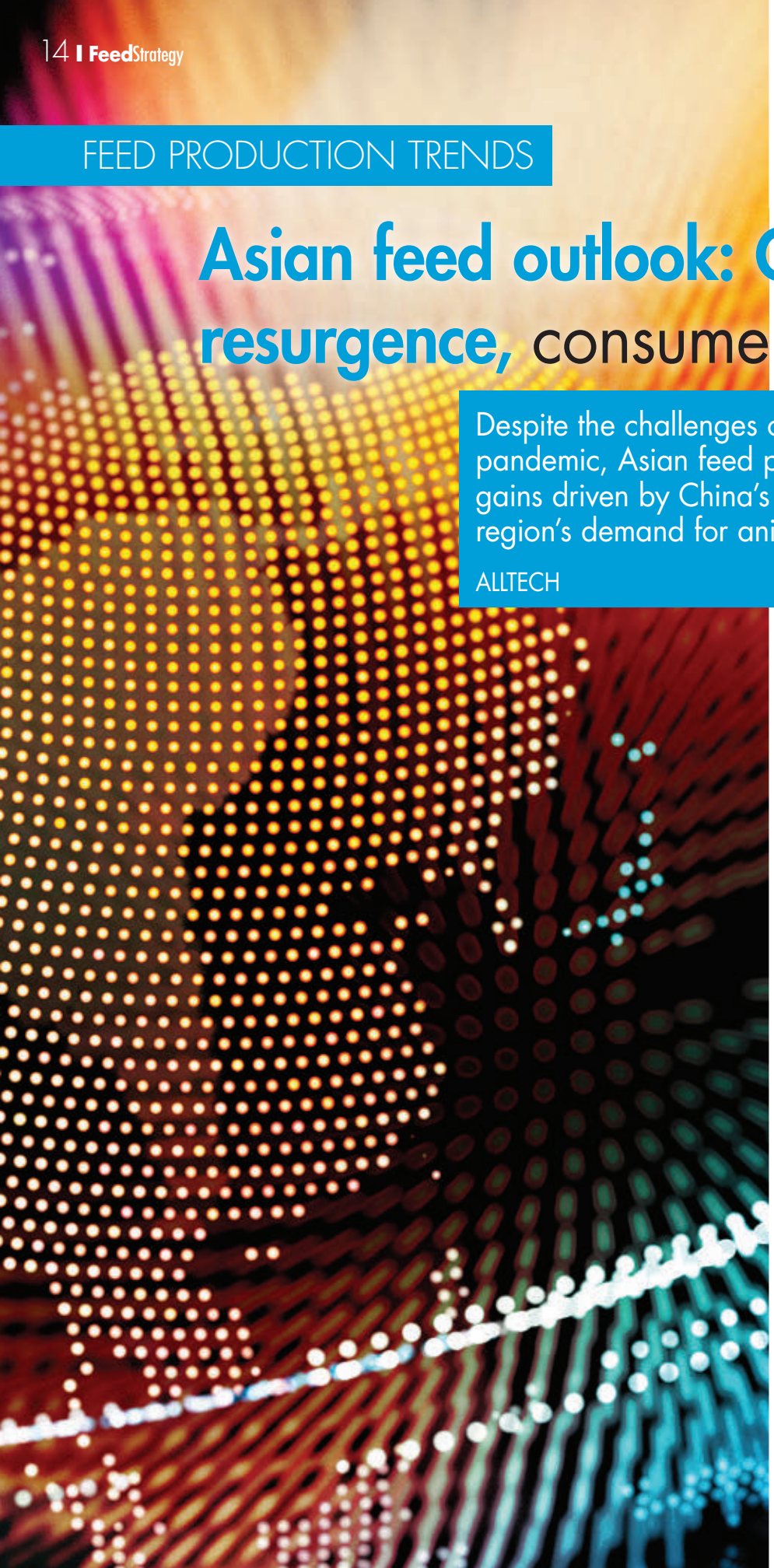
- Consultant/ veterinarian/nutritionist: **32%**
- Broiler production: **13%**
- Feed manufacturing: **15%**
- Egg production: **10%**
- Manufacturing/distributing feed additives: **10%**
- Breeder farm/hatchery: **6%**
- Premix manufacturing: **5%**
- Turkey/duck production: **1%**
- Poultry processing: **1%**
- Other: **7%**

FEED PRODUCTION TRENDS

# Asian feed outlook: China's resurgence, consumer power

Despite the challenges of the COVID-19 pandemic, Asian feed production experienced gains driven by China's ASF recovery and the region's demand for animal protein.

ALLTECH



COVID-19 was a major disruptor across the world in 2020. In Asia, the industrial channel shifted from food-service to retail and online, due to the closing of wet markets as well as trade volatility. The supply chain, worker absences, logistics and distribution issues, and the supply and pricing of inputs like feed additives, animal health and genetics are critical challenges for everyone. However, there were opportunities that allowed Asia to thrive and grow last year.

## Asian 2020 feed production trends

Based on an analysis of the 2021 Alltech Global Feed Survey, feed production recovery increased gradually in China in 2020, with 5% growth, allowing China to reclaim its position as the top feed-producing country, with 240 million metric tons (MMT). After a series of disease, food

oxign | iStock.com

safety and environmental challenges, feed production in China has emerged as one of the most high-tech industries in the world, utilizing new technology and new investments at a faster pace than anywhere else. This resurgence is related to African swine fever (ASF) controlling the swine restocking program in China and producers exploring the production of other species to find a protein replacement for pork.

The rest of Asia — Southeast Asia in particular — has seen a recovery from ASF. Vietnam ended 2020 at 80% of its pre-ASF production rate and has seemed to come through COVID-19 relatively strong and less affected than the rest of the region. Vietnam's population is still largely under 35 years old and consumes more protein and dairy. Disease challenges have remained while the country is recovering from ASF; we have seen an outbreak of avian influenza in the northern region.

Even though Asia experienced a lower domestic meat consumption during the COVID-19 lockdown for a few months in 2020, which resulted in a slight decrease in livestock and feed production, overall, feed production in Thailand increased by approximately 4% by the end of the year. The export of chicken to Japan, England and the EU was a main factor in the 1% increase of broiler feed production. The growth of aqua and pet feed production was also another factor in the increase of feed production in Thailand. While pig and pig feed production decreased by around 4.5% due to the ASF situation in neighboring countries, Thailand's COVID-19 measures forced swine farms to slow down their pig production, and consumers consumed less pork.

COVID-19 impacted the animal feed industry in India, which saw its feed production decrease by 5%, to 39.3 MMT. Noticeable declines were seen in aquaculture (by 5.65%), dairy (by 5.89%) and broiler feed production (by 8.73%). The lockdown across the Indian states resulted in the disruption of the supply chain, and the movement of animal products halted, with chicken and milk products becoming scarce for many weeks. Later, in the second half of the year, India witnessed the revival of its animal industry, as well as a rise in consumer demand.

Globally, pork production is set to grow faster than any other species in 2021, largely because of the recovery from ASF in China and Vietnam. Poultry is also expected to grow — after COVID-19 restricted the sector's growth in 2020 — based on improvements in foodservice. After disruptions due to COVID-19 in 2020, aquaculture is forecast to return to steady growth in 2021. Beef should also return to modest growth in 2021, led by increases in North America, Brazil and even a new significant growth sector in China. Wild-catch seafood is expected to move in the opposite direction, however, with a small

## TOP 5 ASIAN FEED PRODUCING COUNTRIES IN 2020

| Country | 2019* | 2020* | Growth (%) |
|---|---|---|---|
| China | 228.9 | 240.0 | 5 |
| India | 41.4 | 39.3 | -5 |
| Japan | 25.3 | 25.2 | 0 |
| Thailand | 20.4 | 21.3 | 4 |
| South Korea | 20.5 | 20.8 | 1 |

*All numbers in million metric tons
Source: Alltech

**In 2020, Asian feed producers began to recover from 2019's African swine fever-driven production losses.**

decline, due to climatic conditions and reduced quotas.

