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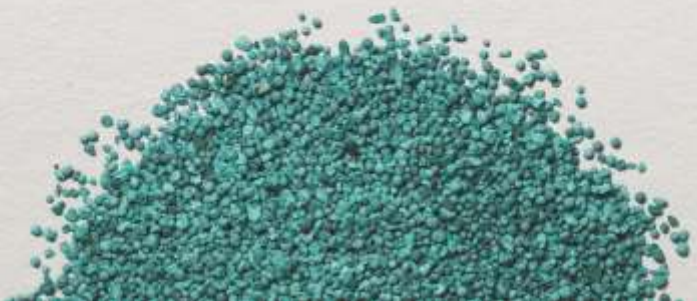

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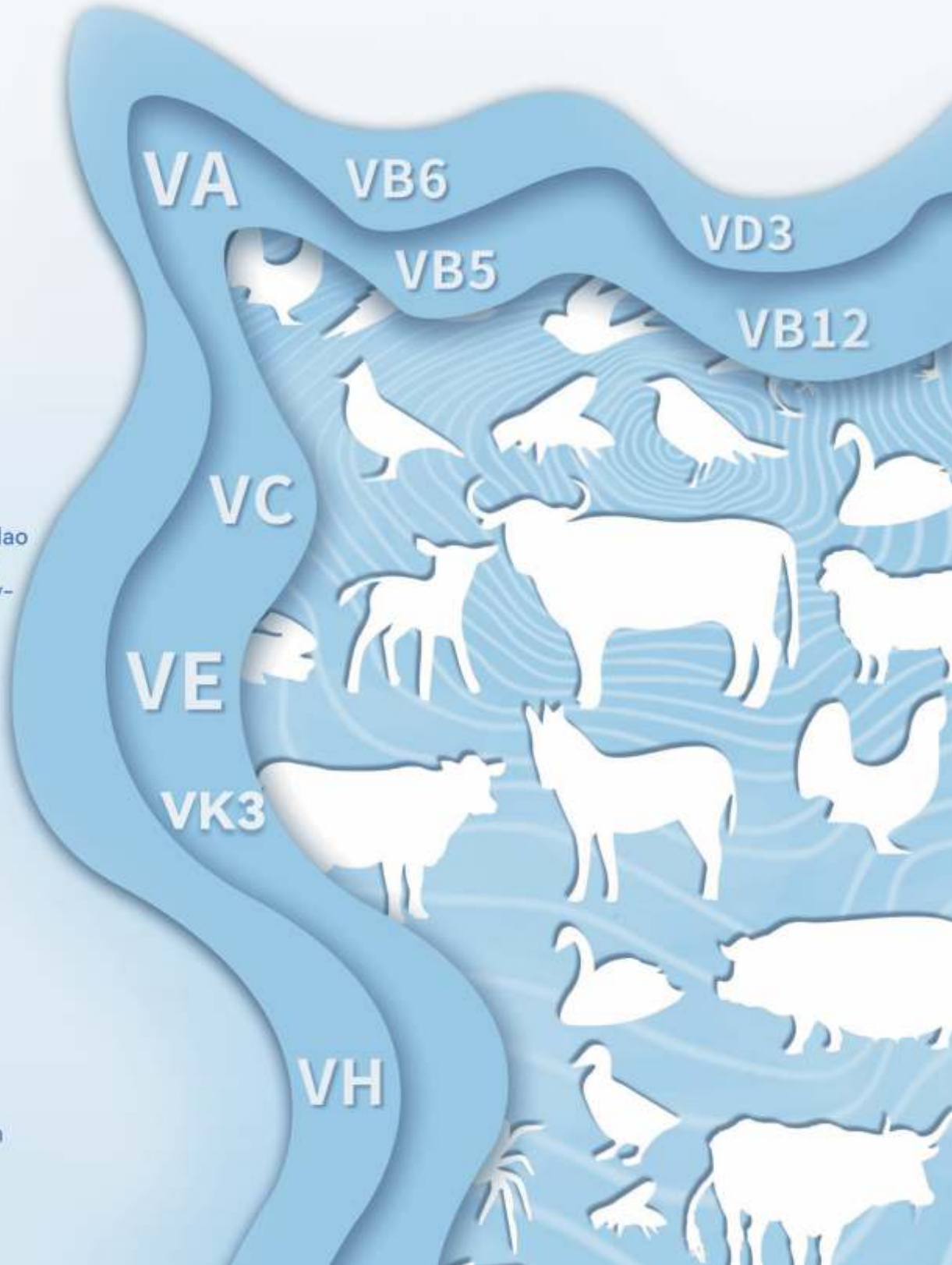

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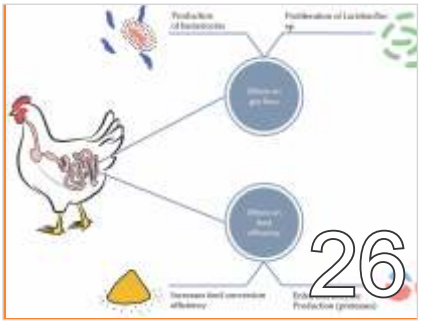

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Erratum: In the previous issue (Volume-12, Issue-7), an image on page 26 was printed incorrectly due to an editorial error. We regret the mistake and apologize to our readers and any individuals or organizations affected.

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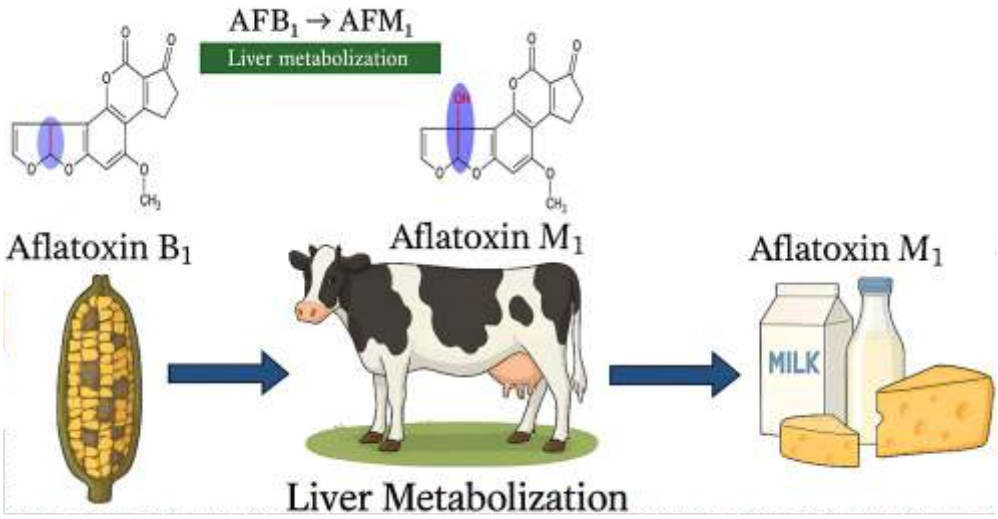
Portable Aflatoxin Testing Could Strengthen Dairy Feed Safety in India



Scientists at Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana, are working with IIT Delhi, the Indian Agricultural Research Institute (IARI) and PGIMER Chandigarh on a three-year National One Health Mission project to strengthen surveillance of aflatoxin contamination in dairy feed and fodder.

A key component of the project is the development of a portable aflatoxin detection device that could enable testing closer to the point of sale or farm. The initiative will also map contamination across Punjab to identify high-risk areas. GADVASU has separately announced plans for a laboratory-on-wheels equipped for feed, fodder, silage, aflatoxin and milk testing.

Aflatoxin Risk Profile

Aflatoxin B1 (AFB1), produced mainly by Aspergillus fungi, is a particular concern in feed ingredients such as maize and groundnut cake. An ICAR study found these ingredients to be highly prone to AFB1 contamination, with higher incidence during the monsoon. The study also identified geographical and seasonal variation in contamination, highlighting the importance of risk-based sourcing and testing.

Earlier Indian research has also detected AFB1 in cottonseed cake, groundnut cake, soybean cake, sunflower cake, maize, wheat bran and other feed ingredients, demonstrating that contamination can enter the feed chain through multiple raw materials.

The dairy sector faces an additional food-safety concern because AFB1 consumed through feed can be metabolised to aflatoxin M1 (AFM1) and excreted in milk.

Way Forward

In dairy animals, ingested aflatoxin B1 can be converted in the liver to aflatoxin M1, which is subsequently excreted in milk. Scientists therefore emphasise prevention through proper drying and storage, alongside monitoring and appropriate feed-management measures. Rapid, portable testing could enable screening of incoming raw materials, storage lots and finished feed, allowing contaminated consignments to be identified before they enter the dairy production chain. When combined with laboratory confirmation, proper storage, moisture control, traceability and validated mitigation strategies, such technology could shift aflatoxin management from periodic testing to a more proactive, risk-based surveillance system.

For India's dairy sector, integrating portable testing with mobile laboratories, digital mapping and farm-level advisory services could provide a practical pathway towards stronger feed-to-milk safety.

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Official Magazine

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Importance of Scientific Feeding of Dairy Cows

By **Dr T. M. Gowrisankar,** Independent Animal Nutritionist and Feed Consultant

Dr T M Gowrisankar

India has a large dairy cow population, but its per-animal milk production remains significantly below the global average. India's total cattle population stands at 193.46 million, according to official figures based primarily on the 20th Livestock Census, while the Department of Animal Husbandry and Dairying initiated the updated 21st Livestock Census in late 2024.

Population Breakdown

- Total cattle: 193.46 million animals nationwide
- Indigenous/non-descript cattle: 142.11 million
- Exotic/crossbred cattle: 51.36 million

Milk Production

Driven by this large cattle population, India remains the world's largest milk producer, producing more than 247.87 million tonnes of milk annually during 2024–25.

In India, a crossbred cow produces an average of 6.78 kg of milk per cow per day, or approximately 2,034 kg of milk per crossbred cow per year. By comparison, the USA produces 102 million metric tonnes (MMT) of milk per year from just 9.57 million cows, equivalent to approximately 28.6 kg of milk per cow per day, or 8,600 kg per dairy cow per year.

