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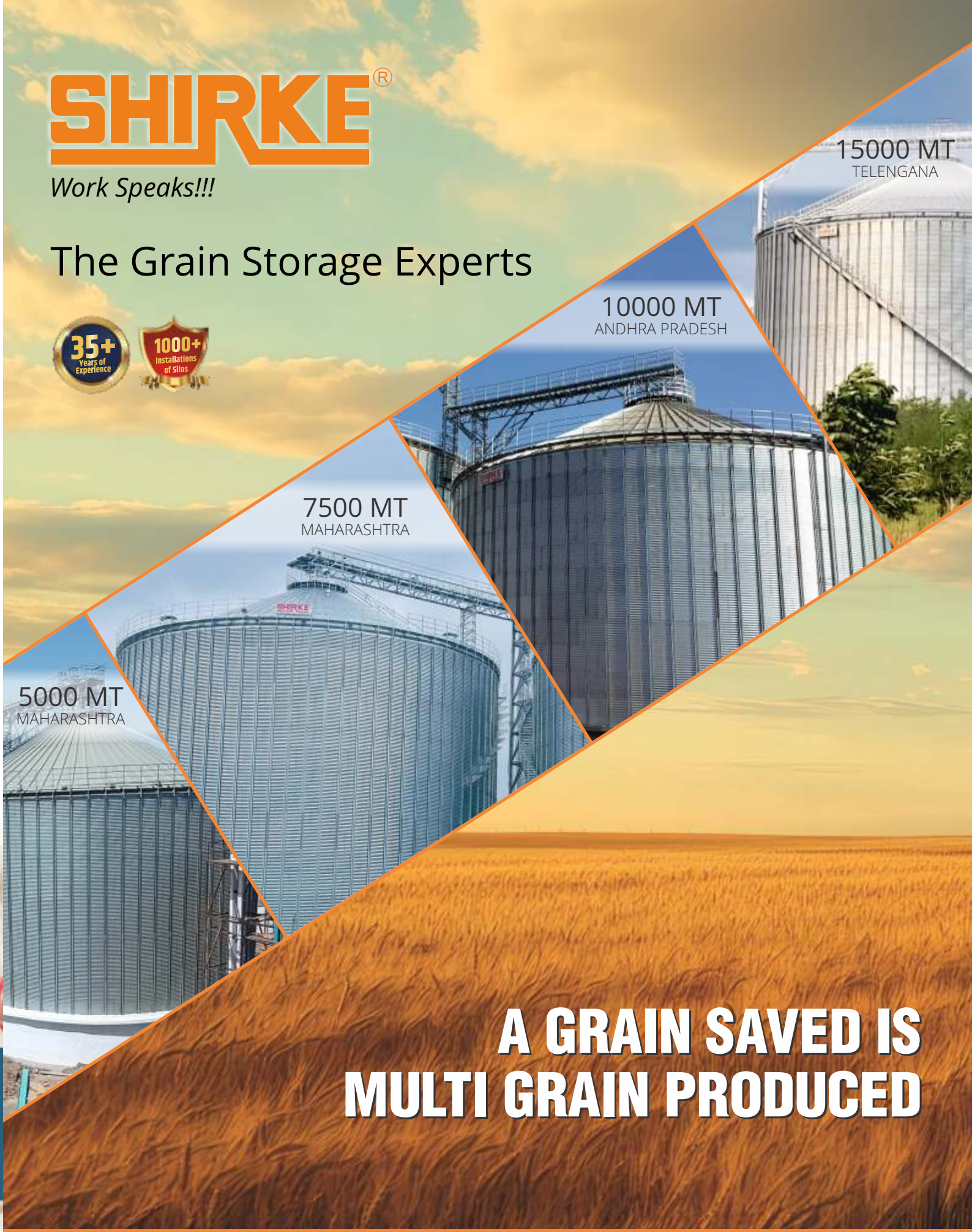

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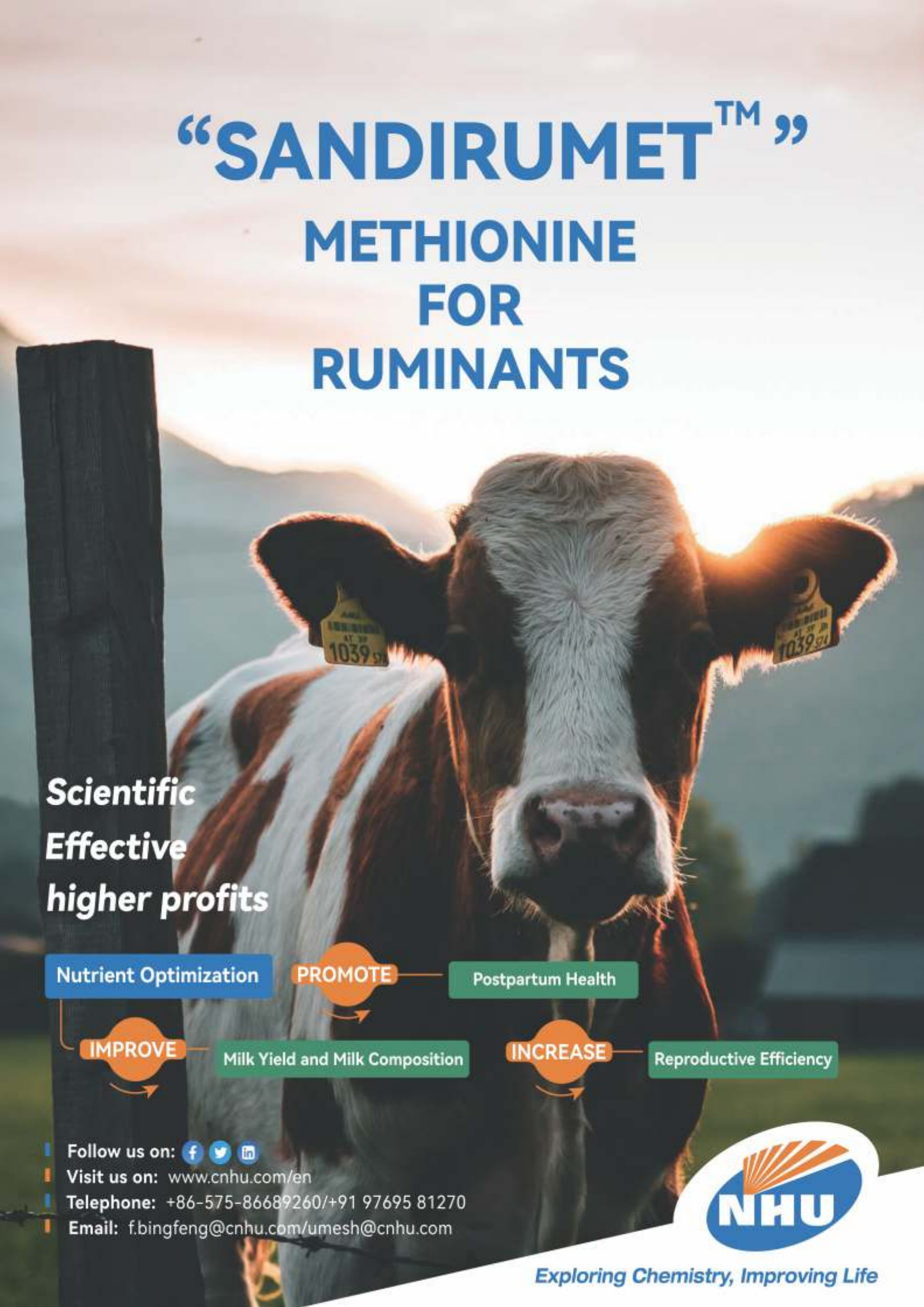
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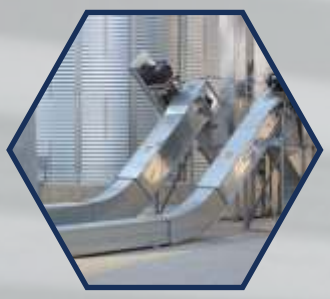

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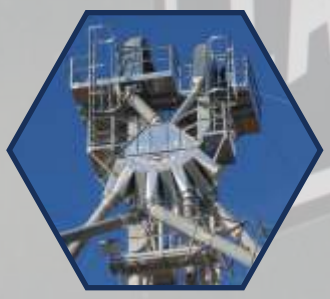

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R&D Spotlight: Transforming Waste into Protein-Rich Animal Feed

Image Source: iamtak

A pioneering research project at the University of Borås has demonstrated how organic waste—particularly food waste and animal manure—can be transformed into high-value protein sources for animal feed. Conducted within the university's Resource Recovery programme, the work highlights a promising pathway for circular, sustainable livestock nutrition.

In her doctoral research, Clarisse Uwineza explored how waste streams can be converted into volatile fatty acids (VFAs) through anaerobic digestion. These VFAs then serve as a nutrient-rich substrate for cultivating Aspergillus oryzae, a fungus that produces a biomass high in protein, minerals, and dietary fibre—and is easily digestible for livestock.