The recovery from COVID-19 presents both opportunities and risks for the global animal protein industry. Major issues include the recovery of foodservice, labor availability and costs, supply chain transformations and food safety. The global animal protein trade continues to create areas of opportunity and risk as we head into 2021.

## China's ASF rebound

China is the largest of many areas facing uncertainty in terms of global trade. Restocking will continue, pressuring prices onto a downward track in the country. Improved biosecurity has proven to be effective, particularly on large-scale farms. Aggressive restocking and new farm expansions in 2020 will lead to a strong rebound in pork production in 2021 — with at least 10% year-over-year growth in output. The hog herd will likely recover to around 80% of its pre-ASF level in 2021.

According to the data from November 2020, production capacity has recovered to 90% of its 2017 statistics, and the number of live pigs has reached 396 million.

The industry is in recovery mode, with faster-growing production and a movement toward larger-scale pig farming. The largest integrators in China are expected to reach 120 million pigs in 2021. Investments will continue to flow into pig farming, driven by lucrative profits in 2020 and strong government support.

The swine market in China rebounded faster in 2020 than anyone could have expected. The third-quarter sow numbers totaled more than 38 million sows — almost a 30% increase year-over-year, and in line with the pre-ASF 2018 numbers. This is a result of the restructuring of the industry. Backyard contract farms have widely been replaced with modern facilities. Large pig producers

have taken an intensive, multistory, high-density approach, whereas others have taken more traditional approaches that still, for China, are very technologically advanced.

The reduction in backyard farms has increased the need for modern compound feeds. Waste that was previously fed to pigs is no longer an acceptable feedstock. The price of pork is CNY34 (US$5.28) per kilogram, and this has attracted major investment. The government has approved a record number of production licenses. However, the profit spread at the moment is narrowing due to the increased prices of raw materials — namely, corn and soy. The *per capita* pork demand has also declined to around 30 kilograms per person, which is down 11 kilograms from the peak in 2016. Will these factors affect China as an attractive export destination for overseas pork?

@ Alltech: Global animal feed production up 1% in 2020: **bit.ly/3oRuzaE**

Efficiencies in the sector are low by international standards, with the number of pigs per sow per year averaging 19. How will this change in light of the fact that breeding sows have largely come from commercial three-way crosses, rather than from pure genetics? This has implications for the feed conversion ratio (FCR) and pigs per sow per year (PSY), as well as overall efficiencies.

Pork imports are expected to decline in 2021, after reaching a record high in 2020. The demand for imports in 2021 will be weaker than in 2020. While still a deficit relative to historic consumption, the market expects this to result in a 20%–30% drop in pork imports, or

about 1 MMT, in 2021. Given the slower projected import demand in the coming years, as most economies are facing less robust growth in the interim, this may leave more sizable volumes on the domestic market. This is likely to translate into weaker product pricing and lower hog values.

In the poultry sector, China's prices improved slightly in the second half of 2020 as the world market demand for poultry steadily recovered, but the growth rate was still lower than expected. Supply will continue to increase in 2021, and the market will continue to adjust. The production of China's high-yield layers reached around 22 million tons in 2020 and increased by around 15% compared with the same period in 2019.

## Changing Asia consumers

A digital business transformation in agricultural integration is underway in Asia. Digitalization and investment in storage and logistics are creating a paradigm shift in the food supply chain. Large e-commerce platforms will drive industry consolidation to create super platforms. As many of us have personally experienced, COVID-19 has changed many people's working styles and lifestyles, with more people working from home. Connecting with clients virtually has been widely adopted, and events, conferences and networking have moved to online platforms.

## WORLD'S TOP 10 FEED PRODUCING COUNTRIES

| Ranking | Country | 2019* | 2020* | Growth (%) |
|---|---|---|---|---|
| 1 | China | 228.9 | 240.0 | 5 |
| 2 | United States | 214.4 | 215.9 | 1 |
| 3 | Brazil | 70.4 | 77.6 | 10 |
| 4 | India | 41.4 | 39.3 | -5 |
| 5 | Mexico | 36.5 | 37.9 | 4 |
| 6 | Spain | 34.8 | 34.8 | 0 |
| 7 | Russia | 30.3 | 31.3 | 3 |
| 8 | Japan | 25.3 | 25.2 | 0 |
| 9 | Germany | 25.0 | 24.9 | 0 |
| 10 | Argentina | 21.0 | 22.5 | 7 |

**All numbers are in million metric tons*
*Source: Alltech*

**Despite the COVID-19 pandemic and the lingering effects of African swine fever, Chinese feed production increase by 5% over its 2019 tonnage — reclaiming its position as the world's No. 1 feed producing country.**

A major trend in Asia has been the influence and power of the consumer, especially online consumers. COVID-19 caused a huge shift, as Asian consumers began to spend more money and time on their health and cooking at home. Seventy percent of online shoppers in China bought fresh groceries online more than two times per week in 2020. This is a massive change from the wet market. Online grocery shopping is expected to grow at a compounded annual growth rate of 29% over the next five years and will represent a US$298 billion market by 2025. What implications does this have for traceability, production and the cold chain in the new online segment?

The values of Asian consumers have also been positively shifting to focus more on sustainability, health and the joy of life. Consumers are not only choosing good-quality products, but they are also looking at the value of the brand. Multi-livestream selling — such as Pinduoduo, linking food producers direct to consumers — has allowed them to access food more widely and rapidly at a good price.

COVID-19 has led to many changes and disruptions globally over the past year. The drive for efficiencies in production and diseases remains a concern, but demographic trends and the new consumer power in online retailing represent a wealth of opportunities. ■

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# How to manage feed costs amid high corn and soy prices

**Experts: Managing feed costs with US$14 soybeans is possible, but requires out-of-the-box solutions**

**Emma Penrod**

The agricultural world had no shortage of economic turmoil when 2020 began. African swine fever continued to rage in Europe and Asia, and then COVID-19 cut a similar path across the globe, making its way to the Americas and shutting down factories, shipping lines and, eventually, meat processing plants. Yet in the midst of it all, one thing the world did not have a shortage of was soybeans.

For the first half of the year, soybeans sold for less than US$10 per bushel and seemed quite stable, recalls Fernando Caja Del Prado, a purchasing manager at Nutreco's Nanta Group. Farmers entered the year with a glut of unsold beans leftover as a result of the U.S.-China trade war, and the weather seemed to foretell another year of high crop yields.

Fortunes began to change after the August derecho raised the specter of crop damage and, by September, prices began to climb. But the real game changer came when China suddenly began to buy corn and soybeans far in excess of any previous prediction.

"A lot of us didn't see this coming," says Hans Stein, a professor of animal science at the University of Illinois. "This is just bad luck and some circumstances we didn't know would come, and therefore things have turned out the way they have."

By early 2021, soybean prices exceeded US$14 per bushel and corn surpassed US$5.50, pushing many farmers, according to a February report, to seek out less expensive alternatives or even food-grade grains.

With high prices for critical ingredients across the board, there is little animal producers can do to avoid high feed prices entirely, according to Ester Vinyeta Punti, global nutrition manager for Nutreco. But there are strategies that can be employed — immediately and long term — to reduce some of the financial pain.

