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Monthly Magazine for Feed Industry

Debunking the Myth of Mycotoxin Prevalence in India

Rethinking Feed Safety in a Changing Risk Landscape

Misinformation About Hormone Use in the Poultry Industry: Scientific Facts vs Myths

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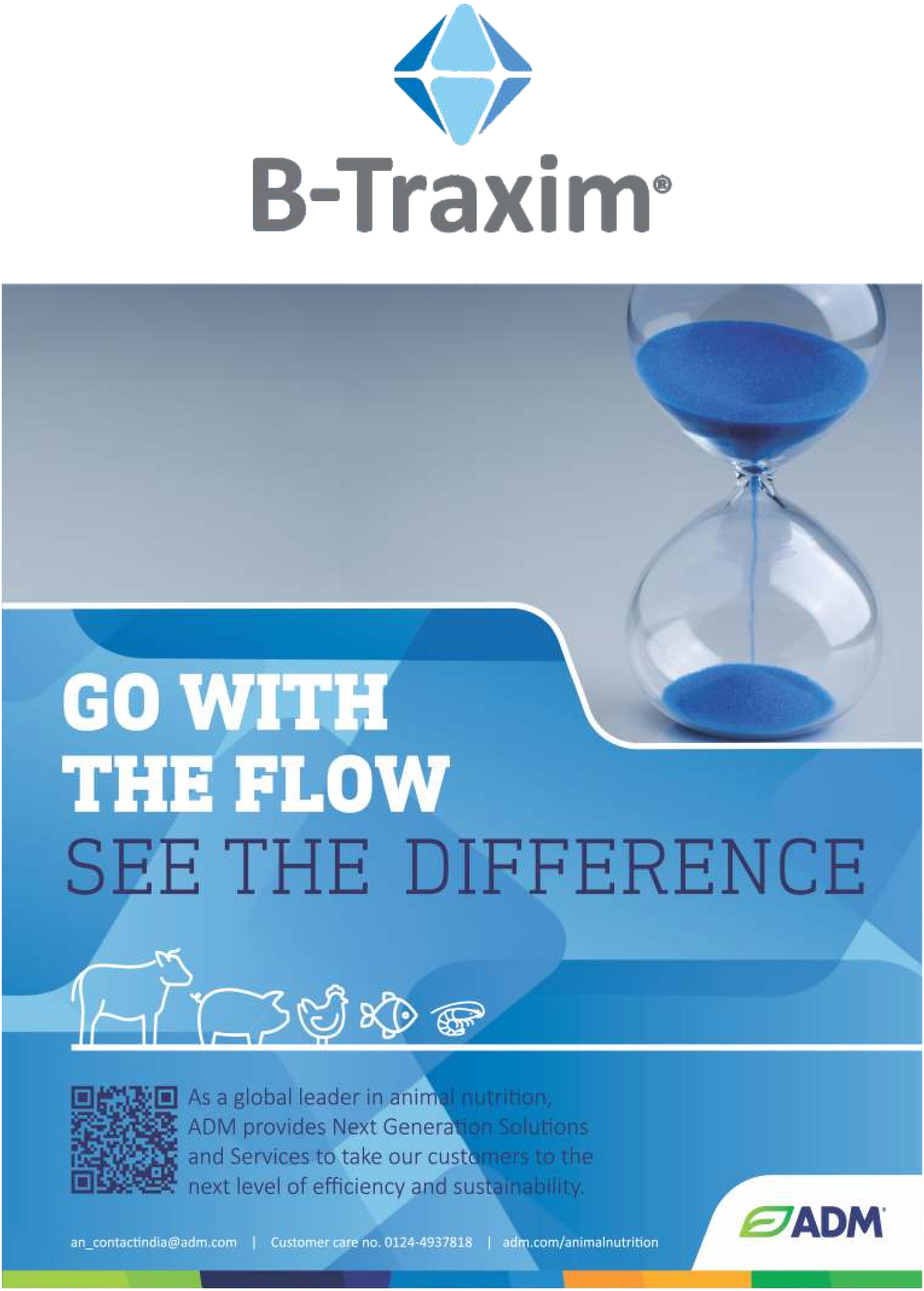
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Turning Agricultural Waste into Next-Gen Feed Solutions

A recent study published in Biochar presents an innovative approach to livestock nutrition that addresses both animal health and the growing global concern of antimicrobial resistance (AMR). The research demonstrates how biochar—produced from agricultural residues such as chestnut shells and vine prunings—can be used as an advanced delivery system for lysozyme, a naturally occurring antimicrobial enzyme. This approach has the potential to enhance the effectiveness of functional feed additives while reducing reliance on conventional antibiotics.

Biochar, a carbon-rich material traditionally used for soil improvement, possesses a highly porous structure and reactive surface chemistry. These characteristics make it an ideal carrier for bioactive compounds. In this study, researchers utilized biochar to immobilize lysozyme molecules, improving their stability and enabling controlled release within the digestive system of livestock.

One of the key challenges with bioactive compounds like lysozyme is their instability in the acidic conditions of the stomach. The study addressed this by designing a pH-responsive delivery system. Under acidic gastric conditions, the biochar–lysozyme complex remains stable, protecting the enzyme from degradation. As the complex moves into the more neutral pH environment of the intestine, lysozyme is gradually released, allowing it to exert its antimicrobial effects where they are most beneficial.

This targeted release mechanism represents a significant advancement over traditional feed additives. It ensures that the bioactive compound remains intact during digestion and is delivered at the optimal site of action, thereby improving gut health and reducing pathogen load.

The implications of this innovation are particularly relevant in the context of antimicrobial resistance. The overuse of antibiotics in livestock production has contributed to the emergence of resistant pathogens, posing risks to both animal and human health. Functional alternatives such as lysozyme offer promise, but their effectiveness has been limited by stability issues. The biochar-based delivery system provides a practical solution by enhancing the durability and efficacy of such compounds.

Another notable aspect of the study is its sustainability. The biochar used was derived from agricultural waste materials that are often discarded or burned, contributing to environmental pollution. Converting these residues into high-value feed additives supports circular economy principles, reducing waste while creating functional products for livestock production.

The process of binding lysozyme to biochar was achieved through a simple, aqueous-based method, avoiding the need for harsh chemicals or complex synthesis. Both types of biochar tested showed strong binding capacity and uniform distribution of the enzyme, which is critical for consistent performance and controlled release.

Beyond livestock nutrition, this research opens avenues for broader applications. The concept of using biochar as a delivery platform could be extended to human nutrition and pharmaceuticals, where protecting sensitive compounds from gastric degradation remains a challenge.

Importantly, the approach is adaptable. Biochar properties can be tailored based on raw materials and processing conditions, allowing customization for different species, production systems, or bioactive compounds. This flexibility makes it a promising platform for future innovations in feed and health management.

In conclusion, this study demonstrates how agricultural waste can be transformed into a high-value, functional solution for livestock nutrition. By combining material science, sustainability, and animal health, biochar-based delivery systems offer a practical pathway toward reducing antibiotic dependence and improving production efficiency. As the industry moves toward more sustainable and responsible practices, such innovations are likely to play a critical role in shaping the future of animal nutrition.

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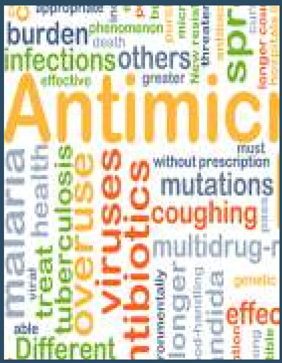

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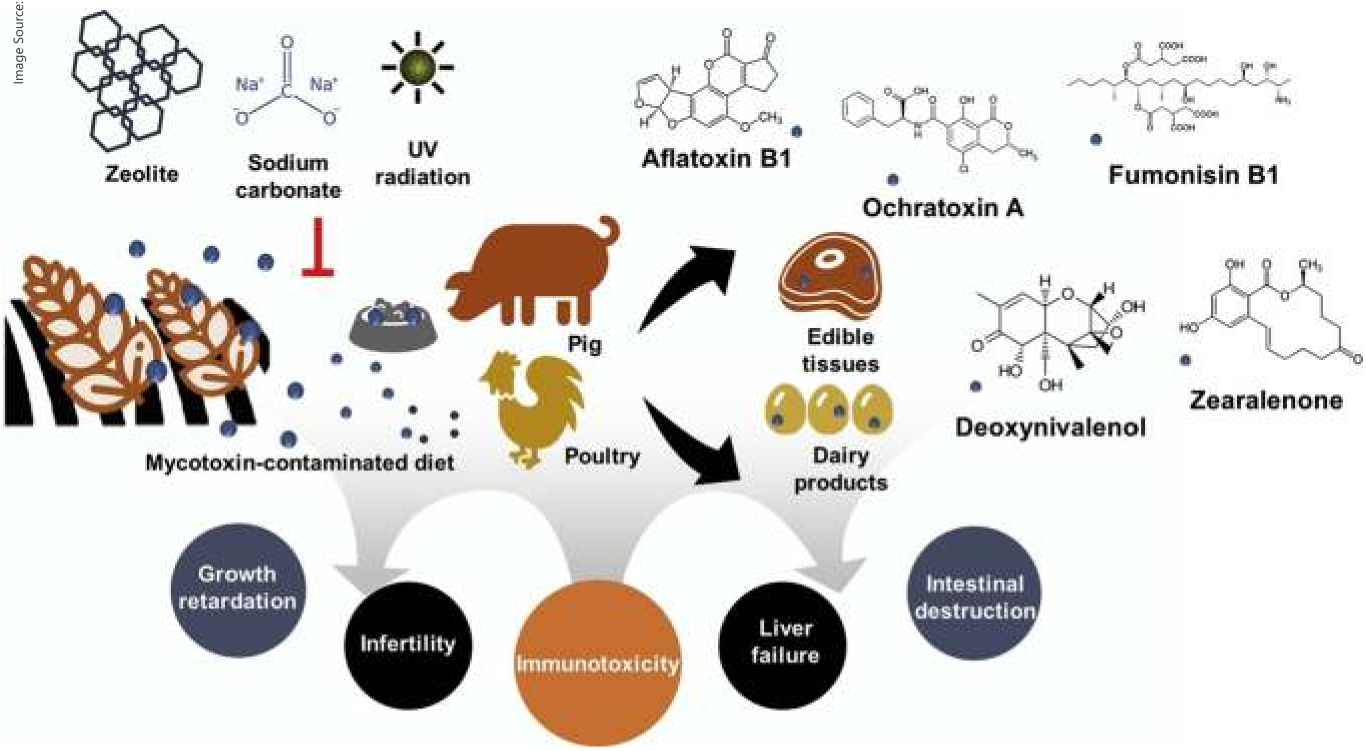