Uwineza's interest in biotechnology and sustainable waste management shaped the project, which addresses one of agriculture's growing environmental challenges: the large volume of organic residues generated from food systems. Using controlled anaerobic digestion, waste is broken down in oxygen-free conditions, yielding VFAs as well as nitrogen and mineral nutrients. These support the growth of fungal biomass that could replace conventional protein sources such as soybean meal and fishmeal.

"My work shows that organic residues can serve as valuable raw material for sustainable protein production, helping to close the loop in a circular economy,"

— Clarisse Uwineza

One of her notable findings was the fungus's surprisingly strong growth on waste-derived VFAs—even though these acids can be toxic at high concentrations. By carefully regulating the addition of VFAs, she developed a method that ensures safe, gradual fungal growth with higher yields and improved product quality.

Beyond animal feed, this fungal biomass shows potential for use in bio-based materials, including biodegradable plastics and leather alternatives. The research demonstrates significant opportunities to reduce emissions, optimise resource use, and support the rise of a circular bioeconomy.

The project contributes directly to several UN Sustainable Development Goals, including SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 2 (Zero Hunger).

Source: National Hog Farmer

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New Maize, New Risks: Gut Health Challenges & Beyond?

By **Dr. Satyam Sharma** and **Dr. Prateek Shukla**, Kemin South Asia

Dr. Satyam Sharma

Maize remains at the center of poultry rations (often constituting about 55–60%) because of its nutritive value and relatively fewer anti-nutritional factors (ANFs) than most energy ingredients; however, newly harvested maize (NM) used within two months can adversely affect growth and gut function due to higher moisture, immature starch, and ANFs (e.g., resistant starch, NSP, phytic acid, protease inhibitors). These risks are amplified where multi-mycotoxin co-contamination is common during/post-monsoon, even when individual toxins are found within permissible limits. This calls for a comprehensive risk assessment while utilizing new maize in poultry rations (Zhong et al., 2019; Guerre, 2020; Palacios-Cabrera et al., 2025).

One of the aspects which takes a back seat during the use of newly harvested maize in poultry is the multifactorial gut-health risk associated with new maize. Gut health disturbances can have negative effects on growth performance, compromise gut integrity, and increase nutritional inefficiencies. The areas of concern include the physiological immaturity and comparatively higher moisture levels of new maize. These can heighten anti-nutritional burden and expose birds to higher mycotoxin contamination under warm, humid, post-harvest conditions that are common across South Asia.

This challenge can have a deleterious impact on gut health, impair digestion and absorption, alter intestinal development, and require more intensive nutritional and health management to maintain profitability in operations. For poultry veterinarians and nutritionists, integrating post-harvest controls, mycotoxin surveillance, gut health support, and effective enzyme strategies becomes essential to protect flock performance while incorporating new maize in rations (Zhong et al., 2019; Guerre,

2020; Palacios-Cabrera et al., 2025).

Qualitative Comparison: Newly Harvested vs. Aged Maize

Controlled trials show clear compositional differences between NM (harvested <2 weeks) and aging maize (AM) (stored ~1 year): moisture 16.05% vs. 13.60%, dry matter 83.95% vs. 86.40%, and gross energy 16.08 vs. 16.63 MJ/kg. The higher moisture dilutes nutrients and is operationally relevant because it predisposes to mold growth and spoilage in storage/transport chains (Zhong et al., 2019).

How It May Affect Production?

For broilers (1–42 d), Feed: Gain (F/G) was found to be significantly higher in NM vs. partial NM diets, particularly at 22–42 d and overall. This confirmed a consistent feed-efficiency loss when NM was used at higher levels. In the same experiment, mixing NM with AM (1/3 or 2/3 NC) yielded (better) F/G than all NM diets, indicating a dilution strategy can mitigate performance drag when AM is available (Zhong et al., 2019).

New Maize & Gut Health: A Deeper Dive

Newly harvested maize is particularly vulnerable to mycotoxin contamination due to its high moisture content and the warm, humid conditions often present during and after harvest. These conditions are ideal for the growth of toxigenic fungi such as Aspergillus and Fusarium,

Item	Newly harvested maize (NM)	Aging maize (AM)	Key difference
Water content	16.05%	13.60%	NM had +2.45% moisture
Dry matter	83.95%	86.40%	NM had lower Dry Matter
Gross energy	16.08?MJ/kg	16.63?MJ/kg	NM had lower Gross Energy

Source: Zhong et al., 2019

which can rapidly colonize the grain and produce mycotoxins like aflatoxins, zearalenone, CPA and T2. In practical terms, this means that poultry feed formulated with new maize—especially during or after the monsoon season— holds the risk of introducing significant levels of mycotoxins into the diet, even before the grain enters long-term storage (Palacios-Cabrera et al., 2025).

Another ignored challenge is multi-mycotoxins contamination. Even when individual toxins are within recommended limits, their combined presence can significantly challenge poultry gut health. This is especially true under post-monsoon conditions in India and post-harvest practices often lead to simultaneous contamination by several mycotoxins. Surveys show that up to three or more mycotoxins (e.g., aflatoxins, trichothecenes, zearalenone and fumonisins) can be detected in a single maize sample, particularly in humid, coastal, or tropical regions (Palacios-Cabrera et al., 2025).

Effect of Mycotoxins on Disruption of Intestinal Barriers

Mycotoxins compromise the gut's defense system in a predictable order, with the most severe effects on the physical barrier. Majorly mycotoxins Aflatoxins, Ochratoxins (OTA) and DON (A trichothecenes subtype), have been reported to have been reported to exert stronger effects on the intestinal barrier. First, they disrupt the tight junctions between intestinal epithelial cells, leading to increased gut permeability or "leaky gut." This allows pathogens, toxins, and antigens to cross into the bloodstream, increasing the risk of systemic infections and inflammation. Second, mycotoxins reduce the production and secretion of mucins and antimicrobial peptides, thinning the mucus layer that normally protects the gut lining from direct microbial attack. Third, they dysregulate immune signaling, often increasing pro-inflammatory cytokines while reducing protective antibodies, which impairs the gut's immune defense and makes birds more susceptible to infections. Finally, mycotoxins alter the gut microbial balance, reducing beneficial bacteria and allowing harmful bacteria to proliferate, which can further worsen gut health and performance (Gao et al., 2020; Guerre, 2020). For poultry stakeholders, this means that gut health programs should

Dr. Prateek Shukla

Ingredient Factors for Gut Health Insult

Various factors affect the ingredient quality eventually leading to gut health insult. However, in current situations predominantly the effect of microbial contamination, mycotoxin related enteritis and certain anti-nutritional factors appear to be the major reasons.

Mycotoxins

CPA (Cydopiazonic acid) levels have been observed at higher levels *(Kemin Internal Data)*

CPA has additive affects with Aflatoxins and doses even at 50 ppb have reported negative effects *(Malekinejad et al. 2010)*

Mycotoxins not only result in necrotic changes in Liver, Kidney, Gizzard and Proventriculus but also have been reported to cause significant oxidative stress build up *(Malekinejad et al. 2010)*

Raw Material Alert

1. High contamination of animal source proteins with Clostridia perfringens and E. coli
2. Rancidity in oils and oil cakes resulting in vent pasting
3. Usage of alternate raw material resulting in higher quantities of NSP's (Non Starch Polysaccharides
4. Methods for NSP estimation through wet chemistry are still empirical which are difficult to apply in commercial operation leading to variations

address all four barriers, not just focus on pathogen control and a strategy could be mitigation of underlying gut inflammation development.

Effect of Combined Mycotoxins Even Within Recommended Levels

Research consistently shows that when multiple mycotoxins are present—even if each is below its individual regulatory threshold—their combined effects can be additive or even synergistic. This means that the total damage to the gut barrier, immune system, and overall bird health can be much greater than expected from any single toxin alone. For example, birds exposed to both aflatoxins and CPA (Cyclopiazonic acid) at "safe" levels may experience more severe gut barrier breakdown, immune suppression, and dysbiosis than those exposed to just one toxin. This is especially relevant in Indian conditions, where feed ingredients are often contaminated with more than one mycotoxin due to climatic and storage factors. The practical implication is that compliance with individual mycotoxin limits does not guarantee safety—risk assessments and management strategies must consider the total mycotoxin burden and the possibility of interactions (Malekinejad et al., 2011; Gao et al., 2020; Palacios-Cabrera et al., 2025).

Effect of Mycotoxins on Poultry Gut Microbiota

Mycotoxins can significantly disturb the gut microbiota, leading to dysbiosis—a shift in the balance of beneficial and harmful bacteria. Studies in poultry have shown that mycotoxins reduce populations of beneficial bacteria such as Lactobacillus and Bifidobacterium, while allowing pathogenic bacteria like E. coli and Clostridium perfringens to proliferate. This disturbance impairs gut barrier function, increases inflammation, and reduces the bird's ability to resist infections. In Indian climatic conditions, the risk of mycotoxin-induced gut microbiota disturbance is particularly high due to the country's warm, humid climate, variable post-harvest practices, and reliance on maize and other susceptible grains in poultry feed.

Indian studies and field reports have documented frequent co-contamination of feed with aflatoxins and trichothecenes, especially during and after the

monsoon season. This co-occurrence leads to significant shifts in the gut microbiota, with reductions in beneficial lactic acid bacteria and increases in pathogenic bacteria, predisposing flocks to enteric diseases and poor performance (Gowda et al., 2013; Reddy et al., 2020). Furthermore, changes in the microbiota can alter the metabolism of nutrients and even create a vicious cycle of gut health decline.