## Ingredient swaps

When producers face abrupt increases in ingredient prices, the quickest solution, according to Stein, is often swapping the high-priced ingredient for something similar but affordable. The trick to this, he says, is that the best options will vary considerably based on one's location.

Rice bran, for example, might be a good alternative for producers in Missouri or Arkansas with ready access to a rice mill, but in Illinois or Iowa, hauling the rice bran north could prove cost prohibitive. In the Midwest, producers often turn to distillers' grains to replace soybeans, but with the decreased demand for ethanol due to the pandemic, distiller's grains are hard to come by. An alternative to the alternative, Stein says, might be corn germ meal or corn gluten feed from a wet milling facility.

The corn gluten recommendation comes with a caveat, Stein says: The quality can be highly variable.

For unreliable ingredients like corn gluten, or any unfamiliar feed ingredient, Stein says, it's

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important to collect a sample and conduct a nutritional analysis. Without this, the nutritional content of the entire diet could be thrown off balance; you can't just take one ingredient out and swap it for another and assume everything will be fine, he says.

Another effective strategy, Stein says, is to look for waste products available from human food processing. Bakery meal, he says, is such a good ingredient that companies have sprung up to collect leftover bread and cereals, strip them of their packaging, and resell them to animal producers.

"Some people have even been able to buy dog food that is off spec and cannot be used for dogs," Stein says, "but can be used for pigs."

These kinds of opportunities tend to come and go, Stein says, so taking advantage of them requires developing long-term relationships with local mills or brokers who can flag, for example, a batch of dog food that got recalled because it was mislabeled.

A final option, if producers are really struggling to find suitable ingredients in their area, is to blend old, dirty or even contaminated grain with better-quality feedstuffs.

"If the mycotoxins are not too high and you can clean it very well," Stein says, "you may be able to blend it down and mix in clean corn."

## Alternative ingredients

Alternative ingredients can help with shot-term price hikes, but they're usually a temporary solution at best, according to Bart Borg of Standard Nutrition.

"Alternatives to soybean meal and corn travel in lockstep on price with soy and corn," Borg says. "Those selling those ingredients are aware that if they're a substitute to corn and corn has doubled in price, they can now double their price."

For most alternatives, Borg says, there is a brief window of opportunity where the alternative is truly a solution to high prices.

## HOW TO MANAGE FEED COSTS

But that window may last a month or less before alternative prices catch up with conventional ingredients and, in the case of 2021, he says, the ship for most alternatives has already sailed.

There are, however, price coping strategies that do not rely on alternative ingredients, but on milling and husbandry practices.

One of the first solutions he employs, Borg says, is to check the particle size of his feed.

"The finer the grind, the better the digestibility, so every pound that you buy goes further and the animal is getting more out of it than if you have whole corn or very course particles," he says.

**With commodity prices rising, experts note that alternative ingredients aren't the only option for reducing costs.**

*Alfribeiro | iStock.com*

What's driving grain price volatility in 2021? **bit.ly/3jScvwl**

Unfortunately, no study has shown that grinding soybeans will improve the digestibility of the amino acids — the solution there, according to Borg, is probably crystalline amino acids. For improving energy efficiency, he says, the only downside to downsizing your particle size is that feed flow can become a problem in automatic feeders.

"If you're using an automated system, my suggestion is to keep trying to get your corn finer until you find that you need to tap on the bin to get it to start flowing," he says. "Then back off a bit. Make it a little more coarse so it will flow."

Particle size, Borg says, also matters for producers who use pelleted feeds, which means times of high ingredient prices are also good times to check your mill's processing standards.

Managing feed safety and quality is also especially important during times of high ingredient prices, according to Roland van Dalem, marketing manager for Selko Feed Additives. Pathogens that may enter feed products may consume nutrients, decreasing feed efficiency and, should an animal become sick, the illness may interfere with its ability to absorb nutrients.

In addition to good mill management, Stein says producers may find it worthwhile in the long term to expand their grain bin capacity. With more bins, he says, producers are better positioned to take advantage of opportunities to pick up cheap quality feedstuffs they can store away for times of economic uncertainty, even if those ingredients are outside the standard fare like corn and soybeans.

"Having more different bins is important," he says. "If you want to be able to take advantage of whatever opportunities come your way, you have to have those bins."

Another area Borg says he has experimented with in his own animals is optimizing diets for price performance, rather than maximum growth.

"In times of high feedstuff costs, you need to stand back and … realize, 'I'm going to lose a little bit of average daily gain and feed conversion may go up,'" Borg says, "but the savings on those ingredients may be greater than what your loss is."

The one production management strategy Stein does not recommend is culling or cutting herd numbers to reduce feed consumption. There are signs this is happening, he says, but

in the long run, it rarely works out for the producer who adopts this strategy because by the time they reap the imagined cost savings, prices have changed — including, often, the market price for pork or poultry.

"Usually trying to jump in and out of the market, you mistime it, has been my experience," he says. "I don't think I would advise that. It's a risky strategy, jumping in out of the market."

## Long-term strategy

Forward contracting and staying on top of commodities markets is also an important long-term strategy for mitigating financial risk, according to Paul Bertels, principal economist for Farm Gate Insights. While this latest round of price increases may have caught many off guard, there were early signs of trouble with nations such as Ukraine and Russia taking steps to curb grain exports in early 2020. Producers who felt caught off guard shouldn't beat themselves up too badly, he said, because prices rose over a very short period of time. But it was possible to see this coming, he said, and highlights the need for producers to pay attention to international markets besides major producers like the U.S.

"To put it in economic terms, the U.S. is the residual supplier of grain," Bertels said. "We are the world's grain storage. As we saw dramatically this year, when everyone else is out [of grain], they come running to America because we're usually not out." ■

*Emma Penrod has covered science and business, with an emphasis on health, the environment and agriculture, for more than a decade. Penrod covers the animal feed industry for FeedStrategy.com.*

# Antibiotic-free production continues to evolve

## Alternatives to antibiotics gain popularity as consumer demand increases and regional regulations change

ANN REUS

Antibiotic-free (ABF) poultry and livestock production has evolved across species and regionally throughout the past decade as new and better antibiotic alternatives gain popularity and consumer demand increases.

Today, approximately 60% of U.S. broiler production is antibiotic free, and the broiler industry has paved the way for ABF production in other species. Overall, ABF production is expected to continue to grow.

"The conversation has shifted significantly over the last 10 years — from feasibility to implementation and now the focus is better tools in the ABF toolbox," said Marilynn Finklin, technical services manager at Kemin Animal Nutrition and Health – North America. "I'd certainly expect ABF poultry production to continue to rise moving forward, due in large part to consumer demand and regulated phase-out of some existing conventional production tools."

There is no one alternative that can completely replace antibiotics, but combinations of several feed additives have been implemented with success in ABF production, including phytogenics, probiotics and prebiotics.

"Combinations of different products are going to be the way forward to find the best fit for different production systems, at different ages of production, in different parts of the world, for different markets," said Mark Blakley, technical services manager at Quality Technology International.

### Growth of antibiotic alternatives

Phytogenics are plant-based substances, which include herbs and spices, essential oils, polyphenols, saponins and tannins, and can provide a line of defense against disease in an animal's digestive tract.

"Phytogenics represent a cost-effective, natural source of microbial suppression for poultry producers looking to reduce usage of antibiotics or bolster their existing ABF programs," said Karen Pollock, technical services manager at Kemin. "However, not all phytogenics are created equal or have the same impact on animal health. It's crucial to ensure (phytogenic feed additives) are closely monitored for quality, concentration and consistency — as no two plants or sources they are derived from are likely to be identical."