Crossbred cows, particularly Holstein Friesian (HF) and Jersey cows, are capable of producing 4,000–5,000 litres of milk per year under village conditions. However, only a small proportion of animals currently achieve this level of production, despite having the genetic potential to do so. Many Indian farmers now have dairy cows with significantly higher genetic potential, but this potential is often not fully realised due to gaps in nutrition and feeding management. The reason is simple: many farmers continue to practise non-scientific or imbalanced feeding, resulting in dairy cows not receiving

adequate nutrients to meet their production potential. A significant part of India's low milk productivity can be attributed to underfeeding and inadequate nutrition. Traditionally, dairy farmers kept cows with relatively low production potential and fed them crop by-products, including roughages such as stover and straw, along with concentrates such as wheat bran and rice bran. While some of these feed resources can provide valuable nutrients, their nutritional quality and availability can vary considerably. However, many farmers have upgraded the genetic potential of their herds by moving from native cattle to exotic or crossbred animals without making corresponding changes to their feeding practices. Matching improved genetics with scientific and balanced nutrition can significantly enhance dairy cow performance, milk production and the overall profitability of dairy farming.

What Does Scientific Feeding Involve?

Simply put, scientific or targeted feeding means meeting the nutrient requirements of a dairy cow at every stage of the lactation cycle. For a dairy enterprise to be profitable, this needs to be done in a balanced and efficient manner so that no nutrients—and consequently, no money—are wasted.

What Are the Nutrient Requirements?

Dairy cows require a balanced supply of:

- **Protein**
- **Energy** – from fats and carbohydrates
- **Vitamins**
- **Minerals**, including organic minerals
- **Water**
- **Essential feed additives**, such as rumen buffers and rumen-specific yeast cultures

One of the major challenges in dairy nutrition is that these nutrient requirements are **not constant**; they change according to the animal's stage of production. For instance, a lactating cow has different requirements from a dry cow, while a cow producing 25 litres of milk per day has significantly different requirements from one producing 5 litres per day.

Nutrient requirements also change during the dry period as the cow approaches calving. Determining the exact nutrient requirements of an individual animal can be difficult for farmers and requires specialist knowledge from veterinarians and dairy nutritionists.

What Does Scientific Feeding Involve?

Simple rules and practices for scientific dairy cow feeding.

A cow's diet consists primarily of two components: roughages and concentrates, including compound cattle feed. Roughage forms the bulk of the diet and includes dry fodder, paddy straw, green fodder and silage. Dry fodder and paddy straw are generally high in bulk but lower in nutrient content, while green fodder and silage provide the required bulk along with higher nutrient availability.

Roughage Quality

The quality of roughage has a significant impact on dairy cow performance. Roughages can broadly be classified into three categories based on their maturity and nutritional value.

High-quality roughage (forages or silage): CO-4, CO-5, Super Napier and COFS-29, when harvested at the right stage of growth, before the plants become too mature and while the stalks are still soft.

Average-quality roughage (forages or silage): CO-4, CO-5, Super Napier and COFS-29 when harvested at a more mature stage, when the stalks become hard. Mature native sorghum, roadside grasses, green maize fodder and sugarcane tops fall into this category.

Poor-quality roughage: Dry fodder, paddy straw, wheat straw and oat straw.

Dairy Cattle Feed / Concentrate Quality

The other important component of the diet is nutrient-dense compound cattle feed or concentrates. Commercial dairy cattle feeds available from reputed manufacturers in India generally contain cereal grains, milling by-products, cottonseed cake, copra DOC, wheat bran, DORB, rice polish, minerals, vitamins and essential feed supplements.

This category can also include highly nutritious forage legumes such as subabul, sesbania and agathi, which are highly digestible and contain relatively high levels of protein. Good-quality fodder is one of the most economical sources of nutrients for dairy cows. Therefore, wherever farmers have the resources to grow good-quality green fodder, they should provide as much chopped green fodder as the dairy cow will readily consume and then supplement it with the required quantity of high-quality compound cattle feed or concentrate. This approach can help improve both milk production and the profitability of the dairy enterprise.

Importance of Nutrient Balance

A balanced dairy diet is essential to prevent the wastage of expensive nutrients and to improve the profitability of dairy farming. If a dairy cow is fed enough protein, energy, vitamins and other nutrients to support a certain level of milk production but is deficient in one critical nutrient, milk production will be limited by that deficient nutrient. The surplus nutrients are then not utilised efficiently, resulting in unnecessary feed costs.

For example, if a cow is provided with sufficient protein, energy and vitamins to support the production of 20 litres of milk per day but receives only enough calcium to support 10 litres, her milk production will be limited accordingly. The additional protein and energy supplied will not be utilised efficiently, effectively increasing the farmer's feed costs without a corresponding increase in milk production.

The easiest way to achieve a balanced diet is to provide good-quality forage, either fresh or as silage, such as COFS-29, CO-5 or Super Napier. Ideally, the forage should be offered in chopped form and in quantities that allow the cow to consume it adequately, followed by the required amount of high-quality, scientifically formulated compound cattle feed to meet her nutritional requirements.

The quantity of compound cattle feed required will depend on the cow's milk production and the amount and quality of forage provided each day. If the compound cattle feed is properly mixed with chopped forage to form a total mixed ration (TMR), the risk of nutritional imbalances and digestive disorders such as acidosis, indigestion and bloat can be reduced significantly.

When this feeding regime is combined with proper teat dipping and clean milk production practices, it can contribute to improved udder health and overall dairy cow performance. Over time, somatic cell count (SCC) can be reduced, milk fat content can improve, reproductive performance can improve, and the cow can maintain better overall health.

If a dairy farmer relies solely on individual home-grown feed ingredients, it is highly unlikely—if not virtually impossible—to provide a scientifically balanced diet consistently. Although individual home-grown feed ingredients may appear cheaper, an unbalanced diet, particularly with respect to protein, vitamins and minerals, can result in lower milk production, poorer reproductive performance and increased susceptibility to disease due to compromised nutritional and immune status.

In the short term, home-grown individual feed ingredients may appear cheaper. However, in the long term, an unbalanced diet can cost the farmer more than using appropriately formulated compound cattle feed.

Protein

Protein is often the limiting nutrient in dairy cow diets for two main reasons:

1. Low protein content of dry fodder: Dry fodder and paddy straw are generally low in protein, which means that larger quantities of compound cattle feed or concentrate may be required to meet the cow's protein requirements.
2. High cost of protein sources: Protein ingredients used in compound cattle feed and concentrates are among the more expensive feed components, partly because many of these ingredients are also used in poultry feed.

Because dry fodder and paddy straw are low in protein, significantly larger quantities of compound cattle feed or concentrate may be required, compared with good-quality green fodder, to provide the same amount of protein. This can make feeding a lactating cow primarily on dry fodder economically inefficient.

One alternative is to include high-protein forages such as subabul, which can help reduce the requirement for compound cattle feed or concentrate while improving the overall protein supply.

Good-quality green fodders such as COFS-29, CO-5 and Super Napier can provide considerably higher nutritional value. When harvested at the appropriate stage of maturity, they can significantly reduce the need for concentrate supplementation and help improve the profitability of dairy farming.

Adequate protein nutrition is also important for maintaining milk composition. Poor protein nutrition can negatively affect milk fat and SNF levels, while improved and balanced protein nutrition can support higher milk fat and SNF. However, milk composition is influenced by several other factors as well, including overall energy supply, fibre, genetics and stage of lactation.

Energy (Fat and Carbohydrates)

Low energy intake is common when poor-quality forages such as dry fodder and paddy straw form a major part of the diet, as these feeds are generally low in available energy. This can be addressed by supplementing the diet with energy-rich feeds such as maize and other grains.

However, feeding excessive amounts of high-energy grains can create another problem. An excess of rapidly fermentable carbohydrates can increase the risk of ruminal acidosis, which can negatively affect rumen health and reduce milk fat content.

A classic sign of inadequate energy intake is a cow with a low body condition score (BCS), often accompanied by poor milk production and, in some cases, reduced milk fat.

Minerals and Vitamins

The symptoms of mineral and vitamin deficiencies can be similar and may include a rough, dry coat, poor reproductive performance and retained placenta after calving.

Fortunately, these deficiencies can often be addressed through appropriate supplementation with a good-quality dairy cattle feed supplement containing the required minerals, vitamins and essential feed additives. However, supplementation should be based on the animal's nutritional requirements and, where necessary, professional advice.

Water

Water is the most essential nutrient and is often one of the most overlooked. Water deficiency can have a rapid impact on feed intake, milk production and overall animal health. All dairy cows should have clean, fresh water available throughout the day, allowing them to drink whenever they need it. Adequate water availability is particularly important for lactating cows because water requirements increase significantly with milk production.

Indicative Model Formulations for Dairy Cattle Feed

The following indicative model formulations for 100 kg of dairy cattle feed are based on commonly available Indian feed ingredients, including maize, cottonseed extraction meal, coconut extraction cake, wheat bran, DORB and rapeseed DOC. These formulations are provided strictly for educational and reference purposes and should not be considered universal or ready-to-use feed recipes.

Farmers should consult a qualified dairy nutritionist or veterinarian before adopting any formulation for actual feeding. Ingredient quality can vary substantially between sources and batches; therefore, the final feed should be validated through laboratory analysis before use.

1. Calf Starter Feed — 0–3 Months

Calf starter feed is intended to support early rumen development, growth and efficient transition towards solid feed intake.

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Raw Material	kg/100 kg
Maize	30.0
Soybean meal, 44–46% CP	22.1
Cottonseed extraction meal/DOC, 36% CP	15.0
Coconut extraction cake, 22% CP	10.0
DORB, first grade	6.9
Wheat bran	10.0
Molasses	1.0
Vitamin-mineral premix	2.0
Salt	1.0
Calcite	0.5
Feed-grade vegetable oil/coconut oil	1.5
Total	100.0

Indicative nutrient targets: CP 23–24%; TDN 70–73%; fat ≥4.5%; CF ≤9%; Ca ≥0.80%; P ≥0.50%.