Effect of Mycotoxins on Gut Inflammation

Mycotoxins are potent triggers of gut inflammation. They cause both acute and chronic inflammatory responses by damaging the gut lining and disrupting immune regulation. Chronic inflammation, often seen with ongoing mycotoxin exposure diverts nutrients away from growth, reduces feed efficiency, and can worsen tissue injury. Mycotoxins like aflatoxins, trichothecenes and CPA have been shown to increase pro-inflammatory cytokines (e.g., TNF-α, IL-1β), reduce anti-inflammatory mediators, and impair the gut's ability to return to a healthy, balanced state. This not only increases disease risk but also impacts flock performance and productivity (Malekinejad et al., 2011, Broom & Kogut, 2018; Guerre, 2020).

For field application, "gut inflammation" develops due to multiple factors in which presence of mycotoxins appears to be one of the core reasons. It comes at the expense of about 0.27 g of ideal protein per bird per day (Sandberg, F. B. et al., 2007; Klasing, K. C., 2007) when measured in simulated models. Translating commercially, the losses could be estimated to be about 60g of feed lost per broiler amounting to almost Rs 2.5 to 3 per broiler bird. Undesired intestinal inflammation weakens gut integrity and aggravates dysbacteriosis, promotes translocation of pathogens from gut into system and importantly puts the gut in oxidative stress further compromising the immune function associated with gut. Eventually, the diversion of nutrients to bring about an inflammatory response reflects in economic losses.

Management and Mitigation: What to Do When We Must Use New Maize

Microbiota & Gut Integrity Support

A strategy is needed to maintain strong protection against Necrotic Enteritis, which remains a major gut-health issue in poultry. Since, new maize could result in gut damage further acting as predisposing factor for NE.

Keeping in mind the inflammatory effects, a strategy to counter gut inflammation simultaneous to microbiota balance is becoming a must to effectively manage poultry gut health and subsequent litter quality.

In this regard a combination strategy of proven Bacillus strains with potent specific anti-inflammatory photoactive could pave a way forward.

Mycotoxin Risk Management

Having a comprehensive mycotoxin screening strategy to assess total burden rather than single-toxin and

Employing a broad-spectrum toxin binder effective against polar and non-polar classes can reduce luminal bioavailability and protect barrier function.

Additionally, mitigating the unseen risk of pesticide residues by using relevant binders could be an effective practice

Post-harvest & Storage Controls

Prefer conditioning/holding new maize > 8 weeks where possible; when not feasible, mix NM with AM (e.g., 1:2 or 2:1) to dilute ANFs and performance penalty suggested by organ-weight and F/G data (Zhong et al., 2019).

Mechanical drying to safe moisture before binning; maintain aeration and hygiene to limit mold growth.

Formulation & Processing

Addressing resistant starch by inclusion of amylase/glucoamylase and xylanase/NSPase and to support duodenal digestion could be a helpful strategy along with considering phytase optimization and Ca/P re-balancing to offset the selective mineral-utilization deficit seen with new maize

Energy matrix & amino acids: Recognizing the lower GE and DM of new maize and adjusting energy and amino acid density accordingly.

Detailed references available upon request

Over 70% of India's Milk Meets Global Standards

Dr Channegowda, a field veterinarian specialized in poultry nutrition, spent over 27 years in the Department of Animal Husbandry before taking up poultry farming and consulting to cattle and poultry feed manufacturers. He is currently working as Vice President–Technical at Zeus Biotech and as Regional Expert (Dairy Platform, India) for the USSEC. In this wide-ranging conversation with Think Grain Think Feed, he talks about genetics, feed, milk quality, DDGS and Govt policy and why animal welfare and "Right tech, Right Feed" matter as much as productivity.

Dr. Channegowda H. K.
Zeus Biotech

Could you please share your journey as a field veterinarian and nutritionist. What are the changes you have witnessed in your professional career?

I began my career in 1992 as a field veterinarian with the Department of Animal Husbandry, Govt of Karnataka, heading a veterinary dispensary and treating dairy cattle, companion animals and poultry.

Before that, in 1991, I worked as a Research Assistant in the Department of Poultry Science at the University of Agricultural Sciences under an ICAR fellowship, assisting state and centrally sponsored poultry research projects.

Later served as a Research Associate at the University of Kentucky, USA, under an exchange visitors program, worked on mycotoxins and phytase. This experience shaped my understanding of feed quality, safety, and analysis.

Later continued my field duties as Veterinary extension officer at block and district levels focusing more on feeding, management and nutrition of poultry and dairy animals. Training thousands of farmers, rural women, youth, para-veterinarians, and AI technicians.

At the state level, served as a resource person for implementing centrally sponsored schemes: INAPH (NDLM-Bharat Pashudhan) in collaboration with NDDB.

Control and containment of Avian Influenza (outbreak investigation with FAO).

Registration/licensing of animal-feed manufacturers in Karnataka, bringing them under BIS-based standards aligned with FSSAI requirements.

Currently, into broiler production: 20,000 birds in EC house. Consulting a few small/ medium cattle/poultry feed manufacturers. Also, a Regional Expert (Dairy Platform) for the USSEC, external member of Research Council, KVAFSU, Joint Secretary to Institute of Veterinarians in Poultry Industry (IVPI) and Vice President–Technical at Zeus Biotech, overseeing their research trials, providing technical support, quality control, and feed formulation to their customers.

My experience spans field veterinary and extension services, research, nutrition, and management services.

You've been closely involved in managing avian influenza outbreaks. When bird flu hits, there is often panic among both industry and consumers. How did you approach awareness and risk communication?

After the first major outbreak in Navapur, Maharashtra (2006), the GOI published the action plan for control and containment of avian influenza as per OIE guidelines.

We ran extensive awareness campaigns in print and visual/electronic media, emphasising two key points:

1. Till date, no human bird flu cases have been recorded in India.
2. There is no human-to-human transmission recorded across the world.

We also sensitized veterinarians, para-vets, poultry farmers, district administration and general public on early reporting of any unnatural mortality. 'Cook and eat'—proper cooking destroys almost all viruses and bacteria. At the field level, we followed strict surveillance within a 10 km radius with quarantine and movement restrictions.

You mentioned that flock sizes and productivity in poultry have increased dramatically. What's your take on this intensification, especially with respect to animal welfare and

antibiotic use?

When I began my career, broiler flock size was around 500 to 2,000 birds which now increased to 10,000 to 20,000. Contract system of rearing (integration) introduced around 1995. Earlier, we produced 1.8 to 2 kg in 60 days. Today we produce 2+ kg in about 35 days whereas the FCR improved from 2.2 to 1.4–1.5. Layers, once kept for 70 weeks now keeping upto100 weeks producing >300 eggs per bird per year. Thanks to improvement genetics, management, and nutrition.

In my opinion putting more animals in less space (stocking density) may be good for economics, but it is not good for animal, its welfare or the environment (One Health). In layers, I would still prefer three birds per cage with a little more height and width of the cage, so that, birds can exhibit their natural behaviour. 4 bird/cage is acceptable but not 5-6 birds.

On antibiotics, it's important to distinguish Therapeutic antibiotics and Antibiotic Growth Promoters (AGPs).

Therapeutic antibiotics like penicillin, tetracyclines, aminoglycosides, cephalosporins and quinolones are used for treating sick animals for a brief period (3 to 5 days) at clinical doses. AGPs like BMD, zinc bacitracin, avilamycin, enramycin and halquinol are used at sub-therapeutic levels to modulate gut flora and to enhance the growth.

The AGPs are not employed for therapeutic purpose.

Factors that contribute to AMR are human antibiotics, effluents from pharma industry, antibiotics used in agriculture, livestock and poultry. It is inappropriate to blame poultry alone.

You've seen India's dairy sector evolve from both field and policy perspective. How have milk yields changed over time, and what role has genetics played?

The average daily yield of cross-bred/exotic cattle was around 4–5 litres/head and that of Indigenous cattle was 1.5–3 litres/head. Today, our national averages are above 10 litres and 4 litres, respectively.

Again, thanks to frozen semen technology, artificial insemination (AI) and sexed sorted semen have dramatically improved the genetic potential of the animals. However, we also need to be honest about two issues:

1. Excessive foreign blood: The original idea was to cap exotic blood at around 50 to 70%. Today, many animals carry 90%+ exotic genetics. It is difficult to manage under Indian smallholder situations without advanced infrastructure - housing, cooling, and high-quality forages.
2. Feeding imbalance: Earlier, cattle used to be fed on plenty of home-grown forages and a little concentrate at the end of the day. Today, many systems have flipped — lots of compound feed and very little true forage. That is no good for rumination, saliva production, rumen health and milk fat/SNF.

There's a renewed interest in indigenous cattle. In your view, what is the right balance between indigenous and exotic genetics for India?