"Natural essential oils, such as oregano oil, are becoming increasingly popular in helping to support livestock health and performance in the absence of antibiotics," said Andrew Jackson, global commercial director at Anparo PLC.

For example, natural oregano essential oil is shown to have

**Approximately 60% of broiler production in the U.S. is antibiotic free.** *davit85 | AdobeStock.com*

anti-bacterial, antioxidant and anti-inflammatory properties — as well as supporting immunomodulatory functions; it is also a natural flavoring compound.

Probiotics and prebiotics work together: probiotics promote healthy gut microbiota while prebiotics provide a substrate on which the beneficial bacteria can colonize and grow.

"Ensuring a well-developed gut with optimal microbial populations, known as a state of eubiosis, helps to support optimal livestock performance and enables animals to better deal with environmental challenge, reducing the need for antibiotics," Jackson said. "It is well recognized that a healthy gut has a profound impact on regulation of metabolic and immune functions, as well as development of gut structures, such as villi for optimum nutrient absorption, thus positively influencing both animal health and performance."

Pollock said use of probiotics and prebiotics have increased in recent years as more integrators have shifted to ABF production.

Additionally, she said, "Outside of strict ABF production, the swine industry has also benefited from probiotics and prebiotics in combination with antibiotics — so there is certainly a conventional production use and benefit as well. As research grows in this space, there is the potential to see more probiotic usage to tackle specific diseases, especially when the aim is to improve feed efficiency."

Blakley said prebiotics may add even more benefits, such as mycotoxin mitigation.

"They also provide spaces for some bacteria and some toxins to actually attach some of your mycotoxins to the prebiotics," he said. "And some of your bacteria, particularly *Salmonella* and *E. coli*, will attach to these prebiotics. And some of that prebiotic structure then is passed out the back end, so they don't cause trouble in the intestine or, in the case of mycotoxins, they don't get absorbed into the bloodstream and go to the liver and cause their damage."

## ABF production across regions, species

ABF production started in Europe, then moved to the U.S., with Latin America adopting the practice more slowly — with the exception of Brazil, which exports a lot of meat to the EU and China.

"But now, it's expanded further than that. There are a number of countries, China, in Southeast Asia, parts of Central and South America, all those countries are now drawing a line in the sand saying, 'At this date, we are going to ban growth-promoting antibiotics in feed.' And some of these are banning antibiotics altogether in the feed. So, the rest of the world is coming along," Blakley said.

PODCAST: Important factors in antibiotic-free production: **bit.ly/3kgJ1sd**

In the U.S., he said, ABF production began with the broiler industry. The egg industry has embraced ABF production while the turkey industry has lagged behind for several reasons, he said.

"You keep the turkeys for so long. Keeping a heavy tom for five months is a long time for things to go wrong," Blakley said. "And turkeys have more issues than broilers. There are more and different pathogens that affect the good health of turkey. And our choices on products available for turkeys is more limited."

ABF production in the poultry industry has grown more quickly than in the swine and ruminant industries, due to those species' unique challenges.

Denmark has taken the lead in ABF production in the swine industry, according to Victor Perez, technical services manager at Kemin. This has been driven by consumer demand, government regulations and economic measures.

"There has been active public engagement bringing together producers, government stakeholders and consumers from Denmark and other European countries," he said. "The United States, of course, has regulations surrounding antibiotic usage, but the structure and sheer size of the swine herd here in the U.S. substantially differs from that of Europe — making ABF production more challenging from many perspectives."

Because pigs of different ages live together on one farm, ABF production in pigs can have more obstacles, said Jessika van Leeuwen, global program manager, gut health at Trouw Nutrition.

"Therefore, we should focus on preventing the use of antibiotics critically important for humans, but also focus on the health of the animals," she said. "Trying to keep those animals as healthy as possible helps prevent the need for antibiotics. But when animals are sick, they need to be treated with antibiotics that work against those diseases."

Lessons learned in the poultry industry can be applied to other species, Finklin said.

"I'd expect a steady pickup (in the swine and ruminant industries) as consumer focus continues to trend in this direction and our alternative technologies continue to improve," she said. "There are poultry intestinal health learnings, for instance, that can be extrapolated and further explored for cross-species application."

## Consumer demand and retail commitments drive implementation

The driving force behind ABF production in all regions is consumer demand, sources agree, but there are other factors as well.

"Increased customer awareness and the involvement of fast food chains in the U.S. is speeding up the search for alternative approaches in this region," van Leeuwen said. "This trend is less clear in the swine sector, and we see more differences with regard to specific molecules that are prohibited in Europe, such as pharmacological levels of zinc oxide in piglets, and the use of certain antibiotics critically important to humans, according to (the World Health Organization). In (Latin America), there are specific countries that are exporting their animals or pork products to Europe or other countries, therefore they need to comply with the legislation in those countries."

Barbara Brutsaert, global program manager, poultry gut health at Trouw, said it is important for producers to realize how strong a force consumer demand is, and they should be prepared to pivot.

"The example of the U.S. reminds us all these changes in consumer demand can happen within a couple of years," she said. "It makes sense for producers to be prepared, whatever the situation is now. Replacing anti-microbials in a production system is possible, but it takes time and especially good preparation."

Meanwhile, in China and the EU,

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public health is the primary driver behind ABF production, according to Jackson.

"China is moving very quickly, with antibiotic use having fallen by 57% in only four years between 2014 and 2018. Previously, only the Netherlands had moved at a faster rate, achieving a 56% reduction between the years 2007 and 2012," he said. "In parts of Latin America, particularly Brazil, change is slower, but it is nonetheless happening and is driven particularly by the need to meet the demand of their export market to countries like China or regions like the EU."

While many experts believe ABF production will continue to grow, others say there will always be room for conventional production.

"Consumer demand will continue to affect and influence many parts of the world through the retailers and restaurant chains," Jackson said. "In some cases, it may eventually be that ABF becomes the norm, not the exception."

While Finklin thinks ABF production will see growth over the next five years, she expects it to level off eventually.

"The percentage of ABF production will plateau, with certain operations staying with conventional practices," she said. "Just as there will always be a place for antibiotics in livestock and poultry production as a necessary tool to improve animal health, it's important to remember that there will always be a place for conventional production."

She added that another important consumer demand is choice.

"Ultimately, consumers need — and demand — choice in the marketplace, and our industry has the tall task of keeping up with these needs. The important thing is that we keep moving forward to develop new solutions and technologies that improve overall animal health, efficiency and welfare," she said.

## Shifting the industry's focus

The growth in ABF production has meant more interest in intestinal health, biosecurity and vaccinations for coccidiosis in poultry.

"The shift toward ABF has renewed the industry's focus on intestinal health. This has led to the development of new products and technologies that benefit all producers, as well as the birds, from a health and welfare perspective," Finklin said.

Scientists have learned that antibiotics use can disrupt the microbial balance in the intestines, van Leeuwen said.

"This can result in damage to the intestinal integrity and intestinal inflammation with detrimental effects for the nutrient absorption capacity of the intestine," she said. "Using nutritional strategies that promote the growth of beneficial bacteria in the intestine, preventing the overgrowth of pathogens and promoting the microbial balance, results in a healthier intestine."

Jackson said stricter biosecurity measures on farms have had a positive effect on reducing the use of antibiotics around the world.

"This has been largely driven by the impact of avian influenza, African swine fever and other viral infections which had led to accelerated development of production facilities and systems that can maintain extremely high hygiene standards and biosecurity," he said. "A high health environment tends to reduce incidence of bacterial or viral challenge, resulting in lower levels of required antibiotic intervention."

Restrictions on the use of ionophores in ABF production has led to more use of alternative ways to control coccidiosis in poultry.