Debunking the Myth of Mycotoxin Prevalence in India

Using data-driven insights from Cargill Mycotoxin Survey (January'25 – December'25)

by **Dr. Nidhi Madnawat,** Cargill


Dr. Nidhi Madnawat

The Myth vs Reality

One of the most common misconceptions in raw material quality assessment is the belief that visual inspection alone can identify contaminated grain. In reality, mycotoxins are invisible chemical compounds produced by fungi and do not alter the appearance, smell, or texture of ingredients. A batch may appear clean and intact while still carrying dangerously high toxin loads that can impair animal health and performance.

This is why analytical testing—not visual inspection—is the only reliable method to detect and quantify mycotoxins. Relying solely on visual checks creates a false sense of security and exposes feed mills and farms to significant, often unnoticed, economic and biological risks. Mycotoxin management must therefore be science-driven, supported by validated testing methods and routine monitoring across the supply chain.

Key Industry Snapshot (2025 Survey Highlights)

- 97% of samples contaminated
- 77% above performance risk thresholds
- 73% samples with 3 or more mycotoxins
- 14,352 analyses conducted

These numbers clearly establish that mycotoxin contamination is not an exception—it is the norm.

The Scale of the Problem

Cargill India's extensive survey,

covering diverse raw materials and geographies, provides one of the most comprehensive datasets in the industry. The findings highlight a deeply concerning reality: contamination is widespread, persistent, and often present at levels that directly impact poultry performance.

More importantly, contamination is no longer a single-toxin issue.

The Multi-Toxin Reality

A common industry assumption is that contamination occurs in isolation. However, the survey data reveals a far more complex picture:

- Only 9% of samples contained a single mycotoxin
- 18% contained two toxins
- A significant 73% contained three or more toxins

Specifically, 15% of samples contained three toxins, 26% contained four, and a significant 32% contained five or more.

This widespread co-occurrence creates additive and often synergistic effects, where the combined impact of toxins is significantly greater than individual exposure.

Even when individual toxin levels appear "safe," their combined effect can lead to:

- Immune suppression
- Poor gut health
- Reduced feed efficiency
- Lower growth and egg production

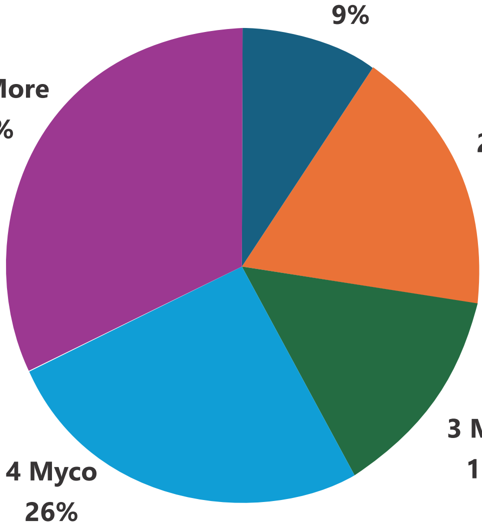


Table 1: Area of Concern: 1 + 5 (Afla > T2 > Zeralenone > Ochratoxin > DON > Fumonisin)

Mycotoxin	Aflatoxin	Fumonisin	T2	DON	Zearalenone	Ochratoxin
No. of Analysis	13,760	143	148	136	140	19
Average ppb	35	1054	32	204	42	13
Maximum ppb	479	19486	199	9282	556	53
Contaminated	99%	59%	62%	66%	60%	47%
No. above performance risk	10,830	19	59	24	54	4
% above performance risk	79%	13%	40%	18%	39%	21%

India's tropical climate, combined with moisture stress, storage challenges, and raw material variability, creates ideal conditions for multi-toxin contamination.

The "1 + 5" Risk Framework

A key insight from the survey is the identification of a "1 + 5 Area of Concern"—the six most impactful mycotoxins affecting poultry production in India.

At the top is Aflatoxin, the most dominant and performance-limiting toxin, driven by tropical climate conditions and high prevalence across raw materials.

It is followed by five additional high-impact toxins:

- T2 toxin – damages gut lining and suppresses immunity
- Zearalenone – disrupts reproductive performance
- Ochratoxin – affects kidney function and immunity
- DON (Vomitoxin) – reduces feed intake and gut health
- Fumonisin – amplifies the effects of other toxins in multi-toxin scenarios

Together, this group represents the core risk cluster requiring continuous monitoring and targeted mitigation.

Aflatoxin: The Dominant Threat

Among all toxins, Aflatoxin stands out as the most critical risk factor in India's feed ecosystem.

- 13,760 analyses conducted
- 99% contamination rate
- Average: 35 ppb | Maximum: 479 ppb
- 79% samples above risk thresholds

This clearly indicates that Aflatoxin is not just present—it is present at levels capable of significantly reducing productivity and compromising flock health.

Beyond Aflatoxin: The Hidden Contributors

While Aflatoxin dominates, other mycotoxins collectively pose substantial risks:

Fumonisin

Detected in 59% of samples, with strong synergistic effects when combined with DON and Aflatoxin.

T2 Toxin

Highly potent, with 40% of samples exceeding risk thresholds despite relatively low concentrations.

DON (Vomitoxin)

Widely prevalent (66%), with significant impact on appetite and gut integrity.

Zearalenone

Detected in 60% of samples; a major concern for reproductive performance.

Ochratoxin

Lower prevalence (47%) but high impact on kidney function and immunity.

Ingredient-Wise Risk Patterns

Mycotoxin contamination in India is both multi-toxin and ingredient-dependent.

High-Risk Ingredients

- Corn and Corn DDGS
- Groundnut cake/meal
- De-oiled rice bran

These ingredients show high contamination levels, particularly for Aflatoxin, Fumonisin, and Zearalenone.

Relatively Lower-Risk Ingredients

- Soybean meal
- Wheat and wheat bran

However, even these are not risk-free and may show spikes in DON and T2 toxin.

Key Takeaway

No ingredient is uniformly "safe," and contamination patterns vary based on season, sourcing, and storage.

Expert Insight: Industry Perspective

To validate and expand on these findings, Think Grain Think Feed interacted with Dr. Nidhi Manwat.

She notes that mycotoxin pressure in 2025 is significantly higher than last year, with strong mid-year spikes driven by monsoon-linked moisture stress. Maize and cereal supply chains are particularly affected, making the May–July period critical for monitoring and control.

Despite representing only a portion of the industry, she emphasizes that the survey's scale and consistency make it a reliable directional indicator, reflecting broader risk patterns across India.

Testing Technologies: From Lab to Field

Effective mycotoxin management relies on a combination of technologies:

Gold Standard Methods

- HPLC, LC–MS/MS

Table 2: Mycotoxin Contamination Pattern: Corn

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)
Aflatoxin	1,414	96%	52%	24	379
Fumonisin	46	52%	15%	532	3,126
Ochratoxin	5	40%	0%	17	17
T2 Toxin	48	35%	19%	35	92
Vomitoxin	43	49%	14%	272	1,933
Zearalenone	45	29%	4%	26	69

Table 3: Mycotoxin Contamination Pattern: Soya Bean Meal

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)
Aflatoxin	164	57%	12%	8	14
Fumonisin	23	65%	4%	1346	7,936
Ochratoxin	4	100%	75%	37	53
T2 Toxin	25	92%	68%	46	117
Vomitoxin	21	76%	19%	219	825
Zearalenone	21	86%	67%	61	184

Table 4: Mycotoxin Contamination Pattern: De-Oiled Rice Bran

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)
Aflatoxin	8,248	99%	81%	27	350
Fumonisin	59	64%	8%	1249	9,723
Ochratoxin	6	67%	50%	37	53
T2 Toxin	62	77%	48%	41	162
Vomitoxin	57	72%	23%	191	825
Zearalenone	57	74%	54%	87	556

Table 5: Mycotoxin Contamination Pattern: Ground Nut Cake

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)
Aflatoxin (Total)	56	98%	91%	72	270
Fumonisin	12	58%	0%	120	328
Ochratoxin	1	100%	100%	43	43
T2 Toxin (Total)	12	75%	58%	98	172
Vomitoxin	12	100%	25%	95	282
Zearalenone	12	83%	67%	51	73

Table 6: Mycotoxin Contamination Pattern: Corn DDGS

Mycotoxin	Total Analyses	% Contaminated Above Detection Limit	% Above Performance Risk	Avg. Contamination (ppb)	Max. Contamination (ppb)
Aflatoxin (Total)	1,164	100%	94%	107	479

- Highly accurate and can detect multi-toxin
- Slower and resource-intensive

Rapid Testing Methods

- ELISA (lab-based screening)
- Lateral Flow Tests (on-site, quick results)

These enable real-time decision-making, particularly at procurement and intake stages.