Pure indigenous breeds produce excellent-quality milk but their average yields are not enough to meet the country requirements. On the other hand, exotic animals (90%+ Holstein) demand an environment and diet that most Indian farmers simply cannot provide. So, a balanced admixture is more suitable. 50:50 to 70:30 exotic: indigenous, moderate body weight like 400- 500 kg with 15–20 litres/day. More emphasis should be given to fertility, adaptability, and longevity than on record-breaking production

Most Indian dairy producers are smallholders with less than five animals. How can their dairying become more cost-efficient and sustainable?

Yes, even today, > 60% of Indian dairy farms have <5 cows, 25–30% have 6–15 cows, 8–10% have 16–50 cows, and only < 2% have > 50 animals. For most of these, dairying is subsistence farming and livelihood. Owning a productive animal is an asset at the same time owning a non-productive animal is a liability.

Keep only productive animals (pregnant and lactating). Dedicate land for fodder production. Adopt high yield fodder varieties

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like multi-cut sorghum, super/red Napier, berseem, fodder moringa. Use cooperatives or farmer groups for specialised rearing of calves, growers, and heifers. Provide enough space, light, ventilation, and clean flooring. Smallholder dairy is the backbone of rural economy — but it must be treated as an asset-based enterprise, not just a sideline activity.

As genetics improve, which life stages and management aspects are most critical from a feeding perspective for dairy cattle?

Every stage is equally important but pregnant, calves, and transition cows are more critical stages. Ensure ad-libitum amount of forage is available throughout the year, quality comes next. Offer enough quantity. How to know you have fed enough? A minimum of 5% should be the leftover. Never feed concentrate to an empty stomach. Offer forage first, then offer concentrate, or mix concentrate with forage (TMR) to avoid ruminal acidosis. Feed only 3 kg of concentrate per meal, increase number of meals as per Dry Matter Requirement (DMR). Maintain optimum Forage–concentrate ratio: Historically, farmers fed something like 80% forage, 20% concentrate on DM basis. Today, ratios in many places have slipped to 50:50 or even below, some places even 30:70 like Kerala.

The optimum Forage: Concentrate ratio is 80:20 (excellent, but rare), 60:40 (acceptable, practiced in Punjab), 50:50 (most commercial dairy farms settle with this) and 40:60 or 30:70 (is practiced in Middle-East Dairy farms)

Drinking Water: Milk contains 88% water. Dairy cows must have free access to clean, cool water throughout the day (ideally 24×7). In tie-stall systems where watering is done only 2–3 times a day, aim for at least 5–6 times. Use sufficiently large and deep troughs so cows can immerse the muzzle up to the nostrils and gulp several litres at once. Use separate bins for water and feed. Cows have more taste buds than humans and are very sensitive to smell. Provide shade to overhead water tank.

Cows should be sitting for 12–14 hours a day and ruminate at least 8 hours a day. Provide dry and soft floor preferably sand as cows do not prefer wet concrete or stone floor.

You have served on the Animal Husbandry Department and contributed to policy decisions. In your view, which has been the most impactful dairy or poultry policy in recent years?

Compartmentalisation (zoning) for avian influenza free status: A single outbreak in one corner of country, entire country was declared "bird flu-affected" and exports were hit. Now, with AI-free compartments notified under DAHD as per WOAH norms, specific integrated operations can get recognised as bird-flu free, provided they meet prescribed biosecurity, testing and surveillance norms. This is a game-changer for trade and export.

Recognition of poultry as agriculture: In several states, poultry is now formally treated as part of agriculture, easing land conversion, agricultural power tariffs, and other benefits.

NAIP: National Artificial Insemination Programme through MYTRI

ABIP: Accelerated Breed Improvement Programme: sex-sorted semen at subsidised price with 95% female calves.

NLM: National Livestock Mission: funding for fodder development, compound feed mills, feed-testing labs, processing infrastructure for egg, meat and milk including cold chain.

AHIDF: Animal Husbandry Infrastructure Development Fund: interest subvention and partial guarantee, encouraging private investment in modern infrastructure.

NADCP: National Animal Disease Control Programme: Targeting free vaccination against FMD, Brucellosis, PPR and ASF.

NDLM: National Digital Livestock Mission (Bharat Pashudhan): A 12-digit ear-tag-based national database covering all animal details.

Milk quality remains a concern, especially regarding SCC, Aflatoxin M1, antibiotic residues and heavy metals. What should

be done at policy, processor and farmer levels?

A large survey conducted by FSSAI in 2019 tested more than 6,000 milk samples across India. Around one-third of samples failed to meet minimum standards for fat, SNF, and water. About 3 to 5% of samples exceed tolerable limits of various antibiotics, heavy metals and aflatoxin M1. In other words, over 70% of India's milk is at par with global standards, and roughly 90% is safe for human consumption.

Policy level: Segregated collection infrastructure, separate lines for procurement of premium and ordinary milk. Incentives to milk processors to pay differential prices depending on the quality of milk.

Processor level: Stop mixing good and bad milk in the same tanker. Create at least two collection lines at the village level (e.g., green line and yellow line). Use the premium line for export and high-value added products, and the regular line for bulk domestic use. Several private players already follow this. Cooperatives must adopt this.

Farmer level: Educate farmers for clean milk production, udder hygiene, proper storage and quick chilling. Awareness about withdrawal periods after antibiotic treatment. The key message is: rural smallholder milk is not inherently "bad". Often, excellent milk from a two-buffalo household is being mixed with poor-quality milk from elsewhere in the same can. That's a system problem we need to solve.

Punjab's dairy sector is considered an exemplary model for India. What can other states learn from the Punjab experience?

Dairy is growing at about 4–5% per year, and poultry at 7–8%. But if you look at organised dairy growth, north-western India especially Punjab stands out.

Their average calving interval is 15–18 months. In many other states, it's often >24 months. Shorter calving intervals mean a steady flow of replacement stock and more days in milk.

Transplanting the Punjab model "as is" to small land-holding regions with mostly landless dairy farmers is not straightforward. But the principles like DM-based feeding, better reproductive management, and housing that allows natural behaviour can and should be adapted. Public–private partnerships in genetics, forage and infrastructure development can help replicate the best elements of Punjab in other geographies.

Corn is expected to contribute around 46% of ethanol production—approximately 5 billion litres—consuming 13.1 million tonnes of the nation's 42 million tonnes of corn output. How do you see this impacting the Indian feed sector and suggestions for the same?

India produces around 42 million tonnes of maize, and a growing share — about one-third of the corn is being diverted for ethanol. At the same time, alcohol plants generate Distillers Dried Grains with Solubles (DDGS), which can be a valuable feed ingredient.

DDGS has moderately high protein, energy, and fat with good amino acid digestibility. If properly used, it can replace part of maize and part of soybean meal. I have used up to 14% DDGS (maize + rice) in dairy rations without affecting the performance. The pellet durability index (PDI) drops when inclusion exceeds around 8–10%. Rice DDGS in broilers, can be used up to 2–3%, whereas in layers can be used up to 5-6%.

DDGS is highly variable feed ingredient in India. Quality of DDGS mainly depends upon type of grain used (FCI reject grains, broken rice, maize, jowar, etc.), amount of soluble added back and method of drying. This leads to variation in colour, nutrient composition, sulfur and urea content. DDGS often gets labelled as "high-risk" for mycotoxins. Yes, it can be contaminated, but we must remember mycotoxins are not uniformly distributed in any feed lot. Proper sampling, multiple grabs, reducing sample size and lab testing are crucial. In practice, focus mainly on aflatoxin B1, keeping total levels in the finished feed below 20 ppb, and use good-quality toxin binders at appropriate dosage.

I don't see ethanol expansion as a long-term "threat" because there is simultaneous increase in

grain production. Nutritionists should start with conservative DDGS levels, monitor performance, and then scale up based on evidence.

Feed prices and milk prices are disproportionate across India. What advice would you give dairy farmers in such circumstances?

Yes, but this situation is not unique to India. Dairy farmers across the world, whether in the US, Europe, Australia, New Zealand, or the Middle East, are facing similar challenges. In India, milk prices are largely regulated by the government. Because prices are controlled, farmers cannot expect high margins, instead, they must work with moderate or low margins and focus on increasing production volume, as the government and cooperatives continue to procure milk consistently.

In contrast, feed prices are market-driven. They fluctuate based on RM availability, demand and supply. Since India has no national Feed Regulatory Act, feed prices vary widely and are not governed by any laws.

My key advice to farmers under these conditions:

Reduce dependency on concentrate feed. Farmers should focus more on producing their own green fodder and silage. Choose right variant of concentrate feed wisely and avoid overfeeding of protein. It has become fashionable to feed high-protein diets, but this is counterproductive. The animal requires ~2,500 kcal just to excrete 1% excess protein. Too much protein diverts energy towards digestion instead of milk production. Protein should match the animal's requirement, a little less is acceptable; excess is harmful. A common mistake is feeding 24% protein feed to all animals: high yielders, low yielders, pregnant cows and non-lactating cows. This increases the feeding cost. Feeds should be animal-specific, based on production level and stage of lactation.

How is Zeus Biotech supporting the animal feed sector with its nutritional solutions?

Zeus Biotech Pvt. Ltd., founded in 1991, headquartered at Mysuru, is a biotechnology-driven company established by a microbiologist. The company specializes in manufacturing fermentation-based feed supplements.