"The use of coccidiosis vaccines, chemical anti-coccidials and other promising alternatives — like phytogenics — has dramatically increased," Finklin said.

Brutsaert agreed that there is increasing interest in vaccinating broilers against coccidiosis, and pointed to a more holistic approach to production.

"We also see producers more interested in a holistic approach to produce ABF: for example, using a broad strategy based on feed, farm and health factors," she said. ■

# Emerging nutritional solutions for coccidiosis in poultry

## Coccidiosis and necrotic enteritis remain 2 of the most important poultry diseases in the US

IOANNIS MAVROMICHALIS

There are several nutritional supplements that can be used to fight coccidiosis.

*Iaroslav Konnikov | BigStock.com*

It is estimated that about US$10 billion are lost each year in the United States due to coccidiosis and necrotic enteritis. If we consider that coccidiosis is one of the predisposing factors to necrotic enteritis, then we can appreciate the extent of damage caused by coccidia alone.

Unfortunately, anti-coccidial drugs are being frowned upon in the U.S., in rearing schemes based upon the marketing approaches of "no antibiotics ever" or "reduced antibiotic use." Clearly, such approach does not help diminish the impact of coccidiosis. In the U.S., unlike the EU, anti-coccidial drugs are considered antibiotics and there is an increasing tendency to remove all such antibiotics from animal feeds.

In addition to alternative veterinary interventions (vaccinations) and altered management schemes, nutrition is the third route through which coccidiosis is addressed today. To this end, several nutritional supplements — additives — are being tested. These are mostly additives that have been tested, with more or less success, against bacterial pathogens. The following list is but the beginning of these efforts as more products enter the testing phase.

### Functional lipids

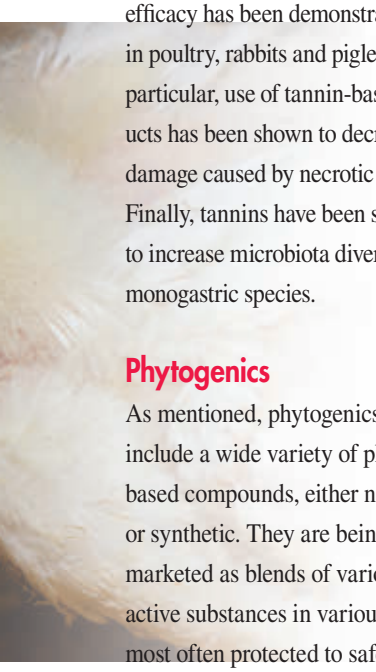
It has been suggested that lipids found in castor oil and cashew nut shells can act aggressively against gram-positive bacteria. The same was tested in two studies against coccidia. It was found that these two lipids increased bird livability and decreased lesions caused by coccidiosis. In essence, these lipids acted in a role similar to monensin, conferring similar beneficial results in birds challenged with coccidia.

### Tannins

This is a large group of chemical compounds found in plants. As such, they could be grouped under the more generic term "phytogenics," but they are being marketed as a distinct product.

@ Nutritional supplements to fight coccidiosis in broilers: **bit.ly/2Nd0DIQ**

At the moment, they appear to be the most promising agent against coccidia, although not all tannins are the same. Thus, their efficacy is bound to be product specific. Their efficacy has been demonstrated in poultry, rabbits and piglets. In particular, use of tannin-based products has been shown to decrease the damage caused by necrotic enteritis. Finally, tannins have been shown to increase microbiota diversity in monogastric species.



## Phytogenics

As mentioned, phytogenics include a wide variety of plant-based compounds, either natural or synthetic. They are being marketed as blends of various active substances in various forms, most often protected to safeguard against their volatile nature. As it is to be expected, their efficacy is widely variable. Given the large number of commercial products, research abounds and is the main focus on finding nutritional agents against coccidia.

## Organic acids

Organic acids are largely effective against bacteria. They are a major component of any antibiotic-free nutrition program in poultry. As it is to be expected, organic acids have been also tested against coccidia. The products used so far have largely failed to elicit any meaningful response. Perhaps they can be somewhat active against *Clostridium perfringens*, the causative factor behind necrotic enteritis, but they do not show much promise against Eimeria species — the protozoa that cause coccidiosis.

## Probiotics and prebiotics

No probiotic strain of bacteria has been shown to act directly against Eimeria species. It is possible, through genetic modification, where allowed, to see probiotics that are specifically designed for such purpose. So far, their action is indirect by enhancing the overall gut health as they promote a healthier microbiota. The same can be said for prebiotics that benefit natural host microbiota. The use of current pro- and prebiotics should be considered as an auxiliary one in a broader scheme against all microorganisms that negatively affect gut health.

## Algae

Recent evidence suggests that some algae-based products may modulate host immunity enough to offer a substantial relief against a coccidiosis challenge. Preliminary results point to a more robust gut epithelial architecture that can better withstand the aggressive action of damaging coccidia. The effects of different additives on host immunity is being investigated vigorously as this appears to be a viable route against coccidiosis.

Despite promising results from many unique additives, the bulk of available nutritional anti-microbial agents is largely ineffective against coccidia. At best, improved gut health helps the animal to fend off coccidia on its own. ■

*Ioannis Mavromichalis, Ph.D., is an animal nutrition industry consultant.*

# Fermented feed: Improve animal performance, ingredients

## Improving pig and poultry performance and getting more out of alternative raw materials are 2 reasons to consider this age-old technique

ZOE KAY

With feed being the greatest cost in pig and poultry production, any technology that can help reduce it is welcomed. Fermentation is an age-old technique that is becoming popular again in animal nutrition for this reason. A similar trend in human nutrition has led to an increase in sales of products like kefir, kombucha and sourdough bread.

The increased lactic acid bacterial content of fermented feed is associated with a lower feed pH and higher concentration of organic acids. For these reasons, gut health is improved, leading to benefits in growth, feed conversion and animal resilience. A push for more sustainable agriculture relies on the use of nonconventional raw materials, and fermentation is one way to improve their nutritional value.

### History of fermentation

The process of fermentation has been used to preserve

food for thousands of years. It improves the taste, smell and digestibility of many human foods. Lactic acid bacteria are used to produce yogurt and cheese, for example, while yeasts ferment products like beer, wine and bread. In order to ferment food, warmth and beneficial microorganisms are needed, as well as having strict processes to avoid contamination with other microorganisms. Many of these species of bacteria or yeast use glucose in the foodstuff and produce fermentation products including ethanol, carbon dioxide, lactic acid and acetic acid.

A wide variety of raw materials can be fermented, including cereals, protein meals and pulses. The raw materials are ground, then added with warm water and lactic acid bacteria into the fermenter — the process takes just a couple of days. In the case of wet feeding for pigs, producers may ferment their own, e.g., wheat and barley, before adding them to the rest of the diet, or fermented raw materials can be bought and added in. In commercial feed production for pigs and poultry, fermented raw materials can be added to diets, which have been dried, post fermentation. Some of these may be processed using a solid state fermentation (SSF) technique. This involves the use of specific microorganisms to ferment dry feedstuffs, which may then be crimped or ground for inclusion into diets.

**Fermenting feed for animals is not a new concept but one that is coming into vogue again, with the aim of saving money and improving the nutritional value of alternative raw materials.** *eakkachaister | iStock.com*

## Digestibility and gut health

Nutrients in fermented feed are more digestible and are more readily absorbed — better to meet the nutritional requirements of animals. Fermentation also increases the levels of B vitamins (folic acid, riboflavin, niacin and thiamin) and improves the content of naturally occurring enzymes in the feed. By improving digestion, the protein content of the feed and amino acid availability in feed is improved. It has been shown that fermentation also reduces the level of anti-nutritional factors (ANFs) — further increasing the nutritive value of susceptible raw materials. The process introduces beneficial microorganisms to the animal's gut, which help digestion and support gut health.