Emerging biosensor-based technologies are expected to further enhance speed and precision in detection.

From Risk to ROI

Mycotoxin management is not just a cost—it is a high-return investment.

The cost of inaction includes:

- Reduced productivity
- Poor feed conversion
- Increased mortality
- Rejected consignments

While 100% risk elimination is not realistic, the goal is effective risk reduction, ensuring toxin levels remain below performance-impacting thresholds.

Practical Strategies for Risk Mitigation

Given India's climate, the focus must shift to control, not avoidance:

- Maintain optimal storage conditions (moisture, aeration, hygiene)
- Implement strict FIFO practices
- Use rapid testing at procurement points
- Adopt seasonal risk-based sourcing
- Avoid mixing high-risk contaminated lots
- Strengthen supplier quality programs

The Role of Digital Intelligence

Digital tools and predictive analytics are emerging as powerful enablers in mycotoxin management.

They help:

- Predict weather-driven contamination risks
- Optimize sampling strategies
- Enable faster, data-driven decisions

While they cannot eliminate risk, they significantly improve preparedness and response.

Conclusion: A Shift from Perception to Precision

The mycotoxin challenge in India is far more complex than traditionally perceived. It is highly prevalent, multi-toxin in nature, and deeply influenced by climate and supply chain variability.

The dominance of Aflatoxin, combined with widespread co-occurrence of other toxins, makes it clear that mycotoxin risk is a multi-dimensional issue—not a single-toxin problem.

As the Cargill Mycotoxin Survey demonstrates, nearly every feed ingredient carries some level of risk—often exceeding performance thresholds.

Rethinking Feed Safety in a Changing Risk Landscape

Dr. Swamy Haladi, Trouw Nutrition

Dr. Swamy Haladi

In an era where food safety is increasingly under the global spotlight, the role of safe animal feed has never been more critical. As the first link in the food production chain, feed quality directly influences not only animal health and productivity but also the safety of milk, meat, and eggs consumed by millions. With evolving climatic conditions, globalized raw material sourcing, and the rising complexity of contaminants such as mycotoxins, the feed industry is being compelled to rethink traditional approaches to safety and risk management.

Globally, companies like Trouw Nutrition have been at the forefront of advancing feed safety frameworks through science-based solutions, predictive tools, and integrated quality systems. In markets like India, however, the challenge is uniquely complex—characterized by smallholder farming systems, fragmented supply chains, monsoon-driven variability, and gaps in post-harvest infrastructure.

To decode these challenges and understand the way forward, Think Grain Think Feed interacted with Dr Swamy Haladi, a leading expert in mycotoxin risk management and feed safety. In this conversation, he shares deep insights into what defines "safe feed" today, how India's risk landscape is evolving, and why the industry must transition from a reactive approach to a more predictive, data-driven model.

From shifting mycotoxin profiles across Asia to the growing importance of multi-toxin testing and advanced mitigation strategies, this discussion highlights a crucial reality: feed safety is no longer just an operational requirement—it is a strategic imperative for ensuring food safety and building consumer trust in the years ahead. Following are the key excerpts from the discussion:

How would you define "safe feed" in today's context, considering both animal health and food safety? What are the key components of a robust feed safety system?

In today's context, safe feed refers to animal feed that is free from contaminants which could adversely affect not only animal health but also human health. This includes hazards such as pathogenic microorganisms, mycotoxins, pesticide residues, and insecticide residues.

While the direct impact of contaminated feed on animal health is well understood, the broader concern lies in how these contaminants transfer through the food chain. Residues and toxins can pass into animal-derived products such as milk, meat, and eggs, ultimately posing risks to human health. Therefore, safe feed must ensure protection at both levels—animal productivity and food safety for consumers.

A robust feed safety system is built on three critical pillars:

1. Comprehensive Monitoring Systems

The foundation of feed safety lies in a well-defined monitoring plan. This applies across the value chain—feed mills, integrated operations, dairy farms, and even silage and Total Mixed Ration (TMR) producers. Stakeholders must have a clear understanding of incoming raw materials, including their origin, quality, and potential contamination risks such as toxins or harmful microorganisms.

2. Stringent Quality Control Mechanisms

Monitoring must be supported by strong quality control protocols. This involves defining acceptable limits for contaminants and making informed decisions—whether to accept, reject, or repurpose raw materials based on these thresholds. Such systems ensure consistency and prevent compromised inputs from entering the feed chain.

3. Innovation-Driven Mitigation Solutions

Even with strict monitoring and quality checks, certain risks—especially mycotoxins—may persist. Therefore, incorporating advanced, science-backed feed additives and technologies is essential. These solutions help neutralize or mitigate the impact of contaminants, safeguarding animal health and improving overall feed efficiency.

In summary, an effective feed safety system integrates proactive monitoring, disciplined quality control, and continuous innovation. Together, these elements ensure that feed not only supports optimal animal performance but also upholds the highest standards of food safety.

What are the major feed safety risks specific to India's climatic and agricultural conditions? How do factors like monsoon variability and storage infrastructure impact contamination risks?

India's feed safety landscape is increasingly shaped by climate variability and structural challenges in post-harvest management. Among the most significant emerging risks is the impact of climate change, which is altering weather patterns through unseasonal rains, rising temperatures, and increased humidity.

These climatic shifts directly influence crop production and feed quality. Variations in temperature and moisture levels during crop growth and harvest create favourable conditions for the development of moulds, pathogenic microorganisms, and, most critically, mycotoxins. Elevated moisture levels in raw materials—especially grains—can significantly increase the risk of fungal contamination, compromising both nutrient quality and safety.

The challenge becomes even more pronounced during the post-harvest phase. If grains are not adequately dried before storage, residual moisture can accelerate mould growth and subsequent mycotoxin production. This not only reduces feed quality but also poses serious risks to animal health and productivity, with downstream implications for food safety.

Monsoon variability adds another layer of complexity. With rainfall patterns becoming increasingly unpredictable, harvesting often coincides with unexpected showers or prolonged humidity. Such conditions can sharply increase moisture content in crops at critical stages, leading to contamination risks even before the raw materials enter the feed supply chain.

Storage infrastructure remains a critical bottleneck in India. While the adoption of modern silo systems is gradually increasing, traditional storage practices—such as the use of gunny bags—are still prevalent. These methods are highly vulnerable to environmental factors like humidity and temperature fluctuations.

Even in advanced storage systems like silos, improper management can negate their benefits. Effective silo management requires strict control of temperature, moisture levels, humidity, and adequate aeration. Without these controls, silos can, in some cases, exacerbate spoilage and contamination risks rather than mitigate them.

In summary, feed safety risks in India are closely linked to a combination of climatic uncertainties and gaps in storage infrastructure. Addressing these challenges requires an integrated approach—improving weather-resilient agricultural practices, strengthening post-harvest drying systems, and adopting scientifically managed storage solutions—to ensure both feed quality and food safety.

As a mycotoxin expert, what major changes have you observed in mycotoxin prevalence across Asia in recent years? How has the mycotoxin risk profile in India evolved over time?

This is a complex and important question, as Asia's mycotoxin risk profile is highly diverse and closely linked to regional agricultural practices and trade dynamics.

Broadly, Asia can be segmented into three regions. China is self-sufficient in human food grains (rice and wheat) but largely depends on imports for raw materials such as soybean meal and corn for animal feed production. Although India is relatively self-reliant in raw materials for animal feed production, future predictions indicate a growing dependence on imports. In contrast, Southeast Asian countries such as Vietnam, Thailand and Philippines, are heavily dependent on imported feed ingredients from regions like the United States, Argentina, Brazil, and Ukraine.

This global sourcing of raw materials has significantly altered the mycotoxin landscape, particularly in import-dependent regions. For instance, Southeast Asia is increasingly reporting the presence of Deoxynivalenol (DON) and Zearalenone (ZEN)—mycotoxins that are not normally present in Southeast Asian countries. As a result, feed producers must now account for both locally occurring and imported mycotoxins, making broad-spectrum mycotoxin analysis and mitigations essential.

Focusing on Asia as a whole, there is a noticeable rise in Fumonisins (FUM), particularly in grains produced within the region and DON & ZEN in imported raw materials.

India has traditionally focused on the analysis of Aflatoxins, owing to their high prevalence and well-established toxicity risks in tropical climatic conditions. Over time, the scope of testing expanded to include Ochratoxin A (OTA) and T-2 toxin. However, current observations indicate that the occurrence levels of T-2 toxin remain relatively low in many regions. In contrast, there is a growing detection of FUM, signalling a gradual shift in the mycotoxin risk profile.