2. Calf Growth Feed — 3–6 Months

As calves progress beyond the starter phase, the diet can be adjusted to support continued skeletal and muscular development while gradually reducing the protein density of the concentrate.

Raw Material	kg/100 kg
Maize	35.0
Soybean meal	12.0
Cottonseed extraction meal	15.0
Coconut extraction cake	10.0
DORB, first grade	8.0
Wheat bran	10.0
Rapeseed DOC	5.0
Molasses	1.0
Vitamin-mineral premix	2.0
Salt	1.0
Calcite	1.0
Total	100.0

Indicative nutrient targets: CP 21–22%; TDN 68–72%; fat ≥4.0%; CF ≤10%; Ca ≥0.80%; P ≥0.50%.

3. Heifer Grower Feed — 6–12 Months

The heifer-growing stage is critical for achieving appropriate body growth without excessive fat deposition. Feed formulation should therefore be aligned with the animal's growth rate and forage availability.

Raw Material	kg/100 kg
Maize	36.0
Soybean meal	4.0
Cottonseed extraction meal	18.0
Coconut extraction cake	10.0
DORB, first grade	10.0
Wheat bran	12.0
Rapeseed DOC	5.0
Molasses	1.0
Vitamin-mineral premix	2.0
Salt	1.0
Calcite	1.0
Total	100.0

Indicative nutrient targets: CP 17–18%; TDN 65–68%; fat 4–5%; CF ≤12%.

4. Heifer Developer Feed — 12–18 Months

During the later growing stage, the objective is to maintain steady growth and prepare the heifer for future breeding and productive life.

Raw Material	kg/100 kg
Maize	36.0
Cottonseed extraction meal	20.0
Coconut extraction cake	10.0
DORB, first grade	12.0
Wheat bran	13.0
Rapeseed DOC	4.0
Molasses	1.0
Vitamin-mineral premix	2.0
Salt	1.0
Calcite	1.0
Total	100.0

Indicative nutrient targets: CP 15–16.5%; TDN 63–67%; fat 4–5%; CF ≤13%.

5. Dry Cow/Pregnant Cow Feed

Nutritional management during the dry and late-pregnancy period is important for maintaining body condition and preparing the animal for the subsequent lactation cycle.

Raw Material	kg/100 kg
Maize	32.0
Cottonseed extraction meal	18.0
Coconut extraction cake	10.0
DORB, first grade	15.0
Wheat bran	15.0
Rapeseed DOC	5.0
Molasses	1.0
Vitamin-mineral premix	2.0
Salt	1.0
Calcite	1.0
Total	100.0

Indicative nutrient targets: CP 15–16%; TDN 60–64%; fat 3.5–4.5%; CF ≤13%.

6. Early Lactation/High-Yield Cow Feed

Early lactation places high nutritional demands on dairy cows. The concentrate should provide adequate energy, protein and other nutrients to support milk production while helping maintain animal health and body condition.

Raw Material	kg/100 kg
Maize	38.0
Soybean meal	5.0
Cottonseed extraction meal	18.0
Coconut extraction cake	7.0
DORB, first grade	10.0
Wheat bran	10.0

Rapeseed DOC	7.0
Molasses	1.0
Vitamin-mineral premix	2.0
Salt	1.0
Calcite	1.0
Total	100.0

Indicative nutrient targets: CP 18.5–20%; TDN 70–72%; fat 4.5–5.5%; CF ≤12%.

7. Mid-Lactation Feed

As milk production and nutrient demand begin to moderate, the concentrate formulation can be adjusted accordingly, taking into account the quality and quantity of forage in the overall ration.

Raw Material	kg/100 kg
Maize	39.0
Cottonseed extraction meal	18.0
Coconut extraction cake	9.0
DORB, first grade	12.0
Wheat bran	13.0
Rapeseed DOC	4.0
Molasses	1.0
Vitamin-mineral premix	2.0
Salt	1.0
Calcite	1.0
Total	100.0

Indicative nutrient targets: CP 17–18%; TDN 66–70%; fat 4–5%; CF ≤13%.

8. Late-Lactation/Low-Yield Cow Feed

During late lactation, nutrient requirements generally decline compared with peak production. The concentrate should nevertheless be balanced with the forage component of the ration and the animal's milk yield.

Raw Material	kg/100 kg
Maize	34.0
Cottonseed extraction meal	17.0
Coconut extraction cake	10.0
DORB, first grade	15.0
Wheat bran	16.0
Rapeseed DOC	4.0
Molasses	1.0
Vitamin-mineral premix	2.0
Salt	1.0
Total	100.0

Indicative nutrient targets: CP 15–16.5%; TDN 62–66%; fat 3.5–4.5%; CF ≤14%.

Indicative Master Nutrient Specifications

The following specifications provide a consolidated reference for the different categories of cattle feed.

Feed Type	CP %	TDN %	Fat %	CF Max %	Ca %	P %
Calf Starter	23–24	70–73	≥4.5	≤9	≥0.80	≥0.50
Calf Growth	21–22	68–72	≥4.0	≤10	≥0.80	≥0.50
Heifer 6–12 months	17–18	65–68	4–5	≤12	0.75–0.90	0.45–0.55
Heifer 12–18 months	15–16.5	63–67	4–5	≤13	0.70–0.85	0.40–0.50
Dry/Pregnant Cow	15–16	60–64	3.5–4.5	≤13	0.80–1.00	0.40–0.50
Transition Cow	16–18	65–68	4–5	≤12	0.80–1.00	0.45–0.55
High-Yield Cow	18.5–20	70–72	4.5–5.5	≤12	0.90–1.10	0.50–0.60
Mid-Lactation Cow	17–18	66–70	4–5	≤13	0.85–1.05	0.45–0.55
Low-Yield Cow	15–16.5	62–66	3.5–4.5	≤14	0.70–0.90	0.40–0.50

Indicative Premix Targets

Indicative micronutrient targets per kilogram of finished feed are:

- Vitamin A: 10,000–15,000 IU/kg
- Vitamin D_3: 2,000–3,000 IU/kg
- Vitamin E: 30–75 IU/kg
- Zinc: 60 mg/kg
- Manganese: 60 mg/kg
- Copper: 15 mg/kg
- Iodine: 1.0 mg/kg
- Cobalt: 0.3 mg/kg
- Selenium: 0.3 mg/kg

These levels should be reviewed against the total diet, animal category, forage contribution and applicable feed standards before finalizing the premix specification.

Least-Cost Formulation

A least-cost formulation should not simply aim to minimize the cost of the feed. It should first meet the required nutrient specifications while respecting appropriate inclusion limits for individual ingredients.

Key constraints should include:

- Crude protein
- Energy
- Fat
- Fibre
- Calcium
- Phosphorus
- Ingredient-specific inclusion limits
- Ingredient quality and variability

The formulations presented here assume GNC = 0. Urea is excluded from calf-feed formulations.

Ingredient inclusion levels should always be adjusted based on the actual laboratory analysis of the available raw materials.

Quality Control

Laboratory testing of raw materials and finished feed is essential because nutrient composition and contaminants can vary between batches.

Depending on the ingredients used, quality-control testing should include:

- Moisture
- Crude protein (CP)
- Crude fibre (CF)
- Ether extract/fat (EE)
- Total ash
- Acid-insoluble ash (AIA)
- Calcium (Ca)
- Phosphorus (P)
- Aflatoxin
- Gossypol in cottonseed products
- Rancidity and residual oil in coconut cake

Scientific Feeding of Cows – Summary

Scientific feeding may appear complicated, but it can be made simple and economical when farmers understand the basic principles of dairy cow nutrition.

The key is to provide good-quality green fodder along with an appropriately formulated compound cattle feed in quantities that meet the cow's nutritional requirements. Dairy nutritionists working with compound cattle feed manufacturers in India have developed feeds designed to complement good-quality forage and help address nutritional gaps.

When good-quality fodder, scientifically formulated compound cattle feed, adequate water and appropriate management practices are provided in the right quantities, dairy farmers can improve milk production, animal health and, ultimately, the profitability of their dairy enterprise.

Acknowledgement: *Thanks to Dr John Niezen, Dairy Consultant, for contributing the information material on the above subject during his tenure in India.*

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The Brazilian Poultry Playbook: Compete Globally, Collaborate Collectively

Data Source: Brazilian Association of Animal Protein (ABPA)

Osler Desouzart

Brazil's rise as a global poultry powerhouse goes beyond production scale and cost competitiveness. Its success has been built on collaboration, continuous improvement, market development and a strong "hunt as a pack, defend as a pack" mindset.

Osler Desouzart, founder of OD Consulting, Market Planning & Strategy, is an internationally recognised expert in agricultural trade and animal protein markets. Having contributed to Brazil's poultry and meat export industries, he has worked with organisations across 39 countries and advises and speaks globally on market trends, competitiveness and strategic development in the agri-food sector. He is also a keynote speaker at Trouw Nutrition's upcoming FeedTechnoVision 2026.

In this interview, Desouzart discusses the Brazilian poultry model, feed-cost management, alternative raw materials, biosecurity, technology and data—and the lessons Brazil offers to poultry industries in Asia, particularly India. Below are the excerpts.

You have been closely associated with the development of Brazil's international meat business. Looking back over the past two to three decades, what were the defining changes that transformed Brazilian poultry into a global export powerhouse?

Brazil's poultry exports did not surge simply because of favourable exchange rates, government policies, superior genetics, a good climate, or good luck. There is a far more interesting story. Ultimately, Brazil became the world's number-one poultry exporter by learning to hunt as a pack, defend as a pack, and bring allies together around collective goals.

Instead of competing to capture a larger share of the domestic marketplace, the mindset shifted to looking outward and asking, "Where are the opportunities for Brazil's poultry industry to grow the global poultry market?"