## Fermented feed in poultry

While fermenting feed for pigs is more widely known, there is increased interest and research into the process for poultry. The fermented feed increases intestinal health through acidification of the upper digestive tract, linked to lower feed pH and higher concentrations of lactobacilli (LAB) and organic acids. Researchers have noted that the concentration of LABs, low pH and high concentrations of lactic and acetic acid led to lower numbers of enterobacteria in poultry fed fermented feed.

Backyard poultry producers have advocated fermenting feed. Methods suggested are simply to cover a quantity of feed with water in a container and leave it for three days. The feed fermented is either an off-the-shelf diet or a mix of whole and cracked grains, e.g. wheat, oats and corn. However, the addition of an effective lactobacillus culture improves fermentation and consistency of the resulting feed. In a commercial situation, wet feeding of hens is difficult to manage with the attractiveness of such diets reducing rapidly.

There have been many studies feeding fermented feed to laying hens. Results include increases in egg

weight and eggshell thickness, as well as improved disease resistance.

Litter quality is a key indicator of gut health and bird welfare. A trial in laying hens showed that when they were fed a wet fermented feed, the dry matter of the litter was lower, along with improvements in body weight gain and feed conversion ratio (FCR). Efficiency was shown in terms of lower dry matter intake and increased egg weight, with the added bonus of increased shell strength, which reduces losses due to seconds.

With increases in the cost of corn, broiler producers are looking at ways of replacing it. One option to capitalize on the benefits of fermented feed without the issues of wet feeding is to include fermented alternative raw materials in the ration. These include fermented cereals, cereal coproducts and protein meals. A recent trial in turkeys demonstrated the potential of a fermented oil seed rape (OSR) product, added at 15%, replacing a standard OSR meal. Birds fed the product had greater final body weight, with no negative effects on carcass quality.

@ How lactic fermented pig feeds benefit swine production: **bit.ly/36TZ8WS**

## Fermented feed and pig performance

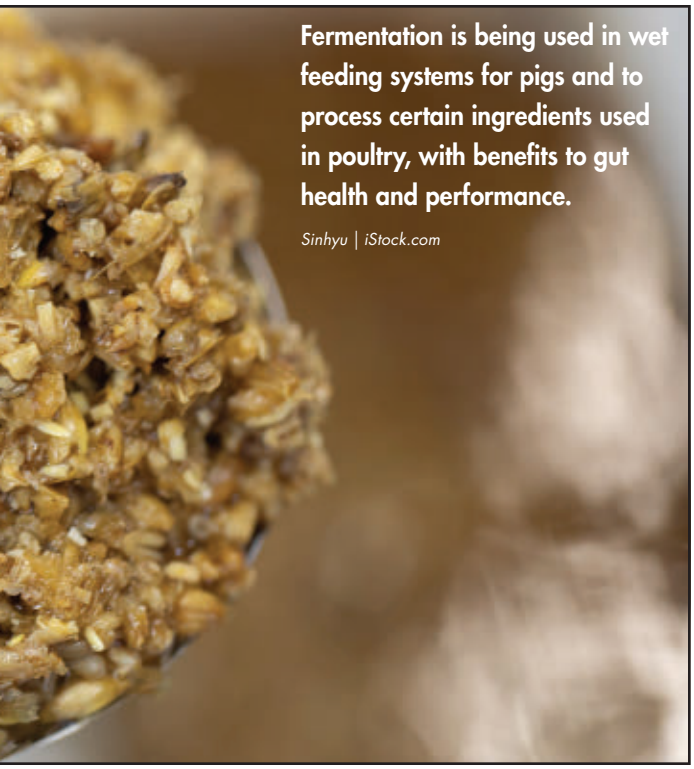
Fermented feed ingredients include protein sources and energy sources. Fermentation improves protein digestibility, increasing the number of small peptides, decreasing larger-sized peptides, and improving amino acid availability. For energy sources, the process increases starch and energy digestibility, as well as short-chain fatty acid content, while at the same time reducing fiber levels. In addition, fermenting botanicals can increase their antioxidative and pharmacodynamic effects.

The use of fermented feed is particularly suited to producers who are already liquid feeding, and it is becoming more popular across Europe. Producers report that pigs have a better start and are more resistant to challenges as they grow, helping to reduce the use of zinc oxide. Trials have shown that pigs fed fermented feed had lower levels of enterobacteria including *E. coli* and *Salmonella*. Standard liquid pig feed has a pH of between 6 and 8, while fermented liquid feed is more acidic with a pH of 3 to 4. A review of trials found that, when pigs were fed fermented feed, their weight gain was 13% higher compared to pigs fed standard liquid feed and 22% higher than in those fed dry rations.

A meta-analysis on the effect of fermented feed supplementation on pig performance (Bocheng *et al.*, 2020) was published in 2020. Here, the trials were divided into two groups, classified as ingredients if they were protein and energy sources, or additives if they were plant materials added at low levels. They found that fermented feed improved average daily gain and gain:feed ratio of pigs, but had no effect on average daily feed intake of pigs. Results suggest that fermented feed ingredients boost the growth performance of weaner and grower pigs and that fermented feed additives promoted pigs' growth at all stages.

## Savings and sustainability

One of the key benefits of fermented feed is its lower pH.



**Fermentation is being used in wet feeding systems for pigs and to process certain ingredients used in poultry, with benefits to gut health and performance.**

*Sinhyu | iStock.com*

This inherent property means that undesirable bacteria are less able to grow in the feed and it naturally lowers the pH of the gut without the use of acidifiers. It is this factor that improves digestibility and gut health of animals, at the same time improving FCR. Together, these actions save feed costs, reduce bacterial load and improve the overall economics of production, as well as being a tool for helping to reduce pathogenic bacteria in both pigs and poultry in an era of reduced antibiotic use.

Many alternative raw materials come with the challenge of higher fiber levels, lower protein and energy content. The ability of fermentation to improve the nutritional quality of these raw materials is four-fold: increasing fat content, lowering fiber levels, increasing protein and amino acid availability and reducing ANFs. The ability of pig and poultry producers to utilize more locally sourced, cheaper feed ingredients will help to improve profitability and sustainability. ■

*References available upon request.*

*Zoe Kay is an independent consultant providing technical services to the animal health and nutrition industry.*

# Guidelines for zinc-free commercial piglet feeds

In June 2022, the pharmacological use of zinc oxide in piglet feeds will be banned in the EU.

IOANNIS MAVROMICHALIS

Zinc oxide used at pharmacological doses of up to 3,000 ppm zinc will be banned in all EU states as of June 2022, although many EU states have already implemented the ban.

This ban comes after a rather long history of partial restrictions and confusing regulations that aimed to reduce the use of zinc in animal feeds and, in particular, zinc in piglet feeds. Zinc is a heavy metal and it is considered an environmental hazard as it can contribute to soil deterioration.

Piglet feeds will be particularly affected by this ban because supplementation with zinc oxide at such high levels has been practiced from the late 1980s on a global scale. Zinc oxide exerts a beneficial effect on gut microbiota, leading to reduced diarrhea problems and/or to enhanced growth performance. This effect is in addition to that of in-feed antibiotics (also banned in the EU since 2006) and parallel to that of copper sulfate (another gut health agent).