This evolving trend suggests that while aflatoxins continue to be a primary concern, mycotoxins such as FUM are becoming increasingly relevant and warrant closer monitoring within India's feed and raw material supply chain.

Modern feed safety programs must include a wider panel of mycotoxins, including:

- Aflatoxins (AFB1, AFB2, AFG1, AFG2)
- Deoxynivalenol (DON)
- Zearalenone (ZEN)
- Fumonisins (FUM)

- Ochratoxin A (OTA)
- T-2 toxins
- Potentially a few emerging mycotoxins, such as moniliformin

In conclusion, the mycotoxin challenge in Asia—and increasingly in India—is transitioning from a single-toxin concern to a multi-mycotoxin risk environment. This shift calls for more comprehensive testing protocols, improved risk assessment strategies, and adaptive feed safety management to ensure both animal health and food safety.

Could you explain concept of Predictive Modelling and its role in managing mycotoxin risks? How reliable are these models in practical feed industry applications?

Predictive modelling refers to the use of historical data, statistical tools, and climatic information to anticipate the likelihood and severity of mycotoxin contamination in raw materials and in turn the feed. It enables stakeholders to move from reactive management to a more proactive risk mitigation approach.

Broadly, there are two key types of predictive models used in this space:

1. Statistical Models

These models rely on historical datasets—spanning several years—to identify patterns and trends in mycotoxin occurrence. Based on past contamination data, they can provide reasonably accurate forecasts of potential risks in upcoming seasons. Such models are already being applied by global organizations, including Trouw Nutrition, to guide feed safety strategies.

2. Climate-Based Models

These models incorporate weather parameters such as temperature, rainfall, and humidity, and soil conditions to predict the development of fungi and subsequent mycotoxin production in crops. While highly advanced, they require extensive data infrastructure and technical resources, making them more challenging to implement, particularly in developing markets.

In principle, predictive modelling can help identify which mycotoxins are likely to occur in specific regions, allowing feed producers to take preventive measures. However, its application in Asia—especially in India—comes with certain limitations.

One of the key challenges in the Indian context is the fragmented agricultural landscape. Unlike countries such as Canada or the United States, where agricultural farms are large and relatively uniform, India is characterized by small landholdings and diverse farming practices. This variability makes it difficult to generate highly precise, location-specific predictions, particularly for climate-based models.

In terms of reliability, no predictive model is 100% accurate. However, in regions with consistent farming systems and large datasets, these models have demonstrated strong reliability. Importantly, their accuracy improves over time as more data is accumulated. For example, a model built on five years of data may offer moderate predictive accuracy, but this can significantly improve with six, eight, or more years of continuous data input.

Given current conditions in India, statistical models offer more immediate practical value, as they can be implemented using available historical data. Climate-driven predictive modelling, while promising, will require further development in terms of data collection, standardization, and infrastructure.

In conclusion, predictive modelling is a powerful tool for mycotoxin risk management, but its effectiveness depends heavily on data quality, scale, and regional agricultural dynamics. For India, a phased approach—starting with statistical models and gradually integrating climate-based systems—would be the most pragmatic path forward.

Which testing methods would you recommend for routine vs confirmatory analysis? How frequently should testing be conducted under different risk scenarios?

In practical feed industry applications, mycotoxin testing typically follows a two-tiered approach: rapid screening for routine monitoring and advanced analytical methods for confirmatory analysis.

Routine Testing: Rapid Screening Methods

For day-to-day operations, rapid diagnostic tools such as lateral flow devices (LFDs) are widely recommended. These include commercially available kits from companies like Charm, Neogen and Romer Labs, as well as customised platforms such as Trouw Nutrition's Mycomaster.

These rapid tests offer:

- Quick turnaround times
- On-site usability
- Cost-effectiveness for high-frequency testing

While they may not deliver 100% analytical precision, they provide a reliable indication of contamination levels and are highly effective for routine decision-making. However, it is critical to emphasize that sampling accuracy is as important as the testing method itself. Poor or non-representative sampling of raw materials or finished feed can lead to misleading results, regardless of the analytical technique used.

Confirmatory Testing: Advanced Analytical Methods

For precise quantification and multi-mycotoxin detection, confirmatory analysis is essential. The gold standard today is Liquid Chromatography–Tandem Mass Spectrometry (LC-MS/MS), which is rapidly replacing older methods such as High-Performance Liquid Chromatography (HPLC).

LC-MS/MS offers significant advantages:

- Simultaneous detection of multiple mycotoxins
- High sensitivity and specificity
- Greater accuracy for regulatory and research purposes

While such advanced testing infrastructure is still developing in India, its adoption is increasingly critical to support a modern, risk-based feed safety framework.

Testing Frequency: A Risk-Based Approach

- Raw Materials:
- Ideally, every incoming batch or load should be tested, especially for high-risk ingredients such as maize and grain by-products.
- Finished Feed:
- If raw material sources remain consistent and controlled, testing can be conducted at least once per week using representative samples.
- High-Risk Scenarios (e.g., monsoon, new suppliers, visible spoilage):

Testing frequency should be increased, potentially to every batch, to mitigate elevated contamination risks.

Low-Risk, Controlled Conditions:

Frequency may be optimized, but routine monitoring should never be completely relaxed.

Importantly, testing should be proactive rather than reactive—waiting until the end of a production cycle (for example, in broiler operations) can result in significant economic losses and health impacts.

Can post-contamination mitigation fully eliminate risks, or is prevention the only sustainable solution? What immediate steps should Indian feed millers take to upgrade their safety systems?

While the principle that prevention is better than cure holds true, the real challenge lies in effectively implementing preventive measures—particularly in a complex and diverse market like India.

Given the current realities—climatic variability, smallholder farming systems, fragmented landholdings, and inherent sampling challenges—it is difficult to achieve 100% accuracy in detecting or preventing contamination. Therefore, relying solely on prevention is not sufficient.

A more practical and effective approach is to adopt a combined strategy of prevention and mitigation.

Prevention Measures

The first line of defence includes:

- Sourcing high-quality raw materials
- Ensuring proper drying before storage
- Maintaining optimal storage conditions (moisture, temperature, and hygiene)

For stored raw materials—especially those held for extended periods—it is advisable to use organic acid-based preservatives, such as propionic acid formulations.

These help inhibit mould growth, reduce the risk of mycotoxin formation, and preserve nutrient quality.

Mitigation Strategies

Even with strong preventive practices, some level of contamination risk persists. Therefore, incorporating mycotoxin risk management solutions—such as scientifically validated toxin binders or deactivators—into feed becomes essential to safeguard animal health and performance.

Upgrading Feed Safety Systems: Immediate Priorities

To strengthen feed safety in India, feed mills must focus on a few critical, actionable steps:

1. Strengthening Feed Mill Hygiene

Maintaining strict hygiene across the facility is fundamental. Clean production environments reduce the risk of cross-contamination and microbial growth.

2. Frequent and Meaningful Testing

- Test every incoming batch of raw materials
- Ensure the right testing methods are used—not just testing for compliance, but for actionable insights
- Expand testing beyond mycotoxins to include heavy metals, pesticides, and insecticide residues, as these risks are increasing

3. Integrated Data-Based Decision Making

Mycotoxin test results should not be viewed in isolation. Instead, they must be correlated with:

- Animal performance data
- Farm-level observations (symptoms)
- Veterinary post-mortem findings

Close coordination between quality control teams, nutritionists, veterinarians, and farm managers is essential to accurately assess and manage risk.

4. Investment in Quality Technologies

Adopting advanced, science-backed solutions is critical. Decision-making should not be driven purely by cost considerations—efficacy and reliability must take priority over price.

5. Improved Storage and Handling Systems

Upgrading storage infrastructure and practices—both at feed mills and farm level—is key to minimizing post-harvest contamination risks.

A Shift in Industry Mindset

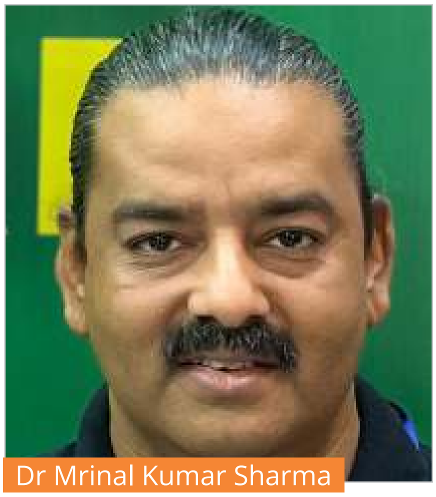
Ultimately, the Indian feed industry must recognize that feed safety is directly linked to food safety. As consumer awareness grows, expectations around safe milk, meat, and eggs are rising rapidly.

The focus can no longer remain solely on higher production—more milk, more eggs, more meat. Equal, if not greater, emphasis must be placed on safety and quality.

This shift is not just a regulatory requirement—it is a market-driven necessity that will define the future of the industry.