When the poultry industry works together to grow an entire market, it can tackle

challenges that no single company can solve alone. That requires commitment and collaboration from stakeholders across the value chain including universities, industry associations, animal nutrition companies, animal science organizations, genetics companies, suppliers, and others. Each one brings expertise that can help the entire industry improve its practices, efficiency, and products.

This spirit of cooperation, coupled with continuous improvement, has been critical to Brazil's export surge. Achieving success requires knowledge, systems, methods, training, and technology that extend beyond the capabilities of any individual company. In Brazil, we deliberately built relationships with our "allies in the trenches" and worked together toward a shared goal.

Adopting a global perspective also opened our eyes to new market offerings. Much of the history of Brazilian poultry exports can be summed up in the phrase, "Every new chicken cut creates a new market." Fifty years ago, we exported one product: whole chickens. Today, Brazil's poultry sector sells hundreds of different products, and a single chicken can be transformed into numerous cuts designed for specific markets and consumer preferences.

Feed is the largest variable cost in poultry production. How has Brazil managed raw material availability, price volatility, and supply chain disruptions while maintaining competitive feed costs and bird performance? What lessons from Brazil's experience could be relevant to other poultry-producing countries?

When it comes to feed costs, poultry producers simply do not have the margin for big mistakes. Much of Brazil's production success comes down to managing the factors that can be controlled. This approach can be implemented in other countries.

The controllable fundamentals are well known in the industry and include genetics, nutrition, water quality, health and biosecurity, handling, housing, temperature, airflow, air quality, lighting, and stocking density. These fundamentals must be systematically managed.

When I worked at Sadia, we adopted the Japanese method of total quality management, drawing on the principles of Deming, Ishikawa, and Falconi. We measured everything, established clear parameters, and followed the PDCA cycle — Plan, Do, Check, Act. Each time we achieved a goal, we sought to improve even more.

This approach was rolled out across the company, from the executive suite to the birdhouse. Procedures had to be clearly defined and once established, people had to be trained to follow them.

I'll share an example of how small things can have big consequences. We always monitored water quality and consumption at the farm level. When two identical broiler houses suddenly showed significantly different water intake—35 litres per bird versus 28 litres—we discovered that a small leak had gone unrepaired. A few drops of water may seem insignificant, but when contamination affects millions of birds, the magnitude is massive.

This lesson applies directly to feed and raw-material volatility where method, systems, and training are the real "magic bullets." We cannot control every market disruption or input price, but we can control how we measure, respond, and improve.

The use of alternative feed ingredients is gaining importance globally to manage costs, availability, and sustainability. However, greater ingredient variability can affect consistency and productivity. How has Brazil approached the use of alternative raw materials and which strategies or ingredients have demonstrated real commercial success without compromising bird performance?

Brazil's experience with alternative feed ingredients is less about finding a single solution and more about creating flexibility in how raw materials are produced, marketed, and incorporated into diets.

Corn and soybean meal have long been the basis for poultry feeds in Brazil. They are widely availability and offer well-understood nutritional value. But Brazil has also benefited from developing alternative markets for agricultural commodities. A nimble approach to market shifts has helped growers in Brazil

manage supply and price fluctuations. A good example is ethanol that was derived from Brazil's sugar cane sector in the late 1970s. Beginning in the 1990s, when corn prices were depressed, producers increasingly supplied corn to the ethanol industry. Today, ethanol production provides an important alternative outlet for Brazilian corn and has created DDGS as a coproduct. It is used primarily in ruminant nutrition but also offers opportunities for other animal species.

This example illustrates how ingredients having multiple uses, combined with multiple sources of demand for agricultural commodities, may help support more flexible formulations. Brazil produces up to three crops a year in some regions, and crop rotation is essential under the country's no-till production system. This production environment contributes to a dynamic supply source allowing producers to respond to changing market conditions. For poultry producers, however, the challenge is not simply in substituting one ingredient for another. Any alternative raw material must be evaluated for its nutritional value, consistency, availability, and impact on bird performance.

Formulation must manage the variations in nutritional characteristics. This challenge becomes a key discussion point for professionals at industry gatherings such as FeedTechnoVision 2026, India.

Which elements of the Brazilian poultry model can realistically be replicated in Asia, particularly in markets that depend heavily on imported feed ingredients? And how might this apply to India, which has a different position as both a major producer and supplier of key feed raw materials?

As I mentioned earlier, no production region is entirely self-sufficient. While Brazil is fortunate to grow grains commonly used in poultry feed, we have to import most of the necessary microelements and we are also highly dependent on imported fertilisers.

Getting back to the “pack mentality” of working with our allies, companies in Brazil not only hunt in a pack but defend in a pack. Various brands or companies may compete intensely in their domestic markets, but when issues create risk for the future of the industry as a whole, these companies respond together.

That principle is highly relevant to Asian markets, particularly those dependent on imported feed ingredients. No individual company can effectively manage issues such as international market access, trade policy, biosecurity, animal disease prevention, or threatening regulations that could undermine production. But an organized coalition sharing the same goals can have more influence.

Building that type of coalition requires well-managed industry associations that can represent the poultry sector to governments, navigate common and competing priorities, and provide technical expertise. Private industry must actively support these organizations not only through participation and sharing expertise, but also through financial support.

Among Asian nations, India's poultry companies have a key advantage in their ability to supply a vast domestic market. Although per-capita meat consumption remains relatively low based on religious affiliations and other factors, rising incomes and a growing population present long-term potential for animal-protein demand. India also has a different resource position from Brazil, being both a major producer and supplier of key feed ingredients.

Brazil has built one of the world's most efficient and export-oriented poultry industries, yet the 2025 HPAI outbreak demonstrated how vulnerable even advanced production systems can be to disease. What did the industry learn from this experience about biosecurity, surveillance, regionalisation, and maintaining confidence in export markets?

The associations and our industry allies, including authorities, academia, specialists, suppliers, and other stakeholders, have increased the focus on biosecurity since the 2004-2006 HPAI outbreaks. That was the first major wave in a long time, and a wake-up call for the industry.

Regionalisation became a priority, with stricter rules imposed on visitors and even company team members and

major shareholders. The motto became biosecurity, biosecurity, and more biosecurity. And when in doubt, enhance biosecurity! Since then, academia and authorities have started monitoring birds' migratory routes. Protocols have been established for every aspect of biosecurity and emergency teams have been established to respond to outbreaks. So far, this joint action has been beneficial, and the 2025 episode was suppressed in record time. Rigorous planning and implementation are imperative for nations that rely on exports. In countries like Brazil, where we have reached what I call "market saturation" in poultry consumption, the importance of protecting poultry exports becomes what Julius Ceaser referred to as our De Bello Gallico—"I have always fought for glory. In Gaul, I fought for my life."

The industry is moving from automation and basic farm monitoring towards AI, computer vision, sensors, predictive analytics, robotics, and real-time decision making. Having witnessed several waves of technological change, which technologies do you believe will genuinely transform poultry economics?

More progress has been made in agricultural and animal production in the last 50 years than all the progress achieved in the past 10,000 years. And in the next 20 years, we could progress even faster. Precision agriculture is advancing through AI and knowledge is rapidly expanding in all sectors of the industry, including animal health, nutrition, handling, and environment. In this period of rapid change, we must learn to learn because, to the Socratic "I know that I don't know", we should learn that "what we know is not enough."

Will data become the new competitive advantage in poultry? Could companies that understand and use farm-level data eventually outperform those that simply have greater physical scale?

As total quality management gurus Demming, Ishikawa, and Falconi stated, all decisions must be based on facts and data. The rest is merely opinion. Looking at the industry, we see that a number of large, leading companies have been purchased by organisations that understand that things change. The only thing that will never change is the reality that things will inevitably change.

Poultry is increasingly completing with other animal proteins on affordability, sustainability, and resource efficiency. How do you see poultry's position in the global protein basket evolving over the next 10-15 years? Which countries or regions do you believe could emerge as the next important centres of poultry production and why?

Over the coming decade, poultry will account for the largest absolute increase in consumption, increasing by 29 Mt (+20%). In comparison, sheep meat will rise by 3 Mt (+20%), beef will rise by 6 Mt (+8%), and pig meat will increase by a more modest 6 Mt (+4%).

While there may not be a major change in the big poultry producers, you can count on new aggressive exporters like Turkey, which is an example of how global companies bring benefits to new markets they enter, and China. Policy initiatives in China are once again seeking to make the nation self-sufficient in food items, mainly meats. Their efforts aim to generate a large volume of chicken meat exports to sustain an increase in production. While the Chinese consumer prefers pigmeat and several other poultry species, such as ducks, to chicken, if a disease outbreak threatens an animal species, similar to the 2018/2019 ASF episode, chicken will act as a safety meat.

About FeedTechnoVision 2026

FeedTechnoVision is Trouw Nutrition's flagship knowledge platform for the global feed industry. Under the theme "Shaping Asia's Future of Feed", the event brings together feed industry leaders, quality managers, nutritionists and technical experts to exchange knowledge, explore emerging technologies and discuss practical solutions to the challenges shaping the future of feed production.

Feed Passage Syndrome: The Silent Enemy of Poultry Gut Health and Productivity

By **Dr Nagesh Sonale,** Techno-Commercial Manager, Immeureka Animal Health

Dr Nagesh Sonale

Introduction

Over the past few decades, the poultry industry has progressed from traditional rearing systems to highly efficient commercial production systems. This transformation has been driven by continuous improvements in genetic selection, precision nutrition, disease prevention and control, and farm management practices. As a result, modern broilers are now capable of reaching market weight within 35–42 days while maintaining excellent feed conversion efficiency.

This progress has made poultry meat more affordable and widely available to consumers. However, rapid growth and high nutrient intake have also increased the physiological demand on the gastrointestinal tract (GIT). The intestine must now digest large quantities of nutrient-dense feed, absorb essential nutrients efficiently, maintain microbial balance, and protect the bird from enteric diseases. Therefore, gut health has become a critical determinant of productivity, bird welfare, and the economic sustainability of modern poultry farming (Ducatelle et al., 2023).