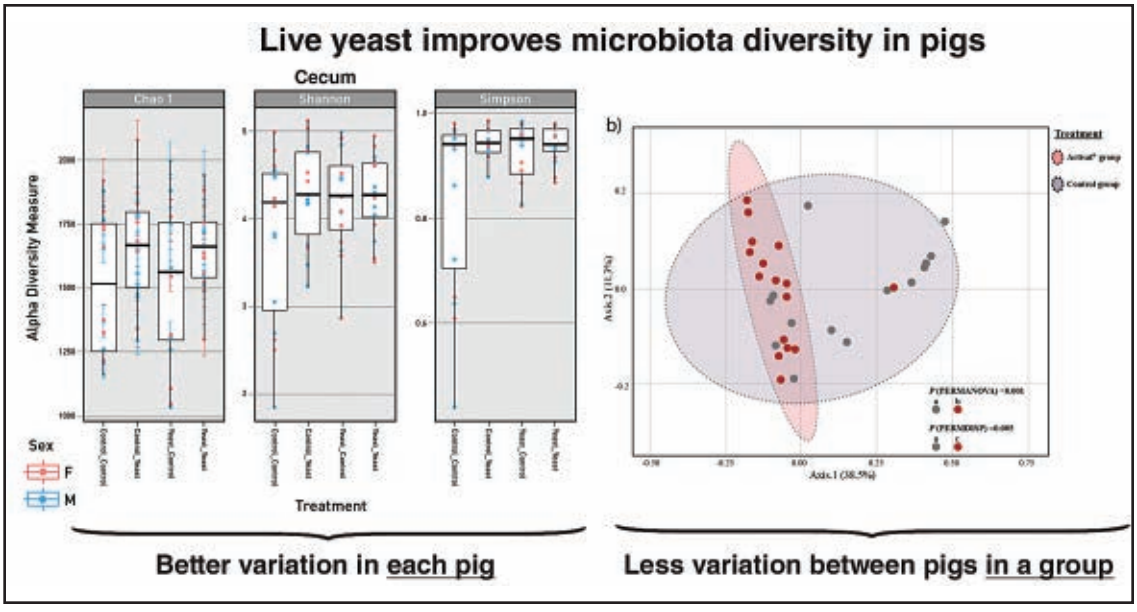
**There are many products that can replace zinc oxide in piglet feed, but it is important to understand what function of zinc oxide is being replaced.** *Brett Critchley | Dreamstime.com*

The mode of action of zinc oxide remains unclear. Many theories and ideas have been proposed, and it is likely zinc oxide has more than one mode of action. Most authorities agree that zinc oxide controls and suppresses the growth of pathogenic bacteria in the hind gut, enabling the establishment of a healthy microbiota. Any similar dietary intervention should help the transition to zinc oxide-free diets.

Here, it is important to note that zinc from zinc oxide and other zinc sources will continue to be used at nutritional levels (up to 150 ppm) in piglet feeds. It is the pharmacological use of zinc that is being curtailed by the impeding ban. To replace its pharmacological properties, the following are offered for consideration:

## Balanced protein concentration

Feeds that contain excess protein invariably benefit the proliferation of pathogenic microbiota. *Escherichia coli*, for example, thrives on protein, whereas beneficial lacto-bacteria require readily available fibers. Reducing total protein (amino acids) levels is counterproductive because it will reduce animal growth. In contrast, reducing crude protein concentration and using higher levels of feed-grade amino acids enables the formulation of a balanced diet that feeds the animal and not the bugs in the gut.




**Left: Live yeast increases (improves) microbiota diversity within each pig. Right: Live yeast reduces (improves) microbiota diversity among pigs.** *(Courtesy Kiros et al., 2018, and Dr. Joe Loughmiller, Phileo, USA)*

## Maximal nutrient digestibility

It follows from the above that anything that reaches the large intestine will be used for feeding the microbiota living there. It is then up to the formulator to ensure that only desirable nondigestible ingredients reach the large intestine. To this end, using highly digestible ingredients will reduce the amount of nondigested nutrients.

## Ideal fiber profile

Not all fibers behave the same. For example, hemicelluloses increase gut viscocity, reduce nutrient digestibility, and promote pathogenic bacteria growth. In contrast, lignocellulose has none of these problems and reduces upper gut leakage. Other, nonviscous fibers can be used to promote healthy microbiota growth. The ideal balance between insoluble and fermentable fibers is the matter of investigation.

## Least possible feed antigens and ANF

Antigens and anti-nutritional factors (ANF) invariably damage the gut and burden its digestive process. A damaged gut is the ideal situation for opportunistic pathogenic bacteria to

@ Alternative zinc sources for medicated piglet feeds: **bit.ly/3aWxfPl**

proliferate. Using ingredients that have the least amounts of antigens and anti-nutritional factors is one of the ways that can reduce this burden. Naturally, feed cost will be higher, but treating piglets for diarrhea is also a costly exercise.

## Other zinc forms

Alternative zinc sources for piglet feeds include products such as potentiated zinc oxide, organic zinc, tetra-basic zinc chloride, encapsulated zinc oxide, nano-zinc oxide and zinc sulphate. Not all of them work with the same efficacy, but at least some offer a partial solution to replacing zinc oxide.

## Gut health additives

All the additives used in replacing in-feed antibiotics can also be used to replace zinc oxide. The list of such additives is exhaustive. Such products can be divided into three broad categories as follows:

Additives that eliminate bacteria: examples include organic acids, phytogenics, medium-chain fatty acids, sources of immunoglobulins, copper sulfate, etc.

Additives that promote beneficial bacteria: examples include probiotics, prebiotics and functional fibers, nucleotides, dead yeasts, etc.

Additives that enhance overall immunity: examples include omega-3 fatty acids, beta-glucans, certain phytogenics, yeasts, antioxidants, etc.

The least amount of research has been dedicated to the role of zinc oxide as an agent that promotes greater microbial diversity. It is well known that an animal will be overall healthier if its microbiota is not dominated by any single species of bacteria. Zinc oxide has been shown to do exactly that, but most research has focused on its potential to eliminate bacteria.

A recent study indicated that it is possible to increase microbiota diversity even without zinc oxide. It is interesting that not only is diversity increased within each piglet, but inter-animal variability was reduced, indicating a healthier overall population. This was the result of feeding live yeast, an additive that has more roles than recognized.

There are plenty of products that can replace zinc oxide. It is important, however, to understand what function of zinc oxide we are replacing, because it has been shown that zinc oxide is an additive with many and diverse modes of actions. ■

*Ioannis Mavromichalis, Ph.D., is an animal nutrition industry consultant.*

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# NGFA's Gordon reflects on career, feed industry's future

Retiring National Grain & Feed Association (NGFA) president and CEO Randy Gordon provides his perspective on the opportunities that lie ahead for the US feed industry

JACKIE ROEMBKE

After 43 years with the National Grain & Feed Association (NGFA), President and CEO Randy Gordon will retire on March 31. Gordon served in various executive capacities within the association before assuming his current position in 2012.

Before he goes, Feed Strategy reached out to discuss how the U.S. feed industry has evolved during his tenure, and to capture his perspective on where he thinks it is headed in the future.

## Major feed industry changes

It's difficult to gauge where the industry is headed without reflecting on where it has been. Gordon identified the following as being among the three biggest changes in U.S. feed production over the last 20 years and how they've shaped production today:

**Outgoing NGFA president and CEO Randy Gordon** *Courtesy NGFA*

### ■ BSE crisis

In his opinion, the introduction of bovine spongiform encephalopathy (BSE), also known as mad cow disease, in the United Kingdom, with a few cases later occurring in the United States and Canada during the early 2000s, was a monumental event due to its immediate and long-term repercussions.