The Critical Importance of Testing for Mycotoxins in Animal Feed

by Dr Mrinal Kumar Sharma, Neogen Corporation



Dr Mrinal Kumar Sharma

Dr. Mrinal Kumar Sharma is a veterinary professional with over 25 years of experience in food safety and animal diagnostics across India and South Asia. He holds a Master's degree in Biochemistry from Govind Ballabh Pant University of Agriculture and Technology and has completed management and certification programmes from Indian Institute of Management Calcutta, Indian Institute of Management Ahmedabad, and Indian Institute of Technology Kharagpur. He has been instrumental in building diagnostic businesses in the region and is currently Director – Business Development at Neogen Corporation – India, where he leads commercial operations for the food safety portfolio in the Indian subcontinent.

Mycotoxins, toxic secondary metabolites produced by fungi such as Aspergillus, Fusarium, and Penicillium, represent a pervasive and severe threat to global agriculture and public health. These naturally occurring toxins contaminate key agricultural commodities like maize, wheat, and barley at various stages, including pre-harvest, harvest, and storage.

Regular testing of animal feed for mycotoxins is not just a regulatory requirement; it is a critical necessity to safeguard animal health, protect human consumers, and ensure the economic sustainability of the livestock industry.

Impact on Animal Health and Productivity

Aflatoxins (B1, B2, G1, G2): Primarily target the liver, causing severe hepatic damage, immunosuppression, and reduced milk and egg production. Young animals are particularly vulnerable, often exhibiting stunted growth.

Ochratoxin A (OTA): A potent nephrotoxin that leads to kidney damage and weakened immunity, especially in swine and poultry.

Fumonisins (B1, B2, B3): Disrupt sphingolipid metabolism, resulting in neurological disorders (such as ELEM in horses), pulmonary oedema in pigs, and reduced growth performance in poultry.

Zearalenone (ZEN): Acts as an oestrogen mimic, disrupting reproductive cycles and causing infertility, abortions, and stillbirths, particularly in pigs.

Trichothecenes (DON, T-2): Including Deoxynivalenol (DON or "vomitoxin"), these toxins induce vomiting, feed refusal, and gastrointestinal distress, significantly reducing productivity.

Emerging evidence highlights that the impact of mycotoxins extends beyond these effects. They can significantly alter the gut microbiome in both

animals and humans, leading to dysbiosis, reduced microbial diversity, and the proliferation of opportunistic pathogens such as Escherichia coli and Clostridium species. Additionally, beneficial bacteria like Lactobacillus and Bifidobacterium are depleted, and the Firmicutes/Bacteroidetes ratio (F/ B)—a key indicator of gut health—is adversely affected.

Risks to Human Health

A major concern is the carry-over effect, where mycotoxins or their metabolites transfer from contaminated feed into animal-derived products such as milk, meat, and eggs.

For instance, Aflatoxin B1 in feed is metabolized by dairy animals into Aflatoxin M1, a Group 1 carcinogen found in milk and directly linked to liver cancer in humans. Given that milk is a dietary staple—especially for children—this risk becomes even more critical, affecting long-term public health.

Mycotoxins are often termed "silent killers" due to their chemical stability, enabling them to survive conventional food processing methods such as cooking and pasteurization.

Primary Carcinogenic Mycotoxins

Aflatoxins (B1, B2, G1, G2, M1): Strongly associated with hepatocellular carcinoma. Classified as Group 1 carcinogens by the International Agency for Research on Cancer (IARC). Aflatoxin B1 is known to metabolize into a reactive intermediate that binds to DNA, and induce mutations in the p53 tumor suppressor gene. The risk of liver cancer increases 30–60 times in individuals with concurrent Hepatitis B infection.

Fumonisins (B1, B2): Linked to oesophageal cancer and classified as Group 2B (possibly carcinogenic). They disrupt sphingolipid metabolism, leading to abnormal cell growth and apoptosis (programmed cell death) failure.

Ochratoxin A (OTA): Associated with kidney and urinary tract cancers and also classified as Group 2B. Chronic exposure is linked to Balkan Endemic Nephropathy, a kidney disease with a high incidence of associated urinary tract tumors.

Emerging Links and Secondary Risks

Zearalenone (ZEN): Associated with hormone-dependent cancers such as breast, ovarian, and cervical cancer due to its estrogenic activity.

Sterigmatocystin: A precursor to aflatoxin and a potent carcinogen affecting the liver and lungs.

Patulin: Commonly found in moldy apples; while genotoxic, its carcinogenic potential in humans is still under investigation, though experimental models suggest links to colorectal cancer.

Economic Importance of Mycotoxin Testing

The financial impact of mycotoxin contamination is substantial, with billions of dollars lost annually worldwide.

Direct losses: Reduced crop

yields, animal mortality, and poor performance (lower feed conversion efficiency and weight gain).

Trade implications: Rejection of contaminated consignments, particularly in stringent markets like the EU and US.

Regulatory costs: Product recalls, legal liabilities, and long-term damage to brand reputation and consumer trust.

In the United States alone, annual losses due to mycotoxin contamination in crops such as maize and peanuts are estimated at approximately USD 932 million.

Regulatory Framework

In the regulatory landscape of animal feed and food safety, international and national bodies work together to set standards that mitigate the health and economic risks of mycotoxin contamination.

International: Codex Alimentarius Commission

The Codex Alimentarius Commission (FAO/WHO) establishes science-based global food safety standards. Codex releases the Maximum Residue Levels (MRLs): It sets recommended Maximum Levels for mycotoxins in various commodities, such as 10-15 µg/kg for aflatoxins in peanuts and 50 µg/L for patulin in apple juice. Codex relies on the Joint FAO/WHO Expert Committee on Food Additives (JECFA) to conduct scientific risk assessments that form the basis for these MLs. Its standards serve as a benchmark for international trade and are recognized by the World Trade Organization (WTO).

India: Bureau of Indian Standards (BIS)

BIS sets quality standards for animal feed and prescribes the requirements and methods of sampling for various animal feeds, such as Compounded Cattle Feed (IS 2052:2009). It has established a maximum permissible level of 20 ppb (µg/kg) for Aflatoxin in all animal feeds to prevent toxicity in livestock and carry-over into human food. BIS provides the certification mark (ISI mark) that ensures feed products comply with these safety standards before commercial sale.

India: Food Safety and Standards Authority of India (FSSAI)

FSSAI regulates food safety and has extended oversight to animal feed. It mandates compliance with BIS standards and sets strict limits for mycotoxins in food products, such as 0.5 µg/kg for Aflatoxin M1 in milk and 15 µg/kg for total aflatoxins in cereals. It publishes the Manual of Methods of Analysis of Foods (Mycotoxins), providing standardized testing procedures for regulatory laboratories across India.

The Role of Rapid Testing Methods

While reference methods like High-Performance Liquid Chromatography (HPLC) and Liquid Chromatography-Mass Spectrometry (LC-MS/MS) remain the gold standard for accuracy, they are often time-intensive, costly, and require specialized infrastructure. This has led to the widespread adoption of rapid testing methods, which are essential for on-site screening and real-time decision-making.

Key Rapid Technologies

ELISA (Enzyme-Linked Immunosorbent Assay): A cost-effective, high-throughput method delivering results within hours.

Lateral Flow Immunoassays (LFIA): Portable, easy-to-use tests providing results within minutes, ideal for on-site screening.

Strategic Advantages

Rapid testing enables real-time decision-making, allowing producers to screen raw materials at the point of entry. Contaminated batches can be immediately rejected or diverted, preventing contamination of the entire supply chain and ensuring compliance and animal safety.

Conclusion

An integrated mycotoxin management strategy—combining rapid on-site screening with precise laboratory confirmation—is essential to effectively mitigate the significant health and economic risks posed by mycotoxins. Proactive testing is not just a quality control measure; it is a fundamental pillar of sustainable and responsible livestock production.

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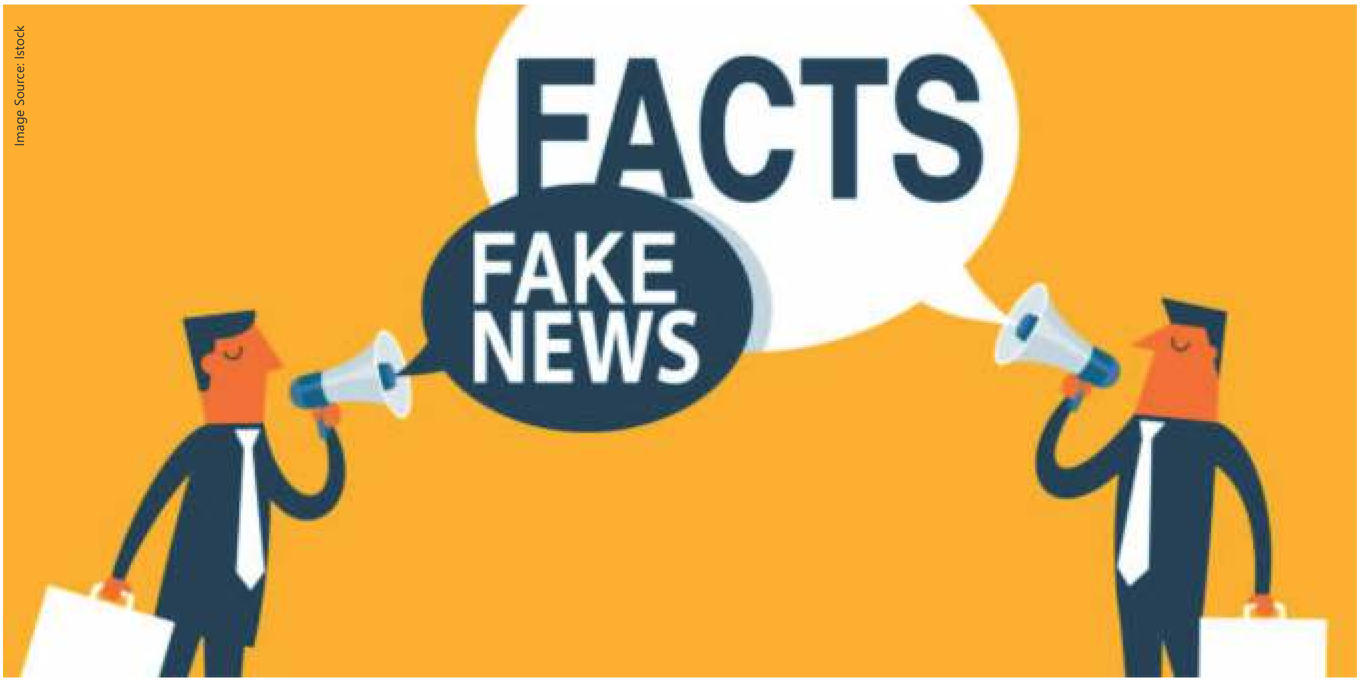