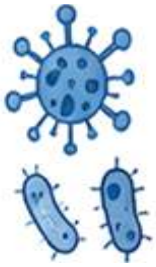
In commercial poultry production, even a minor disturbance in digestion can quickly lead to measurable economic loss. Since feed usually accounts for about 60–70% of total production costs, efficient digestion and nutrient utilization are essential for profitability. When feed is not properly digested and nutrients pass through the bird unused, producers may observe increased feed intake, poor body weight gain, delayed market age, wet litter, increased medication costs, uneven flock performance, and a higher feed conversion ratio (FCR).

Although these losses may appear small at

Fig. 1: Predisposing factors for Feed Passage Syndrome

Nuitrient-related factors

- Poor feed quality (moldy, rancid, mycotoxins)
- High non-starch polysaccharides (NSPs)/Anti-nutritional factors
- Nutrient imbalances
- Inadequate enzyme activity
- Poor feed particle size or gizzard dysfunction



Infectious agents

- Bacteria (e.g., Clostridium perfringens, E.coli)
- Viruses (e.g., IBV, IBDV, Adenovirus)
- Coccidia, Mycoplasma

Climatic conditions

- Heat stress
- High humidity
- Sudden temperature fluctuations

Management practices

- Poor litter management
- Poor biosecurity
- Abrupt feed/water change
- Overcorwding/stocking stress

the individual-bird level, they become substantial when multiplied across large commercial flocks. Among the digestive disorders responsible for such hidden losses, Feed Passage Syndrome (FPS) has emerged as an important but often underestimated challenge in today's poultry production systems.

Feed Passage Syndrome: Definition and Significance

Feed Passage Syndrome (FPS) refers to the passage of partially digested or undigested feed particles in the droppings. This occurs when digestion is incomplete, nutrient absorption is impaired, intestinal transit is accelerated, or intestinal integrity is compromised (Butcher et al., 1997).

FPS should not be viewed as a single infectious disease; rather, it is the visible result of a chain of events involving nutrition, gut microbiota imbalance, infectious agents, environmental stress, and management practices. In most flocks, mortality due to FPS may remain low, but the economic damage can be considerable because affected birds often eat more feed to gain less weight. Over time, this results in poorer FCR, reduced flock uniformity, wet litter, increased ammonia load, greater susceptibility to secondary enteric infections, and reduced profitability. Understanding how FPS develops, therefore, is essential for understanding the various factors responsible for the feed passage syndrome.

Major Causes and Risk Factors Associated with Feed Passage Syndrome

Feed Passage Syndrome develops through multiple interacting factors rather than a single cause.

1. Nutritional Factors

Dietary composition plays a central role in maintaining digestive efficiency. Poor-quality ingredients, excessive crude protein, improper feed processing, oxidized fats, mycotoxin contamination, and high levels of non-starch polysaccharides (NSPs) can reduce nutrient digestibility. NSPs present in wheat, barley, and rye increase intestinal viscosity, interfere with enzyme activity, and reduce nutrient absorption. Increased undigested nutrients reaching the lower intestine provide substrates for harmful bacterial fermentation, promoting dysbiosis and intestinal inflammation (Bedford and Cowieson, 2012).

Variation in feed particle size also influences digestive efficiency. Finely ground diets reduce gizzard development and accelerate intestinal transit, whereas appropriately coarse particles improve gizzard activity and nutrient utilization (Svihus, 2011).

2. Infectious Causes

Several enteric pathogens can contribute to FPS by damaging intestinal tissues. Coccidiosis, caused by Eimeria species, damages

Fig. 2: Gross lesions and clinical signs associated with Feed Passage Syndrome

intestinal epithelial cells during parasite development, resulting in villus destruction, reduced absorption, and impaired digestion (Chapman et al., 2016).

Necrotic enteritis, primarily caused by Clostridium perfringens, causes severe intestinal mucosal damage through toxin production. Subclinical necrotic enteritis can significantly reduce feed efficiency even without high mortality (Timbermont et al., 2011).

Other pathogens, including rotavirus, astrovirus, adenovirus, Salmonella, and pathogenic E. coli, may contribute to intestinal dysfunction and nutrient malabsorption.

3. Intestinal Microbial Dysbiosis (Dysbacteriosis)

The poultry intestine contains a complex microbial ecosystem that contributes to digestion, immune development, and pathogen resistance. Beneficial bacteria such as Lactobacillus, Bifidobacterium, and Faecalibacterium produce short-chain fatty acids (SCFAs), particularly butyrate, which supports epithelial health and intestinal barrier integrity (Oakley et al., 2014).

However, stress, imbalance, inappropriate antibiotic use, and infections can disturb microbial equilibrium, resulting in dysbiosis. Dysbiosis is characterized by reduced beneficial microorganisms and increased growth of opportunistic pathogens such as Clostridium perfringens and pathogenic Escherichia coli.

Microbial imbalance increases intestinal inflammation, damages epithelial cells, reduces nutrient absorption, and contributes significantly to Feed Passage Syndrome (Yadav and Jha, 2019).

4. Environmental and Management Factors

Environmental and management-related stressors play an important role in the development of intestinal disorders. Among these, heat stress is one of the most critical factors affecting digestion in poultry. When birds are exposed to elevated temperatures, oxidative stress increases, intestinal blood flow is altered, tight junction proteins are disrupted, and intestinal permeability becomes higher, thereby compromising gut integrity (Lara and Rostagno, 2013).

Along with heat stress, poor ventilation, high ammonia concentration, wet litter, overcrowding, contaminated drinking water, and inadequate biosecurity further increase physiological stress on birds. These conditions weaken intestinal barrier function, disturb normal digestion, predispose birds to enteric infections, and ultimately increase the risk of Feed Passage Syndrome.

Pathophysiology of Feed Passage Syndrome

The development of FPS involves a complex sequence of physiological disturbances. Initially, nutritional imbalance, infection, or stress reduces digestive enzyme activity and damages intestinal morphology. Reduced digestion allows increased quantities of undigested nutrients to enter the lower intestine.

These leftover nutrients promote microbial fermentation and pathogen proliferation, resulting in dysbiosis. The altered microbial population produces harmful metabolites that damage epithelial cells and stimulate inflammatory responses. Chronic inflammation reduces villus height, increases crypt depth, decreases digestive enzyme production, and compromises nutrient absorption. Damage to tight junction proteins increases intestinal permeability, commonly described as "leaky gut."

Oxidative stress further worsens epithelial damage by producing reactive oxygen

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species that affect cell membranes, DNA, mitochondria, and antioxidant defence systems (Surai, 2016).

Ultimately, reduced digestive capacity combined with accelerated intestinal movement results in the passage of incompletely digested feed particles.

Clinical Signs

The major clinical indicators of Feed Passage Syndrome include:

- Visible undigested feed particles in droppings
- Wet and poorly formed faeces
- Poor weight gain
- Increased FCR
- Uneven flock growth
- Wet litter condition
- Increased ammonia production

Gross lesions are usually nonspecific but may include watery intestinal contents, intestinal distension, mucus accumulation, and mild enteritis.

Histopathological examination commonly reveals:

- Reduced villus height
- Increased crypt depth
- Inflammatory cell infiltration
- Epithelial degeneration
- Reduced villus-to-crypt ratio

Diagnosis requires integration of clinical observations, nutritional evaluation, necropsy findings, microbiological testing, and intestinal histopathology.

Prevention and Control Strategies

Feed Passage Syndrome (FPS) is not caused by a single factor. Therefore, its prevention and control must be planned as a stepwise, whole-flock gut health programme that begins before feed reaches the bird and continues through nutrition, intestinal microbial balance, disease control, farm environment and routine monitoring.

The first and most important step is to reduce the entry of poorly digestible or harmful dietary components into the digestive tract. This requires the use of high-quality, fresh and highly digestible feed ingredients, proper storage of raw materials, regular testing for mycotoxins, avoidance of oxidized fats in diets, maintenance of correct particle size and pellet quality, and formulation of diets with balanced energy, amino acids, minerals and vitamins.

Diets containing high levels of wheat, barley, rye or other non-starch polysaccharide (NSP)-rich ingredients should be managed carefully because NSPs increase intestinal viscosity, slow enzyme access to nutrients, disturb digestion and allow more undigested material to reach the lower intestine, where harmful bacterial fermentation may begin. Therefore, exogenous enzymes such as xylanase, β-glucanase, protease, amylase and phytase are valuable tools in the early nutritional control of FPS, as they break down anti-nutritional components, improve nutrient release, reduce the quantity of undigested protein, starch and phosphorus entering the hindgut, support better feed conversion and indirectly help stabilise intestinal microbiota (Bedford and Cowieson, 2012).

Once feed digestibility is secured, the next chronological focus should be the development and maintenance of a favourable intestinal microbial population.

A healthy gut microbiota supports digestion, produces short-chain fatty acids, improves immune function and protects against pathogen colonisation; however, stress, poor diet, contaminated water, unnecessary antibiotic use and enteric infections can shift this balance towards dysbiosis.

For this reason, probiotics, prebiotics and synbiotic should be incorporated strategically to promote beneficial bacteria such as Lactobacillus and Bifidobacterium, enhance competitive exclusion of pathogens, stimulate short-chain fatty acid production and improve mucosal immunity.

In addition, postbiotics have become important modern alternatives because they contain microbial metabolites, cell components and bioactive compounds that can strengthen the epithelial barrier, reduce inflammation, improve antioxidant status and support gut integrity without depending on live microbial survival (Żółkiewicz et al., 2020).

After microbial stability is supported, feed additives that directly improve the intestinal environment should be considered. Organic acids lower intestinal pH, suppress harmful bacteria and improve nutrient digestion, while butyrate is especially useful because it serves as an

energy source for enterocytes, promotes epithelial repair, improves villus development, strengthens tight junctions and supports mucosal defence mechanisms (Guilloteau et al., 2010).

Phytogenic additives such as Aegle marmelos, Camellia sinensis, thymol, carvacrol, curcumin, garlic extract, oregano oil and other essential oils may provide additional benefits through antimicrobial, antioxidant, anti-inflammatory and digestive-stimulating effects, helping reduce intestinal irritation and improving overall performance.