Zeus Biotech was the earliest homegrown company to manufacture animal feed enzymes by SSF (solid-state fermentation) technology using koji chambers, the process is patented with Zeus Biotech by the Patent Authority of India.

Zeus Biotech isolates fungi, yeasts and bacterial cultures from natural sources such as food grains, feed mills, animal farms and soil. These strains have undergone molecular characterization, DNA sequencing, stability/efficacy studies and safety evaluation before including them in the production. Mother cultures are maintained in Zeus's culture collection bank and are also deposited with MTCC, Chandigarh, GOI and DSMZ, Germany ensuring authenticity and intellectual property protection. All these strains are not genetically modified (non-GMO).

Using SSF, Zeus Biotech produces organic trace minerals (soy proteinates), feed enzymes, probiotics (spores), prebiotics from yeast cell wall, yeast cultures for dairy nutrition

The solid-state fermentation process uses feed ingredients (rice bran, soybean meal) as substrate, with less than 5% residue making it highly eco-friendly. Air, water and surfaces are fully filtered to prevent contamination, ensuring a clean manufacturing environment.

Zeus Biotech has played a significant role in reducing feed supplements price in turn the feed price in India. Since 2017–18, Zeus operates a NABL-accredited laboratory staffed by biotechnologists, microbiologists, and biochemists.

The lab analyses proximate, mycotoxins, heavy metals, trace minerals, vitamins, amino acids, a few antibiotics and coccidiostats along with certain phytomolecules. The lab receives over 50 samples daily from feed manufacturers, integrators and farmers. It participates in proficiency testing and consistently ranks among the top Indian labs. Zeus has a team of nutritionists who help in monitoring the quality of feed ingredients and feeds. Help in feed formulation, feeding values of various ingredients to support their customers.

Animal Feed Yeast Market to Reach USD 3.56B by 2033

As global demand for sustainable and high-performance livestock nutrition rises, animal feed yeast is emerging as a key player in modern feed strategies. No longer just a simple additive, yeast is now recognized as a vital ingredient that supports animal health, boosts performance, and improves feed efficiency.

The surge in demand is driven by the push for natural, antibiotic-free feed solutions. Products like Saccharomyces cerevisiae and yeast cell wall components are increasingly used to enhance gut health, immunity, and nutrient absorption. According to Research Intelo, the global animal feed yeast market was valued at USD 2.13 billion in 2024 and is projected to reach USD 3.56 billion by 2033, growing at a CAGR of 5.7%.

Key growth factors include:

- Rising demand for protein-rich diets: Increased urbanization and higher incomes are boosting livestock production. Yeast-based feed helps improve feed efficiency and animal growth.
- Innovations in yeast strains and fermentation: R&D efforts are creating specialized yeast products tailored to different species and nutritional needs.
- Strategic collaborations and regulatory support: Preventive animal healthcare and natural feed mandates are encouraging adoption of yeast-based solutions.
- Market Insights:
- Poultry is the largest consumer segment, followed by swine, ruminants, aquaculture, and companion animals.
- Asia-Pacific leads the regional market, driven by China, India, and Southeast Asia.
- North America and Europe remain significant, supported by strict feed safety regulations and the shift to antibiotic-free production.

Challenges: Fluctuating raw material prices, competitive pressures, and regional regulatory differences may affect market growth.

Future outlook: Advances in yeast strains, bioactive fractions, precision fermentation, and digital feed management systems will further enhance livestock performance, efficiency, and sustainability.

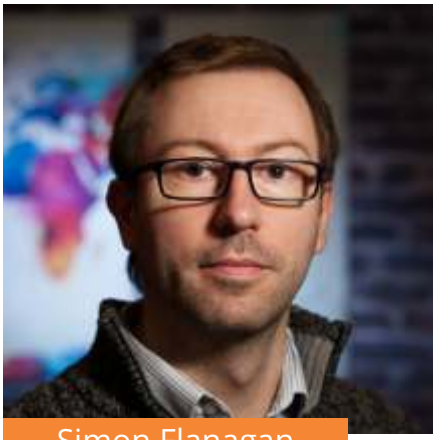
Conclusion: The animal feed yeast market is poised for strong growth. By supporting gut health, immunity, and feed efficiency, yeast is redefining livestock nutrition and helping producers meet the demands of a more sustainable, productive, and resilient animal production industry.

Source: Research Intelo

Image Source: AB Vista

Smarter Farming with Evolving NIR Technology

By **Simon Flanagan**, and **Mohy-El-Din Sherif**, AB Vista



Simon Flanagan

Near Infrared (NIR) spectroscopy is a pivotal tool for feed millers, nutritionists, and livestock producers alike. By measuring the way feed ingredients absorb and reflect near-infrared light, the technology can predict the nutritional composition of raw materials and finished feeds within minutes. It's a capability that has transformed how diets are formulated – reducing waste, saving costs and improving overall feed efficiency, which equates to better animal performance.

Yet as farming practices evolve, so too do the expectations placed on technology. Producers are realizing that they need faster, more reliable insights and systems that work even when connectivity is limited – a reasonable request when you consider that in the UK, around one in 10 farms still lacks consistent internet access.

This highlights a key limitation of many traditional NIR systems, which depend on stable connectivity to operate at their best. To remain relevant to today's production systems, NIR must continue to evolve.

This article explores how NIR has developed, the new demands of farmers and nutritionists, and the innovations shaping the next generation of feed analysis.

How Has NIR Evolved?

In the past, laboratory-based "wet chemistry" analysis for feed was commonly used but proved slow and expensive. Results could take days to arrive, delaying decisions and risking productivity losses. The introduction of NIR instruments changed the game as it allowed producers to analyse samples in-house and act on the results the same day.

Over time, calibrations expanded to

cover a broader range of nutrients, including fibre fractions, amino acids and phytic phosphorus. This allowed nutritionists to fine-tune rations with greater precision and monitor quality more consistently across sites. Next came portable and handheld devices which brought NIR directly onto the farm or feed mill floor, further reducing reliance on external laboratories.

The ability to generate accurate data quickly has helped underpin precision nutrition strategies, which aim to supply animals with exactly what they need – no more, no less – for ultimate efficiency, reducing feed costs and environmental impact in the process.

Speed, Reliability and Offline Access

While NIR has delivered significant gains, the modern farming landscape is creating new pressures. Farmers, nutritionists, and feed manufacturers increasingly expect their technology to deliver immediate, accurate results with minimal need for specialist knowledge. They also want systems that work seamlessly in remote or isolated locations where internet connections can be unstable or absent. The fact that one in 10 UK farms still lack reliable broadband coverage demonstrates the importance of offline functionality.

Mohy-El-Din Sherif

Downtime is another critical factor. In high-throughput operations, every hour counts, so devices and software must be resilient, with updates and maintenance scheduled to avoid disruption. Alongside this, producers want greater control over their data. They expect analysis results to be stored securely, easily exported into common

formats such as Excel, and accessible across multiple sites or teams.

But meeting these expectations is not just about convenience. Inaccurate or delayed analysis can lead to suboptimal formulations, increased costs and greater variability in animal performance. For farmers operating on tight margins, that is a risk few can afford to take.

Advances in NIR: How Technology Is Responding?

Developments in hardware, software and connectivity are helping NIR systems keep pace with these demands. Modern platforms now feature cleaner displays, intuitive dashboards and built-in guidance, making them easier for new users to navigate. Enhanced storage and filtering options allow producers to manage large datasets more effectively, track trends over time and share insights across teams.

Recognizing that not all farms have reliable internet, some systems can now operate fully offline, uploading data automatically once a connection is restored. Next-generation NIR platforms are also being designed to handle new parameters and integrate with emerging technologies over the next decade. This kind of futureproofing reflects a wider shift in agriculture towards digital tools that are not just accurate but also accessible, resilient and adaptable.

Looking Beyond

The next leap forward for NIR will be in how data is interpreted. Machine learning algorithms can process vast amounts of spectral data to identify subtle patterns and predict outcomes with greater precision. This could enable automated alerts when ingredient quality shifts outside expected ranges, or real-time adjustments of feed formulations in response to new data. It could also allow benchmarking of performance across regions or production systems to uncover hidden efficiency gains.

As artificial intelligence becomes further embedded in agricultural technology, the focus will shift from producing insights to delivering actionable recommendations – telling the user not just what is happening, but what to do next.

For farmers and feed professionals, these advances promise faster, more reliable nutritional analysis and more informed feed and farm management strategies, even in remote areas. They offer greater confidence in diet formulations, improving feed efficiency and animal performance. They also provide better control over data, enabling long-term tracking and more informed decision-making. In practical terms, this means reduced reliance on external laboratories, fewer delays in responding to on-farm challenges and a more resilient, cost-effective, and sustainable feed supply chain.

A Shared Industry Challenge

With rising competition across the animal production industry, demand for nutrition strategies that deliver both efficiency and value is growing.

NIR spectroscopy has already transformed feed analysis, providing the speed and accuracy needed to enable targeted nutrition on a commercial scale. To keep delivering meaningful value it must continue to evolve in step with the needs of the user, ensuring accurate, immediate results with minimal downtime; offline functionality for remote locations; seamless integration with other data sources, and machine learning capabilities to move from analysis to decision support.