Misinformation About Hormone Use in the Poultry Industry: Scientific Facts vs Myths

By **Dr. Dibyendu Kumar Dey**, Executive Director, and **Dr. Nagesh Sonale**, Techno-Commercial Manager, Immeureka Animal Health Pvt. Ltd.


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Introduction: Origin and Persistence of the Hormone Myth

One of the most widespread misconceptions surrounding poultry meat and eggs is the belief that growth hormones are routinely used in the poultry meat and egg industry to increase body weight, accelerate growth, or enhance egg production. This misconception persists despite enormous scientific evidence and strict regulatory bans across major poultry-producing countries.

Consumer perception studies conducted in Asia and Europe report that 70–90% of respondents believe hormones are added to broiler chickens and laying hens. These perceptions are often linked to health risks such as early puberty, hormonal imbalance, and cancer (Karasu & Öztürk, 2021; Verbeke et al., 2010).

Unfortunately, such misunderstandings are further amplified by misleading media narratives and the misinterpretation of naturally occurring hormones present in all living organisms.

Both chicken meat and eggs naturally contain trace levels of endogenous hormones, but these are produced by the birds themselves and are not the result of external hormone administration (Courtheyn et al., 2002).

This misinformation undermines consumer trust, impacts poultry farmers and allied industries, and diverts attention from genuine food safety concerns such as nutrition, sustainability, and antimicrobial resistance. International authorities, including the Food and Agriculture Organization (FAO), World Health

Organization (WHO), U.S. Food and Drug Administration (FDA), and the European Commission, have consistently clarified that neither broiler chickens nor laying hens are administered growth or production hormones (FAO/WHO, 2011; FDA, 2023).

Addressing this myth with evidence-based communication is essential to enable informed consumer choices and public confidence in the poultry products.

Scientific Reality: Hormones Are Not Used in Poultry Production

From a biological, practical, and economic standpoint, the use of hormones in poultry meat or egg production is neither effective nor feasible. Comprehensive scientific reviews confirm that no hormone products are approved or used in broiler chickens or commercial laying hens (Esquivel-Hernández et al., 2016).

Unlike cattle, poultry have short production cycles, and their endocrine systems do not respond effectively to externally administered growth hormones. Experimental studies evaluating somatotropin and steroid hormones have consistently shown no significant improvement in growth rate, feed efficiency, or egg production (Scanes, 2009).

In laying hens, egg production is regulated by complex physiological mechanisms involving the hypothalamic–pituitary–gonadal axis, which cannot be safely or effectively manipulated through exogenous hormone supplementation (Johnson, 2015).

Even if protein-based hormones were administered, they would be degraded during digestion, rendering oral delivery ineffective. Injectable administration is impractical in commercial poultry systems managing thousands of birds (Esquivel-Hernández et al., 2016). Additionally, hormone compounds are expensive and incompatible with the low-margin economics of poultry production.

As a result, there is no scientifically valid or commercially viable pathway for hormone use in the poultry sector.

Regulatory Prohibition of Hormone Use in Poultry Production

Regulatory frameworks further reinforce this reality. The U.S. Food and Drug Administration explicitly states that hormones are not permitted in poultry or egg production, and no hormone-based drugs are approved for laying hens (FDA, 2023).

Similarly, the European Commission banned the use of growth hormones in food animals decades ago and continues to enforce strict monitoring programs to ensure compliance (European Commission, 2018). These regulations apply equally to both meat- and egg-producing birds.

Genetics, Nutrition, and Management: The Real Drivers of Productivity

The enhanced productivity of modern broilers and laying hens is the result of decades of systematic genetic selection, supported by precision nutrition and advanced management practices—not hormone use.

Havenstein et al. (2003) demonstrated that modern broilers reach market weight nearly twice as fast as birds from the 1950s when fed identical diets, clearly confirming that improvements are driven by genetics rather than hormones. Continued genetic selection has enhanced muscle fibre deposition efficiency, particularly in the breast muscle, leading to higher lean meat yield. These improvements are achieved using selection indices that integrate growth, efficiency, health, and welfare traits, ensuring sustainable productivity without compromising biological integrity (Havenstein et al., 2003; Zuidhof et al., 2014; Scanes, 2009).

Similarly, long-term genetic selection has significantly

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improved egg production, shell quality, and feed efficiency in laying hens, with modern birds producing over 300 eggs annually without compromising health (Hunton, 2005).

These genetic gains are supported by precision-based nutrition, with carefully balanced diets optimizing growth, reproduction, and egg production (Leeson & Summers, 2001; Pattison et al., 2008). In parallel, advancements in housing systems, automation, biosecurity, and environmental management have further enhanced bird welfare and productivity, collectively explaining modern poultry performance without the use of hormones.

Hormones in Poultry Meat and Eggs: Scientific Context and Safety

All animals, including poultry and humans, naturally produce hormones such as oestrogen, progesterone, and testosterone. Consequently, trace amounts of these hormones are naturally present in chicken meat and eggs, but they are not externally added (Stephany, 2010).

These levels are extremely low and biologically insignificant. The FAO/WHO Joint Expert Committee on Food Additives (JECFA) has concluded that naturally occurring hormone residues in animal-derived foods pose no health risk to consumers, including children and adolescents (FAO/WHO, 2011).

Claims linking poultry consumption to hormonal disorders lack scientific validity. Furthermore, marketing terms such as "hormone-free chicken" or "hormone-free eggs" can unintentionally reinforce misconceptions by implying that hormones are otherwise used, which is not the case (Verbeke et al., 2010).

Clear, science-based communication is essential to address these misunderstandings.

Role of Social Media in Spreading Misinformation

The rapid growth of social media has significantly accelerated the spread of unverified and misleading information. Much of this content is driven by non-expert sources or influencers seeking attention through sensational or fear-based narratives.

Public awareness of anabolic steroid use in humans has led to incorrect assumptions that similar substances are used in poultry production. This has influenced consumer perceptions—particularly among household decision-makers—leading to reduced consumption of broiler chicken in some segments.

In reality, broiler growth is achieved through genetic potential, balanced nutrition, and efficient farm management—not hormones or steroids. Addressing misinformation requires not only scientific communication but also improved digital literacy among consumers.

Conclusion

The belief that hormones are used in poultry meat and egg production is scientifically unfounded, biologically implausible, and legally prohibited.

Modern poultry production relies on genetic selection, precision nutrition, health management, and environmental control—not artificial hormones. Regulatory authorities worldwide strictly enforce these standards to ensure food safety and consumer protection (FDA, 2023; European Commission, 2018).

Continuing to propagate hormone-related myths diverts attention from real challenges such as antimicrobial resistance, climate resilience, and sustainable production systems (WHO, 2017).

Scientists, veterinarians, medical professionals, industry stakeholders, and media all share the responsibility of communicating accurate, evidence-based information. Strengthening public awareness will not only improve consumer understanding but also build trust and credibility across the poultry value chain.

Dispelling hormone-related myths is essential for protecting public health, ensuring food security, and maintaining confidence in the poultry industry.

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	E.Coli	Negative
	S.Aureus	Negative
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Waste to Wealth: Unlocking Alternative Feed Resources for Poultry

by **Gautam Shukla** (4th year BVSC &AH) and **Subarno Saha** (3rd Year BVSc & AH)

Introduction

One of the major challenges in poultry production is the high cost of formulated compound feed, which accounts for nearly 70% of the total production cost. The poultry feed industry relies heavily on maize and soybean meal as the primary sources of energy and protein. However, due to price volatility, limited availability, and occasional import dependence, the cost of these ingredients often fluctuates. This situation particularly affects small-scale and mid-scale poultry farmers, leading to reduced profit margins.

Therefore, there is an increasing need to identify alternative and cost-effective feed resources that can partially replace conventional ingredients without compromising bird health and performance. One promising approach is the utilization of unconventional feed ingredients, such as hatchery waste and feather meal, which are often discarded as industrial waste but possess significant nutritional value.

The concept of converting waste materials into valuable feed ingredients not only helps reduce feed costs but also supports sustainable poultry production and improved environmental management.