However, nutritional measures alone are not sufficient unless infectious causes are controlled at the same time.

Coccidiosis, necrotic enteritis, viral enteritis, Salmonella, pathogenic Escherichia coli and other enteric challenges damage villi, increase mucus secretion, reduce absorptive surface area and accelerate passage of undigested feed; therefore, effective vaccination, anticoccidial programmes, biosecurity, cleaning and disinfection, rodent and insect control, and rapid diagnosis of enteric disease are essential components of FPS prevention (Chapman et al., 2016; Timbermont et al., 2011).

The final layer of control is farm management, because even a well-formulated diet can fail when birds are exposed to stress. Good ventilation, ammonia control, clean and cool drinking water, dry litter, proper stocking density, heat stress management, brooding temperature control and uniform feed and water access reduce physiological stress and help maintain normal intestinal motility and barrier function.

Regular monitoring of droppings, litter moisture, body weight, flock uniformity, feed intake, water intake and FCR allows early detection before visible economic losses become severe. This is important because FPS often causes more financial loss through poor feed efficiency, delayed market age, uneven flock growth, wet litter, increased medication cost and reduced profitability than through mortality.

Thus, an effective FPS control programme should move chronologically from preventing dietary problems, improving digestion, stabilising microbiota, strengthening the intestinal barrier, controlling enteric infections and reducing environmental stress to continuous flock monitoring; only this integrated approach can protect gut health, improve nutrient utilization and sustain profitable poultry production.

Conclusion

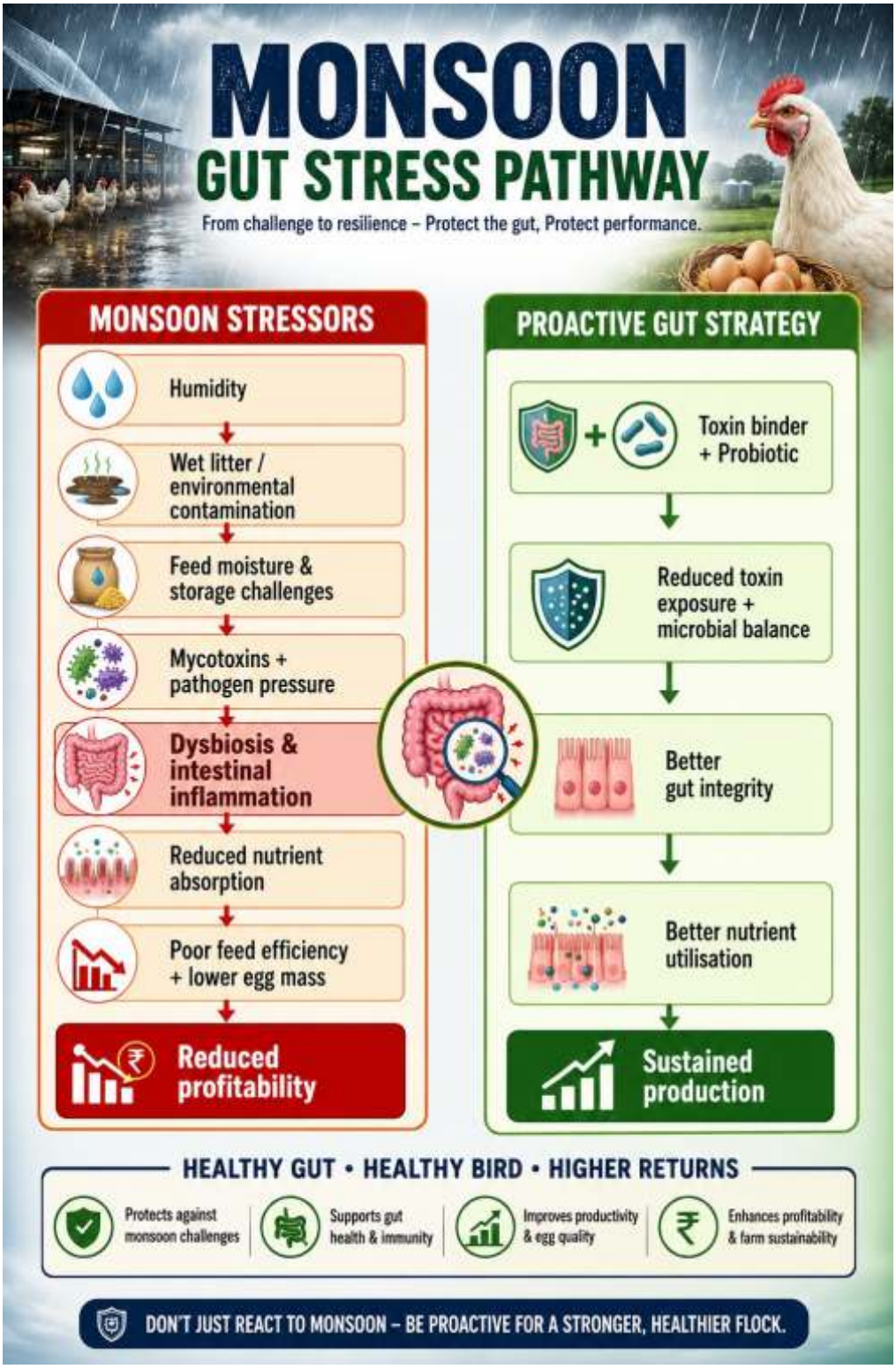
Feed Passage Syndrome represents an important multifactorial digestive disorder affecting modern poultry production. The syndrome results from complex interactions among nutritional factors, microbial imbalance, intestinal inflammation, environmental stress, and management factors.

The intestine is central to poultry productivity, and maintaining intestinal integrity is essential for achieving optimal growth performance and feed efficiency. Prevention of FPS requires a comprehensive gut health strategy involving precision nutrition, enzyme supplementation, microbiome modulation, effective disease control, and improved farm management. Future advances in microbiome analysis, nutrigenomics, metabolomics, and precision poultry nutrition will provide new opportunities to predict, prevent, and control Feed Passage Syndrome. A proactive approach toward intestinal health will remain essential for sustainable and profitable poultry production.

References are available upon request.

Monsoon and the Layer Gut: Protecting Gut Integrity for Sustained Egg Production

By **Midhun Raj M** and **Dr Jyothi Sahu**, Kemin Industries South Asia



Many layer farms experience a familiar pattern during monsoon: feed intake becomes inconsistent, droppings become wetter, egg production and persistency of lay may decline earlier than expected, shell quality weakens, and flock uniformity starts to drift. While these issues are often attributed to weather, disease pressure, or management challenges, the common denominator is usually a compromised gastrointestinal tract.

For commercial layers, where productivity must be sustained for 100 weeks or longer, maintaining gut integrity is not merely a health objective, it is an economic necessity.

Why Monsoon Increases the Risk of Gut Dysfunction

Monsoon places multiple stressors on the bird simultaneously. Elevated humidity, fluctuating temperatures, wet litter conditions, contaminated water sources, mold-prone feed ingredients, and increased pathogen load all converge on the intestine.

Unlike acute disease outbreaks that are easy to identify, monsoon-associated gut challenges are often subclinical. Birds

continue to eat and produce, but not at their genetic potential.

The first signs are usually subtle:

- Reduced feed efficiency
- Declining egg mass
- Increased egg breakage
- Poor shell quality
- Higher flock variation
- Reduced persistency of lay
- Increased reliance on therapeutic interventions

In most cases, the intestine is already under significant stress before these production losses become visible.

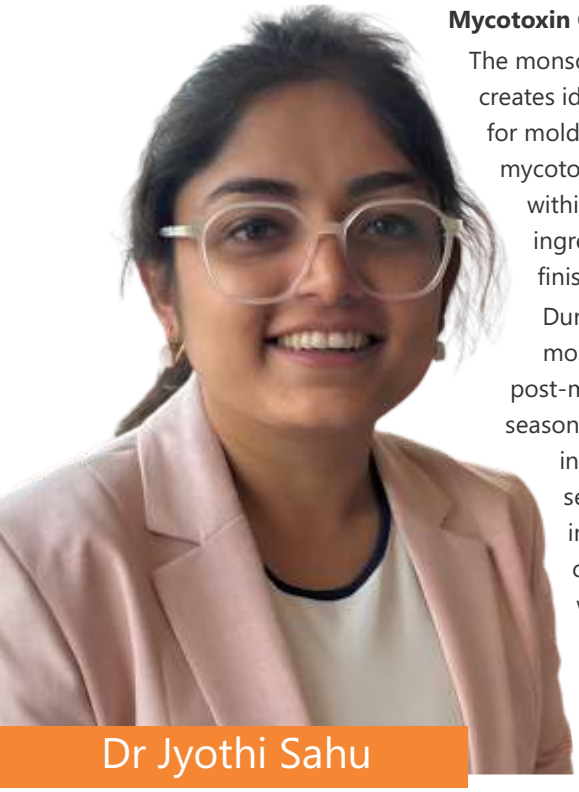
Dysbiosis: The Hidden Cost of Monsoon Stress

A healthy layer gut exists in a state known as eubiosis, where beneficial microorganisms help digest nutrients, produce valuable metabolites, support immunity, and protect the intestinal barrier.

During monsoon, environmental and nutritional stressors disrupt this microbial equilibrium, leading to dysbiosis. The population of beneficial bacteria declines while opportunistic pathogens gain an advantage. This shift triggers inflammation, compromises nutrient absorption, and reduces digestive efficiency.

From a nutritionist's perspective, dysbiosis creates a costly paradox: nutrient specifications may be correct on paper, but the bird's ability to digest and utilise those nutrients efficiently is significantly reduced.

As inflammation increases, more energy is diverted toward immune responses and tissue repair, leaving less energy available for egg production and maintenance.



Dr Jyothi Sahu

Feed-Borne Toxins: The Mycotoxin Challenge

The monsoon season also creates ideal conditions for mold growth and mycotoxin production within feed ingredients and finished feed.