As production costs and environmental pressures mount, the ability to turn vast amounts of data into actionable insights will be critical. Shared datasets, open standards, and robust calibrations based on diverse global samples can help ensure NIR remains a valuable tool regardless of geography or production system.

The next generation of NIR systems – designed not just for today's needs but for the challenges of tomorrow – will be central to supporting more efficient, resilient, and sustainable animal production.

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Lessons from Feed & Dairy Conference 2025

Dairy Farm Profitability

Dr. S. Gaikwad
Govind Dairy

Dairy Farming Innovation: A Tool for Sustainable Dairy Farming

- Low-cost, integrated dairy farming models—combining breeding, manure utilisation, and value-added product development—represent the future of sustainable dairy operations.
- Affordable innovations such as crop-residue flooring, grooming brushes costing only INR 400, and low-cost cooling systems have enabled farmers to scale their operations from small units of 600 farms to more than 4,000 farms.
- Consistent nutrition significantly enhances digestibility, milk quality, and overall milk yield.
- Aflatoxin remains a critical challenge in silage-making; hydroponics provides a nutrient-dense source of green fodder and is a strong alternative.

Takeaway Message:

In dairy farming, cost is not the biggest barrier—mindset and intent matter more. The right exposure and learning can accelerate farm growth dramatically.

Dr. N. R. Ghosh
NDDB

Optimizing Dairy Productivity and Profitability with Scientific Nutrition

- The nutritional needs of dairy animals vary with physiological stages of lactation. The ration of animals must contain the right proportion of protein, energy, minerals, and vitamins.
- Proper NDF (Neutral Detergent Fibre) and ADF (Acid Detergent Fibre) balance ensures healthy digestion and optimal rumen function.
- Rumen microbes supply up to 70% of a cow's energy, making efficient rumen fermentation essential for productivity.
- Current feeding patterns show that 45–50% of diets rely on crop residues; green fodder availability remains seasonal, while cattle feed penetration is still only 13–14%, indicating significant market potential.
- Unscientific feeding practices prevent animals from achieving their genetic potential. Green fodder quality and digestibility play a crucial role in ration formulation.

NDDB's Ration Balancing Programme:

- Implemented across more than 30,000 villages, covering 28 lakh animals.
- Achieved an average increase of 300 g/day in milk yield, INR 26/day additional profit, and a 13.7% reduction in enteric methane emissions.
- In 1962, a digital tool was developed enabling farmers to enter milk yield, fat%, feeding details, etc., to instantly receive balanced ration recommendations.

Economic Benefits:

- TMR feeding can improve profitability by INR 35–40 per animal per day.

Takeaway Message:

High-quality green fodder is the most economical nutrition source. Feeding good-quality fodder alone can improve profitability by INR 30–35 per animal per day. Scientific, balanced feeding is essential to unlock an animal's full potential.

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Dr. Shailesh Madane
Advanced Enzymes

Importance of Animal Health in Dairy Profitability

Animal health forms the foundation of a profitable dairy enterprise. Four key pillars define overall herd well-being: Udder health, Rumen health, Reproductive health, and Hoof health.

Subclinical Mastitis:

Early detection is crucial to avoid invisible losses. A monthly CMT test—readily available in the market—is recommended. An undetected cow with subclinical mastitis can lose 200–250 litres of milk per lactation.

Milking Machine Maintenance:

Liners should be replaced every 2,500 milkings or at least once every six months, whichever occurs first.

Water Management:

With milk composed of more than 85% water, cows require 4–5 litres of water for every litre of milk produced. Clean, fresh water must be available 24×7 at multiple accessible points.

Farm Size Planning:

Setting clear targets for animal numbers is crucial. Herd size should align with available resources—fodder, labour, land, and local market demand. Accurate breeding records are essential for maintaining a high-quality herd.

Silage Preparation:

Profitability depends on harvesting corn at the correct stage and moisture content. Bunker size should match daily silage requirements; a 1 ft × 1 ft × 1 ft bunker stores approximately 16–17 kg of silage.

Housing & Management:

Stress-free animals perform better. Loose housing systems, high-quality silage, clean water, comfortable bedding, stage-wise feeding, proper calf and delivery care, and regular testing for subclinical infections significantly improve herd sustainability.

Takeaway Message:

Profitable dairy farming begins with strong animal health management. Focusing on udder, rumen, reproductive, and hoof health—along with the early detection of subclinical mastitis—prevents major hidden losses. Consistent, scientific management across these areas ensures healthier animals, higher productivity, and a more sustainable dairy enterprise.

Scope and Challenges in the Indian Feed Sector

Dr. Amiya D Nath
JAPFA Comfeed

Poultry Feed and Sustainability Outlook

- India has 100 crore poultry birds—52% broilers, 38% layers, and 10% country chicken—constituting an industry valued at INR 2.3 trillion (2024).
- The country hosts 3,500 registered feed mills; however, large fluctuations in feed ingredient prices—such as corn dropping from INR 27/kg in 2024 to below INR 20/kg in 2025—highlight the need for robust forecasting systems and diversified ingredient sourcing.
- The future of the poultry sector lies in processed meat, circular economy models, eco-friendly packaging solutions, water conservation, and emission reduction practices.
- A greater emphasis on efficient Feed Conversion Ratio (FCR), climate resilience, and zero-waste farming will steer the industry's transition from volume-driven growth to value-driven development.

Takeaway Message:

"The poultry sector must move from volume to value through circular economy principles, efficient feed use, and sustainable, climate-smart practices."

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Ganesh Sharma
Paras Nutrition

Dairy Feed Efficiency and Farmer Empowerment

- India's feed industry is growing at 6%, with an overall feed potential of 183 MMT for 2024–25 based on total animal population; however, 92% of the cattle feed market remains untapped. This gap is currently being filled by raw materials such as mustard meal, cottonseed meal, groundnut cake, and other oil meals and grains.
- Cow milk accounts for 55% of India's total milk pool, while buffalo milk contributes 45%.
- Despite India having the world's largest buffalo population, there is no nutrient-specific feed available for buffaloes, representing a major untapped opportunity for the feed sector.
- Precision nutrition and nutrient optimization are crucial for dairy productivity. While the impact of nutrients on milk production is well-documented for dairy cows, buffaloes still require updated nutritional guidelines to improve feed efficiency and productivity.
- A dedicated, service-oriented approach—evaluating key feed resources at the farm level and developing nutrient-balanced Total Mixed Rations (TMR)—is essential, as it can enhance milk yields by 10–15%, significantly improving farmer profitability.

Takeaway Message:

"Empowering farmers with nutrient-based, service-oriented feed solutions can unlock India's 92% untapped dairy feed potential and enhance milk yields sustainably."

Dr. Ashutosh D Deo
ICAR–CIFE

Aquaculture Feed and Future Readiness

- India produces 19.5 MMT of fish, ranking second globally, yet current aquafeed production stands at only 2 MMT across 28 feed mills.
- By 2047, national feed requirements are projected to rise to 30 MMT (based on an FCR of 1.5), necessitating major expansion in feed manufacturing capacity.
- Shrimp feed production currently exceeds demand (capacity: 1,900 tons/day; demand: 1,100 tons/day), though disease challenges and seasonal fluctuations continue to affect the sector.
- Future solutions include developing season-, system-, and species-specific feeds, utilizing fish silage, and implementing blockchain-led traceability systems.
- Precision nutrition has already helped reduce production costs by INR 12 per kg, demonstrating its effectiveness and value.

Takeaway Message:

"India's aquafeed future lies in innovation—customized feeds, traceability, and precision nutrition to balance productivity, profitability, and sustainability."

Dr. Suyash Vardhan
Innovatief Technologies

Scope and Opportunities of the Indian Feed Sector

- The Indian livestock sector's Gross Value Added (GVA) has increased by approximately 13% from FY 2013–14 to FY 2022–23.
- The livestock industry is projected to reach USD 350 billion by 2030, driven by strong annual growth across the poultry, dairy, and aquaculture segments.
- Milk production in the dairy industry is growing at 5.6%, the layer segment at 6.9% (expected to reach 10% by 2030), while broiler meat is forecast to grow by 3–8%. The aquaculture sector continues to expand at a rate of 7–10%, driven by market conditions, export policies, and environmental factors.
- As India is a consumption-driven market, there is a pressing need to adopt precision nutrition for improved productivity and sustainability. This includes shifting focus towards critical nutrients such as amino acids and fatty acids rather than crude protein and edible fats, particularly in dairy, while adopting enhanced nutritional strategies in poultry and aquaculture to achieve better FCR.
- Surveys indicate that by 2025 India will face a deficit of 40% in green fodder, 23% in dry fodder, and 38% in cattle feed concentrate, with shortages

expected to widen by 2030.

- The industry mindset must shift from "least-cost formulation" to "best-cost formulation," supported by advanced nutritional interventions and digital tools to enhance value, efficiency, animal performance, and overall livestock farmer profitability.

Takeaway Message:

"As the livestock sector is growing steadily, contributing a significant GVA to Agriculture GDP, industry must focus on adopting new nutritional strategies, especially on precision nutrition, considering the importance of critical nutrients like amino acids and fatty acids over ingredients."