What is Waste to Wealth?

"Waste to Wealth" refers to the efficient utilization of by-products and waste materials that are generally discarded but have significant nutritional and economic value.

In the poultry industry, materials such as hatchery waste and feathers are generated in large quantities. Hatchery waste includes infertile eggs, eggshells, broken eggs, membranes, and dead embryos. These materials are rich in protein, fat, minerals, and calcium. Through proper processing methods such as rendering, heat treatment, or fermentation, hatchery waste can be converted into nutritionally valuable feed ingredients.

Similarly, feathers produced during poultry processing are rich in keratin protein. When feathers undergo proper hydrolysis, the keratin becomes digestible and is converted into feather meal, which can be used as a protein supplement in poultry and fish feed.

By safely processing and utilizing these materials, poultry producers can reduce feed costs, minimize environmental pollution, and move toward a circular and sustainable production system.

Potential Waste Products and Their Processing Techniques

1. Hatchery Waste

Hatchery waste consists of infertile eggs, eggshells, membranes, and dead embryos generated during the hatchery process. These materials can be converted into valuable products through several industrial processing methods.

One of the most common methods is rendering combined with heat treatment, similar to the process used for producing meat and bone meal or organic fertilizers. Rendering helps remove moisture, destroy pathogens, and produce a stable product suitable for further processing.

Alternative heat treatment methods include boiling infertile eggs at 100°C for approximately 1 hour and boiling dead embryos at 100°C for around 30 minutes, followed by sun drying for about four days. These methods help reduce microbial contamination and increase the shelf life of the product.

Advanced methods such as autoclaving and extrusion processing with ingredients like soybean meal or maize are also used. However, these techniques often require specialized facilities and infrastructure. In regions where such facilities are limited, on-site methods such as ensiling and fermentation offer practical alternatives. These processes lower pH levels and inhibit microbial spoilage.

Research indicates that ensiling fresh hatchery waste with a carbohydrate source and lactic acid–producing bacteria for two weeks results in a microbiologically safe and nutritionally stable product. Similarly, preservation using 7% of a 1:1 mixture of formic acid and propionic acid helps maintain nutrient quality and ensures microbial safety.

2. Feather Meal

Feather meal is a high-protein feed ingredient containing approximately 87% crude protein. The primary protein in feathers is keratin, which constitutes about 80–100% of the feather structure.

However, keratin in its natural form is highly resistant to digestion, with digestibility reported to be less than 5%. This resistance is due to the high cysteine content (around 8%), which forms strong disulfide bonds that create tightly folded protein structures.

To improve digestibility, feathers must undergo hydrolysis, which breaks these bonds and makes the protein more accessible to digestive enzymes.

Typically, feather hydrolysis is carried out under high pressure and temperature conditions such as steam pressure of 60–65 pounds per square inch and a temperature around 140–143°C for about 30–40 minutes.

After hydrolysis, the material is dried at 90–110°C for approximately five hours, cooled, and then ground using equipment such as a hammer mill. The final product is sieved and stored under appropriate conditions to maintain quality.

Hydrolyzed feather meal can then be used as a protein supplement in poultry, fish, and livestock feeds.

Conclusion

The concept of waste to wealth offers a promising strategy for improving the sustainability and economic efficiency of the poultry industry. By utilizing waste materials such as hatchery waste and feathers, the poultry sector can reduce dependence on expensive conventional feed ingredients like maize and soybean meal.

Proper processing techniques ensure that these by-products are nutritionally valuable, safe, and environmentally sustainable. Adoption of such practices can help poultry producers lower feed costs, reduce environmental pollution, and promote a circular agricultural economy.

Going forward, increased research, improved processing technologies, and greater awareness among farmers will be key to unlocking the full potential of alternative feed resources in poultry nutrition.

Export Disruptions Trigger Price Crisis in Namakkal's Poultry Sector

India's leading poultry hub, Namakkal, is facing a severe market disruption as egg exports to West Asia have stalled, triggering a sharp fall in domestic prices and mounting financial losses for farmers and exporters. Widely known as the "Egg City of India," Namakkal produces over 6–7 crore eggs daily and plays a critical role in supplying both domestic and international markets.

The region has long depended on exports to stabilise prices, with key destinations including the United Arab Emirates, Qatar, and Oman. However, recent geopolitical tensions linked to the Iran–Israel conflict have disrupted shipping routes, forcing exporters to suspend operations. As a result, the Namakkal poultry cluster is estimated to be incurring losses of nearly INR 5 crore per day.

With export channels blocked, eggs originally intended for overseas markets are now flooding the domestic supply chain. Farms and storage facilities are struggling to manage the sudden surplus, leading to a sharp correction in prices. The National Egg Coordination Committee has reduced benchmark procurement prices multiple times in response to the oversupply. Over a short period, prices in Namakkal have dropped from around INR 5.40 per egg to approximately INR 4.30 per egg, with some farmers reporting even lower realizations in certain markets.

The crisis is further compounded by weak seasonal demand. Egg consumption typically declines during the summer months, and this trend is amplified during periods such as Ramzan and Lent, when dietary patterns shift across several regions. The combined effect of reduced demand and excess supply has intensified downward pressure on prices, significantly affecting farm profitability.

In response, industry stakeholders are calling for immediate government support. Key recommendations include facilitating access to alternative export markets, providing logistical assistance, and introducing measures to absorb surplus production within the domestic system. Without timely intervention, prolonged low prices could threaten the financial sustainability of poultry farms, particularly smaller and mid-sized operations.

Despite the current challenges, Namakkal remains a cornerstone of India's poultry ecosystem, with over 1,000 farms supported by a well-developed network of hatcheries, feed mills, and exporters. While price recovery is expected once exports resume and demand stabilise, the ongoing disruption highlights the sector's vulnerability to external shocks and the need for more resilient market strategies.

Ethanol Push vs Feed Security: Can India Strike the Right Balance?

India's pursuit of energy self-reliance is increasingly reshaping its agricultural economy. The rapid expansion of the E20 blending programme has significantly boosted grain-based ethanol production, with maize accounting for 42.74% of total ethanol output in the 2023–24 supply year. This shift has strengthened energy security and reduced dependence on imported crude, aligning with the broader vision of Aatmanirbharta. However, it has also tightened domestic grain availability and influenced cropping patterns. As maize is increasingly diverted toward fuel, a critical question emerges: can India sustain its ethanol ambitions without compromising feed availability and livestock sustainability?

The most immediate pressure point is maize. Traditionally a key energy ingredient in animal feed, maize has become an attractive ethanol feedstock due to assured procurement and stable pricing mechanisms. Industry estimates suggest that maize diversion to ethanol increased sharply—from around 1 million tonnes in 2022–23 to nearly 7 million tonnes in 2023–24—with further growth expected as new grain-based distilleries become operational. This steady offtake has altered market dynamics, keeping maize prices firm even during periods of high production and reducing the price relief that feed buyers typically rely on.

India's poultry sector, which consumes approximately 60–70% of the country's maize output, is particularly vulnerable to such shifts. Feed constitutes the largest share of production costs in both poultry and dairy systems. Any sustained increase in maize prices quickly translates into higher input costs, which in turn affect the pricing of eggs, milk, and meat. Recent years have already seen a notable rise in maize prices, reflecting tightening supplies and growing competition from ethanol producers. For poultry farmers operating on narrow margins, this sustained price firmness creates significant cost pressures, with downstream implications for food affordability.

India Opens DDGS Imports to Stabilise Feed Supply

India has moved to ease raw material shortages in the feed sector by allowing duty-free or concessional imports of U.S. distillers dried grains with solubles (DDGS) under an interim trade arrangement with the United States. The decision provides preferential tariff treatment for DDGS used in compound feed and has been welcomed by industry stakeholders, including the Poultry Federation of India.

According to industry representatives, the measure is aimed at addressing the widening gap between domestic feed demand and supply. Production of key ingredients such as maize and soybean meal continues to fall short of the requirements of poultry, dairy, and aquaculture sectors, while constraints such as limited arable land and productivity challenges restrict output growth. As a result, reliance on imports is expected to increase over the coming years.

The move follows earlier announcements by Piyush Goyal on tariff quotas to facilitate reduced-duty imports. Industry experts note that such imports can help balance supply-demand mismatches and stabilise feed costs.

The decision also comes amid rising concerns over input price volatility. Poultry associations have highlighted increasing soybean meal prices and fluctuating maize markets, partly influenced by competing demand from sectors such as bioethanol. With several months remaining until the next soybean harvest, producers are facing continued margin pressure.

Overall, the policy is expected to provide short-term relief to the feed industry while supporting production stability and moderating cost pressures across the livestock value chain.

Blue Economy Momentum: Inland Aquaculture Drives Growth and Exports

India's aquaculture sector is gaining strong momentum, driven by innovative use of underutilised land and expanding global market opportunities. Recent developments highlight how inland shrimp farming and export diversification are reshaping the country's seafood landscape.

In Haryana, particularly across the Gurugram–Faridabad–Nuh belt, saline and waterlogged lands are being successfully converted into productive aquaculture zones under the state's "Blue Revolution" strategy. Farmers are increasingly adopting the cultivation of Litopenaeus vannamei, a species well-suited to brackish water conditions. This shift has enabled the transformation of previously unproductive land into high-value shrimp farms, significantly improving farm incomes.