During the monsoon and post-monsoon seasons, feed ingredients show seasonal spikes in mycotoxin contamination, with substantially higher average and peak levels.

Contamination is not limited to aflatoxins alone; the prevalence of emerging and masked mycotoxins has also increased over the years, making the overall mycotoxin challenge more complex. In addition, the increased prevalence of multiple mycotoxins in feed can exert synergistic effects, negatively affecting bird health, gut integrity, immunity, and overall production performance.

Maize, rice bran, DDGS, and other hygroscopic raw materials readily absorb atmospheric moisture. Under such conditions, fungi belonging to Aspergillus, Penicillium, and Fusarium genera proliferate rapidly and can produce a range of mycotoxins including aflatoxins, deoxynivalenol (DON), fumonisins, ochratoxin A, T-2 toxin, and zearalenone.

Pesticide Residues: An Additional Feed-Safety Concern

Feed ingredients may also carry pesticide residues. Pesticides can enter the feed chain at multiple stages, including crop cultivation, harvesting, storage, transportation, and handling. Residues from field application may persist in grains and oilseeds, while additional contamination can occur during post-harvest storage through insecticides and fumigants used to protect stored grains from insects and spoilage. Cross-

Midhun Raj M

contamination may also occur when raw materials come in contact with treated commodities, contaminated containers, or pesticide-treated storage facilities. As a result, pesticide residues may enter poultry feed before it reaches the farm, posing a potential risk to bird health, gut integrity, and production performance

The challenge is that mycotoxins rarely produce dramatic clinical signs in commercial layers. Instead, they induce chronic, subclinical damage that gradually erodes performance.

Research shows that mycotoxins can:

- Damage intestinal villi
- Reduce digestive enzyme secretion
- Suppress immune responses
- Impair nutrient absorption
- Increase oxidative stress
- Compromise intestinal barrier function

Particularly concerning is the effect of toxins on tight junction proteins such as claudins and occludins. Damage to these structures increases intestinal permeability, creating what is commonly referred to as a "leaky gut."

Once this barrier is compromised, bacterial toxins, inflammatory molecules, and undigested feed particles can enter systemic circulation, triggering a chronic inflammatory state that negatively affects production and immune competence.

Probiotics: Supporting Microbial Balance and Gut Resilience

In recent years, probiotics have evolved from being viewed as performance enhancers to becoming essential tools for gut resilience.

Scientifically validated probiotic strains help maintain microbial balance when environmental pressures are promoting dysbiosis.

Probiotics exert their benefit through multiple mechanisms:

1. **Competitive Exclusion of Pathogens**

   Beneficial bacteria compete with pathogenic organisms for nutrients and intestinal attachment sites, helping reduce colonization by undesirable bacteria such as E. coli, Salmonella, and Clostridium.

2. **Improved Gut Barrier Function**

   Probiotics support villus development, mucosal integrity, and tight junction stability, enabling the intestine to maintain its role as an effective barrier against pathogens and toxins

3. **Modulation of Gut Inflammation**

   A well-balanced microbiome helps regulate inflammatory responses and reduces unnecessary immune activation. This allows nutrients to be utilized for egg production rather than immune defense.

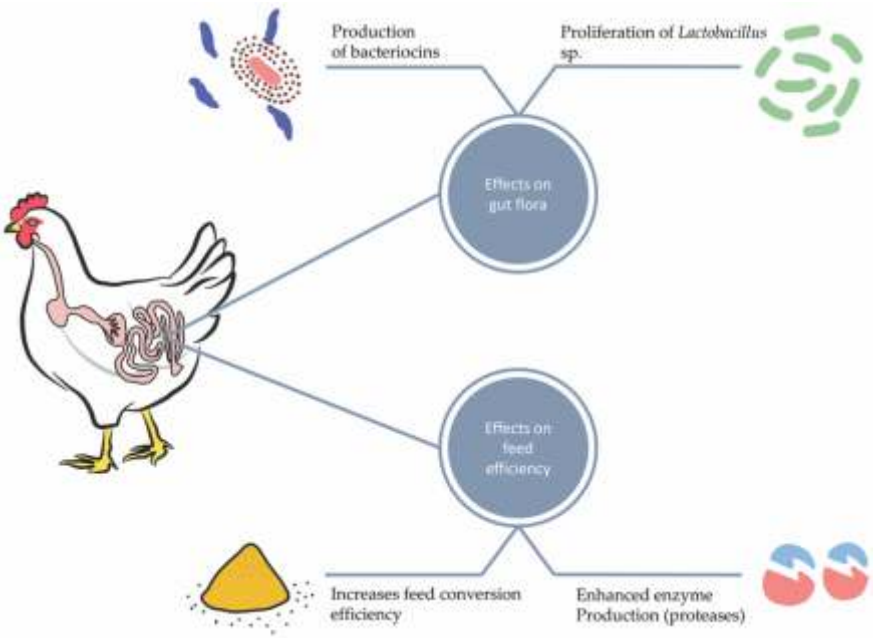
4. **Enhanced Resilience During Stress**

   Commercial layers are continuously exposed to environmental fluctuations during monsoon. Probiotic supplementation helps stabilize gut function and support performance despite these challenges.

Simply put, probiotics help ensure that the nutrients formulated into the feed actually reach the bird in a form that can be utilized for production.

In trials with probiotics such as Bacillus subtilis PB6, supplementation supported a stronger production curve by optimizing nutrient utilization and improving metabolic efficiency. It also improved feed conversion

Fig. 1: Healthy intestinal barrier vs. compromised barrier



and increased egg mass, indicating better feed utilization and enhanced reproductive efficiency.

Toxin Binders: Protection Against Multiple Mycotoxins

One of the most common mistakes observed in the field is the reactive use of toxin binders after performance losses become apparent.

By that stage, valuable weeks of production may already have been lost.

Modern layer feeds are often challenged by multiple mycotoxins simultaneously. Traditional binders based solely on clay technology may perform effectively against aflatoxins but offer limited protection against toxins such as DON, fumonisins, T-2 toxin, and zearalenone.

A scientifically validated broad-spectrum toxin binder should therefore be considered an insurance policy for gut health during monsoon.

Quality binders help:

- Reduce gastrointestinal exposure to mycotoxins
- Protect intestinal morphology
- Support liver function
- Preserve immune competence
- Maintain nutrient absorption efficiency
- Reduce performance variability across the flock

Protection + Restoration: A Two-Pronged Strategy

If monsoon challenges originate at the gut level, then the solution must also begin there.

A quality mycotoxin binder helps protect the gut from feed-borne toxins before damage occurs. Probiotics help restore and maintain microbial balance, barrier integrity, and digestive efficiency. Together, they provide complementary support against the two major drivers of monsoon-associated gut dysfunction: mycotoxins and dysbiosis.

For the modern layer nutritionist, this combination represents a practical and science-backed approach to sustaining egg production, shell quality, feed efficiency, and flock uniformity throughout the rainy season.

Conclusion

For long-cycle layers, monsoon management is ultimately a question of protecting productive potential. Gut integrity influences how efficiently birds utilise nutrients, withstand environmental pressure and sustain production. A proactive programme combining feed-quality management, validated probiotics and appropriate mycotoxin-control strategies can therefore help reduce performance variability and protect the economics of the flock.

References are available upon request.

AI Could Transform Mycotoxin Risk Management in Feed Supply Chains

Artificial intelligence (AI), machine learning and smart sensing technologies are emerging as tools to shift mycotoxin management from reactive testing to predictive and real-time risk surveillance, according to a 2026 review published in the Journal of Stored Products Research.

The review analysed 65 studies from 1,200 records covering advances in AI-driven predictive modelling and smart surveillance for mycotoxin risk management across global food supply chains.

From Detection to Prediction

Conventional mycotoxin testing relies largely on laboratory-based methods such as HPLC, ELISA and mass spectrometry. While these techniques offer high accuracy, they can involve significant costs, specialised infrastructure and delays between sampling and results.

AI-based systems offer a different approach by combining machine learning with sensor and environmental data to forecast contamination risks before they become critical. Models can analyse variables such as temperature, humidity, moisture, crop conditions, storage parameters and historical contamination data to identify patterns associated with fungal growth and toxin production.

Smart Surveillance Across the Supply Chain

The review highlights the potential of integrating AI with the Internet of Things (IoT), smart sensors, remote sensing, cloud computing and edge computing.

IoT-enabled sensors can continuously monitor conditions in grain stores and other facilities, while AI models can analyse the data and generate early-warning alerts. Remote sensing technologies, including satellite and drone-based systems, could further help identify environmental conditions associated with mycotoxin risk.

For feed manufacturers, such systems could eventually support risk-based raw-material screening, storage management and targeted laboratory testing, allowing resources to be directed towards higher-risk consignments.

Climate Change Adds Complexity

Changing temperature and rainfall patterns are also altering fungal growth and mycotoxin contamination risks. The review points to the importance of incorporating climate and geospatial data into predictive models to identify potential contamination hotspots and improve early-warning capabilities.

Technology Still Needs Validation

Despite the promise, AI-based mycotoxin surveillance remains largely at the pilot and experimental stage. The researchers identify several barriers, including limited standardised datasets, weak model transferability between regions, fragmented data from different parts of the supply chain and limited integration of climate, storage and transport information.

The review also highlights the need for explainable AI, interoperable data systems, real-time IoT monitoring and global data-sharing platforms. Blockchain-based traceability and hybrid AI systems could further strengthen transparency and supply-chain resilience.

For the feed industry, the emerging technology could eventually move mycotoxin control beyond periodic laboratory testing towards a continuous, predictive and risk-based system—helping feed mills identify problems earlier, optimise testing and strengthen raw-material quality management.

Source: Journal of Stored Products Research, 2026

Goa Forms Poultry Development Corporation to Strengthen Sector

The Goa government has established the Goa State Poultry Development Corporation Ltd to boost poultry production, organise the sector and regulate poultry businesses in the state.