Scope of Commercial TMR

B. M. Bhanderi
Amul

Role of FPO in the Total Mixed Ration (TMR) Supply Chain

- Indian dairying is the backbone of the rural economy, and small herd sizes offer distinct advantages including lower methane emissions, significant scope for productivity enhancement, etc.
- TMR can be a transformative solution for the dairy sector, provided the mixture remains uniform and consistent. For long-term sustainability, TMR must be both nutritionally balanced and economically viable.
  - o Recommended Composition:
- 45–50% Maize/Sorghum Silage
- 12–15% Jowar Hay / Wheat Straw / Oat Hay
- 32–36% Concentrate Mixture
- 5–6% Premix
- Mycotoxin remains a major challenge in TMR production, storage, and handling.
- Documented benefits of feeding TMR include:
  - o 12% increase in milk yield
  - o 11% increase in fat percentage
  - o 2% improvement in SNF
  - o Reduction in mastitis incidence
- Green and dry fodder production can be significantly enhanced by forming FPOs and adopting advance contracting models with farmers.

Takeaway Message:

Balanced nutrition through TMR significantly improves milk production, reproductive efficiency, and overall herd health—boosting long-term farm profitability.

Dr. V. D. Patil
Gokul

Scientific & Commercial Review of Commercial TMR

Key Points

- India generates nearly 500 million tonnes of crop residues annually, of which 140 million tonnes are burned. Efficient utilisation of these residues through TMR can address major environmental and fodder-management challenges.
- Dry TMR is ideal for farmers who grow their own green fodder; an optimal combination of green fodder, dry fodder, and TMR ensures nutritional adequacy.
- TMR helps optimise feed costs, improves nutrient consistency, reduces digestive disorders, and enhances overall farm profitability.
- Trial outcomes demonstrate:
  - o 24% increase in lactation yield (against an expected 15%)
  - o 48% increase in net farm income
- Key challenges include meeting the rising market demand and ensuring the consistent supply of high-quality TMR.

Takeaway Message:

TMR is the future of Indian dairying. It can bridge the fodder shortage, enhance milk production, and attract the next generation to smart, efficient, and sustainable dairy farming.

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Dr. Ashok Patel
Banas Dairy

Commercial TMR: Benefiting Small Dairy Farms

- Total Mixed Ration (TMR) is an optimal blend of dry fodder, green fodder, and concentrate, ensuring that each bite delivers uniform nutrition. Feeding twice daily with a 7-hour interval helps maintain gut health.
- Under the National Livestock Mission, farmers are eligible for up to 50% subsidy for installing TMR plants—up to INR 1 crore (or INR 50 lakh for investments above INR 1 crore).
- Production-purpose TMR is available at INR 16/kg, while maintenance-purpose TMR is priced at INR 13/kg.
- NDDB trials on 31 early- to mid-lactation cows recorded an increase of ≥0.5 kg in DMI and a rise of 2–3 kg in milk yield per cow per day.
- TMR ensures consistent fulfilment of nutritional requirements, improves body condition score, enhances animal health and fertility, increases milk yield, fat%, and SNF%, improves ROI by reducing feeding costs, and saves time and labour.
- To strengthen raw material security, Banas Dairy is expanding TMR production through a new plant and has initiated contract farming to ensure reliable green fodder supply.

Takeaway Message:

TMR offers small dairy farmers a cost-effective way to deliver balanced nutrition, improve animal health and productivity, boost milk yield and quality, and reduce feeding labour—ultimately increasing profitability.

Chandrashekhar Jagtap
Kisan Feeds

TMR & Milk Quality

- Concentrate feed alone cannot meet the nutritional requirements of cattle; high-quality fodder is essential, and TMR remains one of the most effective methods for ensuring uniform, balanced feeding.
- TMR has a shorter shelf life (approximately 7 days) compared to conventional cattle feed (up to 2 months).
- Feeding should be customized according to the animal's life stage and requirements.
- Silage is commonly outsourced, but contract farming provides greater control over silage quality.
- Water intake rises when animals are fed TMR; hence loose housing systems tend to offer better performance results.
- TMR significantly improves animal health: milk production increases by 10–15%, repeat breeding and mastitis cases decline, milk yield remains consistent across lactation, and somatic cell count and aflatoxin levels decrease—resulting in better milk quality and higher farm income.
- Adoption of TMR can potentially raise farm-level milk output by up to 11,000 litres per month.

Takeaway Message:

A progressive and educated new generation must enter dairying with strong record-keeping, scientific feeding practices, and long-term planning. With the right approach, TMR can enhance milk quality, increase yields, and drive sustainable profitability.

Shiva Mudgil
IFC

Making Sustainability Profitable

Holistic Sustainability

- True agricultural and livestock sustainability requires an integrated approach that combines farmer-centric financing, well-defined production standards, and strong collaboration across public, private, and institutional stakeholders.
- IFC is leveraging global expertise to advance Sustainable Agribusiness, encompassing sustainable crop production, sustainable proteins, resilient supply chains, and enhanced food safety and loss-prevention systems.

Takeaway Message:

Supportive government policies and multilateral partnerships – such as those driven by IFC, World Bank, and national development bodies – are vital to scaling sustainable agriculture models and mitigating systemic risks.

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Dr. Anil Kavtekar
Schreiber Foods

Making Sustainability Profitable for Dairy Farmers

- India contributes 24% of global milk production, with per-capita consumption increasing at 8%, although exports remain low at 3–4%.
- A study across 140 farms shows milk production costs ranging from INR 21–46 per litre. The core challenge is low milk yield per cow:
  - India: 3,200 kg per cow per year
  - USA: 11,000 kg per cow per year
- The average body condition score of Indian cattle is below 2.75, whereas European cattle typically score above 4.
- Four pillars of sustainable dairy development include:

1. Breed improvement
2. Feed and nutrition
3. Management
4. Disease control

- Transitioning animals to loose housing with fewer animals per unit area has resulted in more than 20% increase in milk yield.
- Good management practices can further enhance production by 15–20%.
- Key welfare essentials include access to 24x7 clean drinking water, nutritious feed, comfortable bedding, and ensuring cows are not tied too tightly.
- Ethno-Veterinary Medicine (EVM) provides a natural cost effective alternative to reduce antibiotic usage in the animal treatment & ultimately controls residues in milk. Currently available for 13 diseases, EVM demonstrates up to 98% efficacy in most conditions and typically costs only 1% of conventional allopathic treatments.

Takeaway Message:

Sustainable dairy becomes profitable when farmers improve breeds, nutrition, and management, adopt better housing and welfare practices, and use cost-effective ethno-veterinary treatments to boost milk yield, reduce losses, and ensure safer milk.

Dr. Channegowda HK
Zeus Biotech

Rumen Dynamics & pH: Impact on Milk Quality

- Milk fat and SNF are the strongest indicators of milk quality and long-term farm sustainability.
- A 2019 national survey reported that one-third of milk samples failed to meet minimum fat and SNF standards, primarily due to nutritional gaps at the farm level.
- The rumen acts as a 150-litre microbial fermenter, producing up to 2.5 kg of microbial protein per day, supporting ~10 litres of milk production.
- The forage-to-concentrate ratio is a key determinant of both fat and SNF levels; a 60:40 ratio is generally recommended.
- Cows should rest for 12–14 hours daily and ruminate for around 8 hours to generate adequate saliva, maintain rumen pH, and ensure optimal digestion.
- Total ration should contain 4–5% fat for optimal performance.
- TMR must be a scientifically balanced blend of forage, concentrate, supplements, and additives.
- Clean drinking water (preferably under shade) should be provided 7–8 times a day.

Takeaway Message:

Enhancing nutrition, housing, health, and welfare practices is central to improving milk quality, productivity, and farm longevity—linking animal well-being directly to economic resilience. An optimal forage-to-concentrate ratio, along with proper infrastructure, remains key to profitable dairying.

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CONFERENCE OUTCOMES

Dr. V. R. Kulkarni
VRK Biotech

Waste to Wealth

- Although poultry and livestock waste can negatively affect ecosystems and human health, it becomes a valuable resource when scientifically managed.
- Selecting highly digestible feed ingredients reduces undigested protein and ammonia formation; for instance, excessive soybean meal increases ammonia levels, whereas insoluble fibre functions as a prebiotic—enhancing beneficial microbes while reducing proteolytic activity.
- Using corn cobs as bedding lowers moisture, ammonia, and odour. Acidifying the bedding further inhibits bacterial growth and increases the fertiliser value of poultry waste.
- Organic fertiliser derived from treated waste can be sold for INR 5–100 per kg, generating economic returns while promoting healthier poultry environments.
- Slaughter waste is now efficiently converted into protein-rich ingredients (with or without high calcium and phosphorus content), while the remaining material is managed similarly to dead birds. Ash generated through incineration can also be utilised as nutrient-rich organic fertiliser.

Takeaway Message:

Waste is no longer a burden—it is a valuable resource. Converting livestock and poultry waste into value through composting, biogas, and recycling reduces pollution, lowers input costs, and supports circular, resource-efficient agriculture.