"BSE really heightened awareness that the animal feed and feed ingredient industry plays a major role in both animal and human health," Gordon recalls. "It also highlighted the importance of taking a science- and risk-based approach to policymaking as the only rational approach to meaningfully addressing such hazards."

Gordon notes how containment of the threat required collaboration across industry organizations (including the species groups, rendering and feed sectors), the scientific community and the Food & Drug Administration (FDA) to address BSE risk factors, which ultimately led to the removal of

Victoria | AdobeStock.com

specified risk materials, e.g. animal brain and spinal cords, from cattle 30 months and older in meat-and-bone meal used as feed ingredients.

"I think it's a real success story of the industry working with government, in a professional, collaborative and science-based and risk-based way, to address a major challenge," he notes. "It demonstrated that the animal feed industry is a major, constructive contributor to both human and animal health as an integral part of the supply chain and provides a road map for addressing food safety challenges in the future."

## Emphasis on feed safety and quality assurance

The BSE outbreak led to a renewed focus on feed and ingredient safety. Then came the Chinese melamine contamination incidents in infant formula and pet food in 2008 that led to the 2011 enactment of the Food Safety Modernization Act (FSMA), arguably the most significant U.S. food safety law since the original Food, Drug and Cosmetic Act of 1938. Gordon says the feed industry largely was successful in embedding in that landmark law, as well as in the FDA's preventive control rules implementing it, the same science- and risk-based approach to further enhance human and animal food safety.

Gordon notes that the U.S. feed industry is still adjusting to the FDA's FSMA mandates promulgated through its rule-making and guidance.

## Changing consumer preferences

Consumers worldwide have more disposable income to use toward improving their diets, resulting in exponential growth in animal protein demand.

"I think that's a very positive long-term trend from the feed industry standpoint," Gordon notes.

Meanwhile, consumer interest in animal agriculture has pushed the producers and the feed industry to implement new production

## NGFA'S GORDON REFLECTS

practices that align with their values, e.g. addressing anti-microbial resistance, sustainability, and animal welfare.

### US feed industry challenges, critical issues

Biosecurity and feed hygiene issues as they relate to food safety and animal disease risk mitigation will remain a top feed industry priority.

"There's need for broad stakeholder interaction that includes working with FDA, USDA, academic researchers — as well as livestock and poultry groups — as the feed industry partners to analyze whether animal feed ingredients play any role, and if so how, as a vector for transmitting animal diseases," he says.

Gordon stresses that science does not indicate that is the case for foreign animal diseases like African swine fever (ASF).

But if ASF were to be introduced into the U.S. pig herd, it would have catastrophic impacts on the animal protein industry, affect the demand for feed, feed ingredients, and grains and oilseeds domestically, and could damage U.S. trade.

"Our association and the others in the feed industry have — and will continue to — work very hard to proactively engage with other relevant stakeholders to conduct the research that needs to be done to address these challenges, as well as obtaining and disseminating information to the industry on preventive measures, if and when necessary" he says.

In the U.S., Gordon believes sustainability and climate change issues are likely going to dominate the Biden presidency.

"As we all learn more about the science of climate change and the contribution we think agriculture can play — and already is playing — to address climate change issues, the challenge is going to be for industry to be at the table to help design the shape of these policies going forward so that our industry and U.S. agriculture can continue to grow and contribute to global food security," Gordon says.

**"LEARN FROM MISTAKES — I've certainly made more than my share. Be persistent. Learn — keep learning, keep learning, keep learning."**

**— Randy Gordon**

For example, he expects the Biden administration to examine "carbon bank" proposals using the United States Department of Agriculture's (USDA) Commodity Credit Corporation (CCC) funds to incentivize farmers to adopt practices that sequester carbon in the soil.

"I think there's good work going on — on both the meat and the feed side — looking at the ways we can contribute to reducing the carbon footprint of our operations," he says. "It is in its infancy, but we're taking the initial steps to examine this whole area. It is going to be a huge effort going forward to devise policies that meaningfully address climate change in a way that is fact and science based."

## Opportunity ahead

Gordon predicts continued high demand for U.S. animal foods and the meat, poultry and seafood sectors but emphasizes that global trade agreements will play an integral role in sustaining this growth.

"As we see the world's economies improving and the desire of consumers for wholesome and safe meat and poultry products grow, U.S. feed industry is well positioned so long as the United States continues to aggressively pursue trade agreements, knock down trade barriers and address the sanitary and phytosanitary issues that often crop up that are not science or risk based and can impede trade," he says. "The feed

What lies ahead for the US feed industry? bit.ly/3rl9WQa

industry is well positioned to assist in meeting that growing export demand for meat, poultry and seafood so long as we have the ability to compete fairly in global markets."

Meanwhile, the COVID-19 pandemic has heightened consumer awareness about the food supply chain.

"There's a new appreciation for the importance of trade and providing not only animal protein products, but grains, oilseeds and other agricultural products from areas of surplus to areas of deficit," he says. "I think we have a great opportunity for trade to take on more importance, and there being a greater appreciation among U.S. consumers about the indispensable role of the food and feed supply chain."

Gordon point to the labor and environmental issues addressed in the United States-Mexico-Canada Agreement (USMCA), which he feels "shows the way toward bipartisan support for trade going forward.

"I'm cautiously optimistic that after the Biden administration addresses COVID-19 and some of the domestic economic challenges and policies he wants to address early on, hopefully, we'll be in a good place to pursue some new agreements."

While the U.S. withdrew from the Trans-Pacific Partnership (TPP) trade agreement under the Trump administration, Gordon feels it is particularly important that the U.S. reengages with Pacific Rim countries to "balance and take on Chinese dominance in the region."

"We have a lot of good trading partners there — Vietnam, Japan, South Korea, other countries — so I think there's real opportunity," he says.

## Advice for future feed industry leaders

Gordon encourages the next generation of feed industry leadership to engage with the professional trade associations and "look at the broader industry groups to get engaged in.

"You can learn so much from just the expertise that other members of this industry have," he says. "Break out of your company role — go to conferences, participate in conventions and different events that industry groups are having — it'll broaden your horizon tremendously."

The second tip: "Keep growing and don't get discouraged.

"Learn from mistakes — I've certainly made more than my share. Be persistent. Learn — keep learning, keep learning, keep learning," he says. "Even after nearly 43 years with NGFA, every day is kind of new and exciting for me. That is what makes it so hard to retire, quite frankly. I am still learning stuff every day. And that's an exciting, wonderful and rewarding thing."

Michael J. Seyfert, Gordon's successor, will become NGFA's top executive staff officer on March 1. ■

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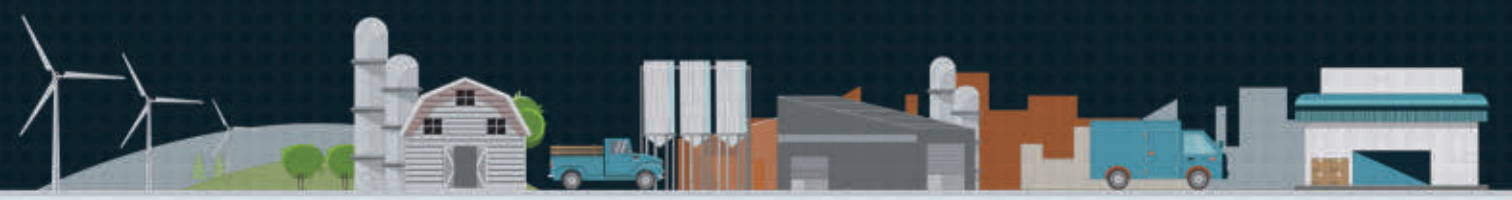

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