The corporation will undertake poultry farming, breeder and hatchery development, and the production, procurement and marketing of poultry and poultry products in domestic and international markets. It will also facilitate the procurement and marketing of feed additives, medicines and other raw materials.

The corporation will focus on policy formulation, licensing and registration, biosecurity enforcement, market research and awareness programmes to streamline Goa's poultry sector.

The initiative follows Chief Minister Pramod Sawant's proposal to establish a state poultry board aimed at increasing poultry production, strengthening industry regulation and ensuring quality chicken supply.

Chittoor Faces Fodder Shortage Amid Rainfall Deficit

Chittoor district in Andhra Pradesh, a major dairy-producing region, is facing a severe fodder shortage following a prolonged dry spell and significant rainfall deficit. Authorities are preparing a contingency plan to support livestock and dairy farmers through the 2026–27 agricultural season.

Between June 1 and July 28, the district received just 66.8 mm of rainfall against the normal 175.7 mm, a 62% deficit. The resulting water shortage has affected cultivation of groundnut, paddy, maize, sorghum, millets and pulses, reducing the availability of crop residues used as livestock feed.

The district has around 5.05 lakh livestock, with fodder requirements estimated at 2.32 lakh tonnes between July and September. Several mandals, including Nagari, Nindra, Vijayapuram, Gudipala and Bangarupalem, are expected to face shortages, while areas around Kuppam and Palamaner are projected to have surplus stocks. Authorities plan to transport fodder from surplus to deficit areas.

Proposed measures include subsidised fodder seed distribution, promotion of short-duration fodder crops, village-level fodder banks, scientific silage preparation and wider distribution of chaff cutters. Special livestock shelters and cattle camps are also being considered to prevent distress sales.

The fodder shortage comes as the district targets increasing milk production to 40 lakh litres per day, making timely feed and fodder interventions critical for sustaining dairy productivity and farmer incomes.

Policy Impact: Strengthening India's Dairy and Livestock Sector

The Government of India has highlighted a series of measures to strengthen the country's dairy and livestock sectors, covering dairy infrastructure, indigenous breed improvement, livestock entrepreneurship and animal disease preparedness.

Under the National Programme for Dairy Development (NPDD), 36,611 new Dairy Cooperative Societies have been organised and 34,557 existing societies strengthened up to June 2026. The programme has added around 168 lakh litres per day of milk chilling capacity and distributed 76,748 milk quality testing devices. Meanwhile, projects approved under the Animal Husbandry Infrastructure Development Fund (AHIDF) represent a combined milk processing and value-addition capacity of 418 lakh litres per day.

The Rashtriya Gokul Mission (RGM) continues to support indigenous breed improvement and genetic enhancement. More than 17.27 crore artificial inseminations have been carried out under the Nationwide Artificial Insemination Programme over the past five years, benefiting nearly 5.98 crore farmers. The government has also reported 47,687 trained MAITRIs, 24 IVF laboratories and 48 sanctioned semen stations.

The National Livestock Mission (NLM) has approved 4,084 breed multiplication farms and 204 silage and Total Mixed Ration units. Under its Entrepreneurship Development Programme, 4,291 projects worth INR 2,956.79 crore have been approved, with subsidies of INR 1,356.53 crore. The projects are expected to create nearly 21,000 direct jobs and benefit around 91,000 farmers indirectly.

Animal disease preparedness is also being strengthened through vaccination programmes covering Foot and Mouth Disease, Brucellosis, Peste des Petits Ruminants and Classical Swine Fever. A national mock exercise, Pashujanya Yudh Abhyas, held in Madhya Pradesh from 29 June to 3 July 2026, tested preparedness for zoonotic disease outbreaks, including surveillance, laboratory protocols, biosafety and emergency response.

The government said continued support to states will focus on disease surveillance, vaccination, laboratory strengthening, crisis management and capacity building, alongside investments in dairy infrastructure, breeding and livestock entrepreneurship.

Andhra Pradesh Shrimp Farmers Seek Relief as Feed Costs Rise

India's shrimp farming sector is facing growing pressure from high feed costs and weak farm-gate prices, prompting farmer groups in Andhra Pradesh to seek government intervention.

Feed accounts for an estimated 50–60% of shrimp production costs, while manufacturers face rising raw-material expenses, particularly for fishmeal and soybean meal. Shrimp feed prices reportedly increased by INR 12,000–14,000 per tonne between February and June 2026, adding to pressure on farmers.

Farmer associations in AådÜra Pradesh have raised concerns over feed pricing and shrimp procurement prices, with some groups calling for reduced stocking and harvest boycotts.

Following discussions with industry and farmer representatives, the Andhra Pradesh government reduced the aquafeed price by INR 4/kg to around INR 108/kg. It has also established a 15-member Andhra Pradesh Shrimp Feed Ingredients Price Monitoring Committee, including farmer representatives, to monitor raw-material costs and address feed-pricing concerns.

Way Forward

Industry stakeholders have called for greater transparency in feed pricing, diversified protein sources and measures to reduce dependence on imported feed ingredients. Improving domestic soybean productivity, exploring alternative proteins such as insect and microbial proteins, strengthening farmer organisations and developing transparent mechanisms linking feed costs and shrimp prices could help improve supply-chain resilience.

The developments highlight the need for a more balanced and transparent shrimp value chain, particularly to protect small farmers from sharp fluctuations in feed costs and shrimp prices while maintaining the competitiveness of India's seafood exports.

India, Seychelles Strengthen Cooperation in Fisheries and Blue Economy

India and Seychelles have agreed to deepen cooperation in fisheries, aquaculture and the blue economy, with a focus on technology, research, capacity building and sustainable marine resource management.

The discussions took place on 25 August during a highJlevel båateral meeting hosted by the Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying. The Seycheläes delegation was led by Wallace Cosgrçw, Minister of Fisheries, Agriculture and Blue Economy, while India was represented by Dr Abhilaksh Likhi, Secretary, Department of Fisheries.

Key areas identified for collaboration include mariculture, hatchery development, tuna fisheries, stock assessment, post-harvest technologies and marine conservation. Both sides also discussed fisheries data systems, monitoring, control and surveillance, and the potential use of Artificial Intelligence in fisheries management.

The two countries further explored cooperation in tuna processing and value-chain development, fish waste management, technical studies, laboratory access and joint pilot projects. Seychelles expressed interest in establishing a dedicated bilateral MoU on fisheries and aquaculture, supported by an annual work plan.

India highlighted its growing fisheries sector, with fish production reaching 19.7 million tonnes and seafood exports valued at USD 8.46 billion, while reaffirming its commitment to technical cooperation and capacity building in the Indian Ocean region.

Both sides agreed to strengthen institutional linkages through technical exchanges, exposure visits and collaboration among Centres of Excellence, with the aim of translating bilateral commitments into practical and sustainable outcomes.

India-US Team to Develop AI System for Precision Soybean Breeding

A joint India-US research project will develop an AI-enabled smart sensing system for precision soybean breeding, supported by a USD 528,137 grant from the US National Science Foundation (NSF). The three-year project will run from October 2026 to September 2029.

Led by Xiaolei Huang, Professor of Computer Science at the University of Memphis, the project involves researchers from US and Indian institutions, including IIT Delhi and ICAR's National Soybean Research Institute.

The system will integrate smart sensors, wireless networks, drone-based data and AI tools to monitor crop, soil and environmental conditions. Researchers aim to use the data for crop phenotyping, pest and disease management, and yield forecasting, helping soybean breeders make more informed decisions.

The collaboration between the NSF and India's Ministry of Electronics and Information Technology (MeitY) is expected to strengthen soybean productivity while advancing India-US cooperation in agricultural research and digital technologies.

astructure, breeding and livestock entrepreneurship.

China Takes 71% of Brazil's Soybean Exports in First Seven Months of 2026

China accounted for 71% of Brazil's soybean exports from January to July 2026, maintaining its position as the dominant destination, according to Brazil's National Association of Grain Exporters (ANEC).

Spain was the second-largest destination at 4%, while Thailand, Turkey and Iran each accounted for around 3%.

China's growing reliance on Brazilian soybeans comes amid weaker US shipments. In June, Chinese soybean imports from the US fell 20.6% year-on-year to 1.27 million tonnes, while imports from Brazil increased 13.7% to 12.08 million tonnes, according to China's General Administration of Customs.

Despite the shift in ëourcing, China's overall soybean demand remains strong. Imports reached a record 13.55 million tonnes in June, while total soybean imports in 2025 stood at 111.83 million tonnes, up 6.5% year-on-year.

Brazil, the US and Argentina remain China's major soybean suppliers, with China continuing to diversify its sourcing to strengthen supply-chain resilience.

The strong Chinese demand is strategically important for Brazil's soybean industry. In 2025, China purchased 85.4 million tonnes, representing about 79% of Brazil's total soybean exports.

As imported soybeans are primarily processed into soybean meal for animal feed and edible oil, China's sourcing patterns have significant implications for global soybean trade and feed ingredient markets.

AI Could Help Reduce Blanket Antibiotic Use in Livestock

Artificial intelligence could help livestock farms reduce blanket antibiotic use by identifying individual animals showing early signs of illness, according to Prof. Dr Goh Yong Meng of Universiti Putra Malaysia.

Speaking at the Global Animal Production and Veterinary Industry Summit (GAVIS) 2026 in Malaysia, Dr Goh said AI-powered systems using animal movement, sound and biometric data can enable earlier and more targeted intervention.

He cited a pig farm in China where AI detects coughing among individual animals, allowing treatment to be directed at affected cages rather than entire pens. Continuous monitoring could help veterinarians identify changes in behaviour and stress indicators before disease spreads, reducing the need for routine prophylactic medication.

Dr Goh also linked technology-driven health monitoring with One Health and One Welfare, stressing that better animal welfare can reduce disease risks and support public health.

He noted that animal welfare is increasingly becoming a trade consideration, as countries strengthen welfare requirements for livestock and animal products. Technology, regulation and appropriate production practices will therefore need to work together to improve animal health, welfare and antimicrobial stewardship.

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