The growth trajectory is notable. Shrimp production in Haryana rose from around 11,000 metric tonnes in 2023–24 to nearly 14,966 metric tonnes in 2024–25, marking an increase of about 36%. With an estimated 58,000 hectares of saline-affected land available for aquaculture, the scope for further expansion remains substantial. Farmers adopting intensive practices are achieving yields of 11–12 tonnes per hectare, with net returns ranging between INR 8–10 lakh per hectare—far exceeding conventional crop earnings on such land.

This expansion is supported by policy initiatives such as Pradhan Mantri Matsya Sampada Yojana, along with the adoption of advanced systems like biofloc and recirculatory aquaculture. Additionally, proximity to major logistics hubs, including Delhi's export infrastructure, is strengthening the farm-to-market ecosystem through improved cold-chain and processing facilities.

At the national level, India's shrimp export sector is also witnessing a strong recovery. Export revenues have crossed INR 50,000 crore, with projected growth of 13–15%, driven largely by improved realizations due to currency depreciation. While export volumes are growing at a moderate pace of 6–7%, the industry is successfully offsetting reduced shipments to the US by expanding into alternative markets. Countries such as Vietnam, the European Union, and China have recorded strong double-digit growth, supporting overall export performance.

Looking ahead, export volumes are expected to grow further, supported by rising aquaculture production and improving global demand. Stable operating margins and strong financial fundamentals indicate resilience within the sector.

Together, these trends underline the growing importance of aquaculture as a high-potential segment within India's agri-economy—offering scalable income opportunities, efficient land use, and a strong export-driven growth pathway.

Punjab Positions Itself as an Investment Hub for Dairy and Animal Nutrition

At the Progressive Punjab Investors Summit (PPIS) 2026, the Punjab government outlined its vision to position the state as a leading destination for investment in dairy, animal nutrition, and livestock development. Emphasising the importance of allied agricultural sectors in driving rural economic growth, Animal Husbandry, Dairy Development and Fisheries Minister Gurmeet Singh Khudian highlighted Punjab's strong foundation in dairy production and feed infrastructure.

Punjab's dairy sector remains one of its key strengths, with annual milk production exceeding 14.5 million tonnes. The state's per capita milk availability stands at approximately 1,318 grams per day—nearly three times the national average—reflecting both high productivity and strong farmer engagement. This performance has been supported by progressive farming practices, modern infrastructure, and a policy environment conducive to growth.

The presence of global players such as Cargill Animal Nutrition & Health and De Heus Animal Nutrition, which have established advanced feed plants in the state, further reinforces Punjab's attractiveness as an investment destination. In addition, government initiatives promoting commercial silage production and hydroponic fodder systems are aimed at improving feed availability and sustainability.

Research and extension support also play a crucial role. Institutions like Guru Angad Dev Veterinary and Animal Sciences University provide scientific expertise, including region-specific mineral mixtures that enhance animal health and productivity. The state's extensive veterinary network—comprising hospitals, dispensaries, and polyclinics—supports livestock health at scale, complemented by the adoption of advanced reproductive technologies such as IVF and sex-sorted semen.

A significant opportunity lies in dairy processing, as a large share of milk is consumed in raw form. This creates potential for investment in value-added products such as paneer, ghee, ice cream, and flavoured milk. With strong infrastructure, skilled manpower, and policy support, Punjab is positioning itself as a future-ready hub for dairy and livestock-based industries.

Uttar Pradesh Tackles Green Fodder Deficit to Support Livestock Sector

Uttar Pradesh is facing a significant shortage of green fodder, with a deficit estimated at around 45%, posing a challenge to livestock productivity and the rural dairy economy. Despite having a total agricultural area of about 166.84 lakh hectares, only 2.41 lakh hectares—less than 1.5%—is currently under green fodder cultivation. Within this limited area, crop distribution remains highly skewed, with sugarcane occupying nearly 80% of the fodder acreage.

According to officials, the imbalance has led to a substantial gap in green fodder availability, even as dry fodder remains marginally surplus at around 3%. This shortage has direct implications for milk production, animal health, and the overall cost of livestock management, particularly for small and rural farmers.

To address the issue, the state government has initiated a multi-departmental strategy under a task force led by Chief Secretary S. P. Goyal. The initiative involves coordination across agriculture, horticulture, animal husbandry, and other departments, along with expert consultations to develop sustainable solutions.

One of the key focus areas is reclaiming traditional grazing and meadow lands. Of the approximately 65,000 hectares previously encroached upon, nearly 50,000 hectares have been cleared, with green fodder cultivation already initiated on around 6,000 hectares. Efforts are also underway to create localized fodder supply systems by linking over 7,000 cow shelters—housing more than 12 lakh stray cattle—with nearby fodder-producing fields.

The strategy further emphasizes a shift toward participatory models by involving Farmer Producer Organisations (FPOs), NGOs, and rural youth in fodder cultivation. The government plans to support these efforts through quality seeds, technical guidance, and extension services, enabling a more decentralized and market-driven approach.

Experts have highlighted the need for diversification of fodder crops, promotion of silage-making, and better utilization of crop residues such as wheat straw, paddy stubble, and maize stalks. While these measures are expected to improve fodder availability, sustained implementation will be critical, particularly as feed costs continue to rise and dairy margins remain under pressure.

India's Corn Exports Gain Momentum Amid Shifting Global Trade

India's maize (corn) exports are witnessing a recovery, supported by strong production, competitive pricing, and evolving global trade dynamics. According to the United States Department of Agriculture, export projections have been revised upward, with nearly 400,000 tonnes shipped between October and December 2025—almost double the volumes recorded during the same period in the previous two years.

Robust domestic production underpins this growth. India's maize output is estimated at over 43 million tonnes for the 2024–25 crop year, ensuring sufficient availability for both domestic consumption and exports. Additionally, the depreciation of the rupee has enhanced the global competitiveness of Indian maize, particularly in price-sensitive markets across Asia and Africa.

Geopolitical developments are also influencing trade flows. Disruptions in West Asia, including those linked to tensions around Iran and shipping challenges through the Strait of Hormuz, have impacted traditional supply chains. As a result, importers are increasingly exploring alternative suppliers, with maize emerging as a viable option for feed and industrial use.

However, export potential remains closely tied to domestic demand. A growing share of maize is being diverted towards ethanol production and the poultry feed sector, tightening internal availability. This structural shift suggests that while export opportunities are improving, they will depend on maintaining a balance between domestic consumption and surplus availability.

Overall, favourable global conditions, including supply uncertainties in key producing regions and sustained biofuel demand, are creating new opportunities for India to strengthen its position in the international maize market.

Poultry Industry Seeks Stability Amid Soybean Supply Concerns

India's poultry and livestock sectors are raising concerns over tightening soybean availability, urging policy support to stabilise feed markets. Soybean production for the 2025–26 season is estimated at 12.72 million tonnes; however, the Soybean Processors Association of India has projected a lower output of 10.53 million tonnes, compared to 12.58 million tonnes in the previous year. The USDA Foreign Agricultural Service has also indicated a potential 15% decline, citing reduced acreage, adverse weather conditions, and crop diversification.

A decline in soybean production directly impacts the availability of soybean meal, a critical protein source for poultry, dairy, aquaculture, and fish feed. Any disruption in supply is likely to increase feed costs and exert pressure on farmers and integrators dependent on affordable, high-quality nutrition inputs.

To address the anticipated shortfall, industry stakeholders have recommended allowing imports of up to 1.5 million tonnes of genetically modified (GM) soybean meal. This, they argue, would help ensure continuity in feed supply and mitigate price volatility.

In parallel, there are calls to extend the government's suspension of soybean trading on the National Commodity and Derivatives Exchange, which was implemented to curb speculative activity and stabilise prices. With the restriction set to expire on March 31, 2026, industry bodies believe an extension could prevent sharp market fluctuations and protect stakeholders across the value chain.

Overall, the situation highlights the need for balanced policy measures to manage supply risks, maintain feed affordability, and support the stability of India's livestock and aquaculture sectors.

Oilseed Meal Exports Under Pressure Amid Market Shifts

India's oilseed sector is facing headwinds, with exports of both rapeseed and soybean meal declining despite strong production trends. Rapeseed output for 2026 is expected to reach a record 11.7 million tonnes; however, lower carryover stocks are likely to offset the gains, limiting overall availability. According to Germany-based Oil World, the coming 2026–27 season may see a slowdown in rapeseed processing after several years of expansion, driven by constrained domestic supply and evolving global market dynamics.

Export performance has already weakened. Rapeseed meal shipments fell by 32% to around 356,000 tonnes during October–January 2025/26, largely due to uncompetitive pricing. Demand from key markets is expected to soften further, particularly as new trade arrangements between China and Canada could reduce India's share in the Chinese market.

The soybean segment reflects a similar trend. Soybean meal exports declined by 30% over the same period, reaching approximately 425,000 tonnes. Higher domestic prices compared to global benchmarks have reduced India's competitiveness, leading to a sharp drop in demand from European buyers.

External factors are also adding pressure. Ongoing geopolitical tensions in West Asia have increased freight costs and disrupted supply chains, further impacting export viability.

Overall, while production remains relatively strong, India's oilseed meal exports are being challenged by pricing disadvantages, shifting trade relationships, and global logistical uncertainties, signalling a period of adjustment for the sector.

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