Bharat B. Mehta
Reliance

Plastics and Sustainability

- India's PET consumption is rising rapidly, with 5-year and 10-year CAGR of approximately 12%, and a recent 3-year CAGR of 18%.
- Globally, 500 million MT of PET has been used for food-contact, with 25 trillion bottles consumed safely over 40 years.
- PET outperforms glass across most environmental impact categories.
- India has one of the world's highest PET recycling rates—90–95%—as recognised by the MoEF in the Rajya Sabha.
- PET and rPET contribute significantly to SDG 2030 goals:
  - Nearly 4 million waste pickers rely on post-consumer recycled (PCR) PET
  - rPET production reduces carbon footprint by ~60% (NAPCOR study)
- The top 13 Indian states, which account for ~73% of PET consumption, achieve almost 100% recycling. Four states recycle 2.5–3 times their consumption, effectively processing waste from neighbouring regions.
- Innovations such as PET caps or tethered caps, label-free bottles, and similar design improvements can further strengthen recycling initiatives.

Takeaway Message:

When responsibly designed and effectively recycled, plastic packaging—especially PET—supports food safety, extends shelf life, and promotes sustainability. The key challenge is developing strong recycling systems and empowering consumers to participate actively.

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Non-GMO Advantage Drives India's October Soymeal Export Growth

India's soymeal exports recorded a strong rise in October, touching an estimated 163,000 tonnes compared with 111,000 tonnes during the same month last year, according to the Soybean Processors Association of India (SOPA). The country shipped soymeal to 42 destinations, with Bangladesh, Nepal, Germany and France emerging as the largest buyers—reflecting India's growing relevance in the global feed market.

Soymeal production also improved, reaching 829,000 tonnes in October, up from 750,000 tonnes a year ago. This growth comes despite a dip in soybean arrivals, which stood at 1.5 million tonnes for the month, lower than 1.8 million tonnes last year. Overall soybean output for the current season is estimated at 10.5 million tonnes, slightly below last year's 12.6 million tonnes.

Crushing operations remained strong, with 1.05 million tonnes of soybeans crushed in October, higher than 950,000 tonnes a year earlier. As of October 1, total soybean stocks available for crushing, direct consumption and export were estimated at 9.8 million tonnes. By the end of October, soymeal stocks stood at 114,000 tonnes.

Soybean processing yields soyoil and soymeal—the latter being a key protein-rich feed ingredient preferred in poultry and livestock nutrition. India's non-GMO soymeal enjoys strong demand globally. However, export competitiveness continues to face pressure from more affordable alternatives like DDGS in international markets. Despite this, India remains a major soymeal exporter and one of the largest importers of soy oil.

Poultry Revenues to Rise, Margins to Tighten in FY26: Crisil Report

India's poultry sector is projected to grow 4–6% in revenue in FY26, supported by rising rural consumption, increasing per capita meat intake, and a growing shift toward protein-rich diets, according to a recent Crisil Ratings report. However, the industry's operating margins are expected to decline by 80–100 basis points due to weaker broiler prices in the first half of the fiscal.

Despite pressure on profitability, Crisil notes that the credit profiles of poultry companies remain stable, helped by modest capital expenditure, limited borrowing, and healthy cash flows. The poultry industry is divided between the layer (egg) segment, which contributes 55% of the sector's value, and the broiler meat segment, which accounts for the remaining 45%.

The broiler segment is expected to witness muted revenue growth of 1–3% this fiscal, as wholesale broiler prices fell nearly 20% year-on-year to INR 110–115 per kg in Q1. This drop was triggered by a short summer and early monsoon—leading to heavier birds and surplus supply. While festive demand has begun supporting prices, average realisations for the fiscal are still expected to remain 4–6% lower year-on-year. Nevertheless, broiler sales volume is projected to rise by 6–8% to 5.86 lakh tonnes.

In contrast, the egg segment shows stronger momentum. Sales volume is estimated to increase 4–6% to 15,750 crore eggs, with prices rising 2–4%. With India's per capita egg consumption at just 102 per year—far below the global average of 218—the segment has substantial room for expansion. As a result, egg segment revenue is expected to grow 7–9% in FY26.

Feed costs, which make up 60–65% of total material expenses, will remain manageable. Soy de-oiled cake prices are expected at INR 35–37 per kg due to oversupply, while maize prices should stay stable at INR 24–25 per kg.

Overall, the sector is poised for stable growth, even as margin pressures persist due to volatility in broiler prices.

From Farms to Hatcheries, India's Shrimp Ecosystem Feels the Heat

India, the world's second-largest shrimp producer, is facing a severe threat as US tariff hikes and rising production costs push farmers toward heavy losses. Shrimp farmer Buddhadeb Pradhan from West Bengal is among many taking risky decisions—such as cultivating a second crop despite high disease risks—simply to recover investments. Shrimp prices have plunged from INR 300 to ₹230 per kg after the United States imposed steep tariffs, including anti-dumping and countervailing duties totaling 58.26%.

India exported USD 5 billion worth of shrimp in FY25, with nearly half going to the US. But with high duties, farmers fear losing their largest export market. Production costs remain high at INR 275 per kg, putting farmers like Nardu Das on the brink of financial collapse. Many borrow heavily for land leases, power, feed and seed—making price crashes devastating.

India produces about 1.1 million tonnes of shrimp annually, mostly Pacific whiteleg (vannamei). Shrimp farming is spread

across nine coastal states and supports nearly 10 million people. But falling prices and disease outbreaks are forcing farmers to dump stock and avoid new cycles. Farmers also blame poor-quality imported brood stock from the US, which often fails to adapt to Indian conditions, causing further disease issues. They urge the government to promote locally bred brood stock to reduce risk.

The crisis has hit hatcheries hard. India's 550 private hatcheries, which produce around 80 billion shrimp seeds a year, are seeing demand collapse. Nearly half have shut down as farmers stop buying seed. Hatcheries have already destroyed 7–8 billion seeds in four months due to negligible demand.

Adding to India's difficulties, Ecuador—its biggest competitor—is rapidly capturing the US market. With lower prices, better-quality vannamei and tariffs of only 15%, Ecuador exported over one million tonnes of shrimp to the US in the first nine months of 2025.

Experts warn that India must diversify into the domestic market, which remains largely untapped, to reduce dependence on the US and stabilize the industry in the long term.

Middle East Demand Powers a Surge in India's Poultry Exports in H1 FY26

India's poultry exports have witnessed a remarkable resurgence, more than doubling to USD 149 million in the first half of FY26 on the back of strong demand from the Middle East. This is a sharp jump from USD 71.16 million recorded during the same period last year. In rupee terms, exports touched INR 1,288.63 crore, reflecting the sector's robust revival.

The surge has been driven primarily by growing egg shipments to the United Arab Emirates and Oman. Traditionally, Oman was India's top buyer, but this year UAE has emerged as the largest importer, according to DGCIS data. Valsan Parameswaran, Secretary of the All India Poultry Exporters Association, noted that UAE's acceptance of Indian eggs has grown rapidly after opening its market last year, supported by consistent quality standards.

Global supply disruptions have also favoured India. Production challenges in Turkey and Iran — key suppliers to the Middle East — tightened availability, boosting India's export opportunities. Turkey additionally diverted part of its supplies to the US, which faced domestic shortages, creating further gaps in the Middle Eastern market. India even supplied one crore eggs to the US in June for the first time, although no subsequent orders followed.

Beyond the Gulf, markets such as Japan and Indonesia have shown rising interest in Indian eggs and egg products. Exporters expect this momentum to continue through January, making FY26 a strong year for poultry shipments.

India had seen a 9% decline in poultry exports in 2024–25, but rising global demand appears to be reversing that trend. With total egg production reaching 142.77 billion in 2023–24 — and major contributions from Andhra Pradesh, Tamil Nadu, Telangana, West Bengal and Karnataka — India is well-positioned to meet growing international demand.

Telangana Raises Maize Procurement Limit as Yields Surge Across the State

Telangana has increased the per-acre maize procurement eligibility limit from 18 quintals to 25 quintals after several regions reported higher-than-expected yields this season. The decision comes as procurement activity gains momentum and farmers face pressure from depressed market prices.

The area under maize cultivation has surged significantly, reaching 2.60 lakh hectares—an increase of two lakh hectares compared to the same period last year. With this expanded acreage, the State government is preparing to procure nearly 8 lakh tonnes of maize through 125 procurement centres. Total maize output for the season is projected at 11.50 lakh tonnes.

Telangana Agriculture Minister Tummala Nageswara Rao has urged the Union Government to support the State's procurement efforts. In a letter to Union Agriculture and Farmers' Welfare Minister Shivraj Singh, he sought Central intervention to ensure smooth procurement and protect farmers from financial distress.

Simultaneously, Civil Supplies Minister N Uttam Kumar Reddy has requested the Centre to relax moisture-level norms for paddy and cotton. The State reported crop damage in approximately 1.10 lakh acres due to adverse weather conditions, and officials believe leniency in quality parameters is crucial to providing relief to affected farmers.

During a recent review meeting, the Agriculture Minister also announced plans to push for an increase in the cotton procurement yield limit—from 7 quintals per acre to 12 quintals—to better support growers recovering from losses.

With rising production, larger procurement targets, and appeals for Central assistance, Telangana is gearing up for an intensive procurement season aimed at safeguarding farmer incomes amid fluctuating prices and crop challenges.

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