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From the Pen of Chief Editor

Reducing Winter Stress for Better Productivity

As winter settles in, dairy farmers across the country brace for a season that tests both management skills and animal resilience. While cows tolerate cold better than heat, the combination of freezing winds, damp bedding, and fluctuating temperatures can quickly tip them into winter stress—a condition that silently chips away at productivity and herd health. In today's dairy industry, where margins are tight and efficiency is crucial, ensuring cow comfort during winter is not just compassionate—it is economically vital.

Winter stress begins when temperatures drop below a cow's thermal comfort zone. At this point, she must burn extra energy simply to stay warm. Energy that should be used for milk production or reproductive cycles is instead diverted to basic survival. The consequences are noticeable: reduced milk yield, lower feed efficiency, suppressed immunity, and higher susceptibility to diseases like mastitis or pneumonia. Calves, with their immature immune systems, face even greater risks during bitter cold spells.

However, winter doesn't have to be a setback. With thoughtful management, farmers can create an environment where cows remain healthy, productive, and comfortable throughout the season. Simple steps—such as maintaining dry bedding, improving shelter from cold winds, and ensuring adequate ventilation—can significantly reduce cold stress. Nutrition also plays a key role. Cows require more energy in winter, and adjusting rations to support this need helps maintain body condition and milk output. Equally important is calf care, which demands warm bedding, draft-free housing, and proper colostrum intake to build immunity.

The economic rewards of reducing winter stress are substantial. Comfortable cows produce more milk, fall sick less often, and show better reproductive performance. Reduced treatment costs, fewer losses, and improved feed efficiency make winter comfort strategies an investment that returns value year after year.

As climate patterns shift and winters become increasingly unpredictable, progressive dairy farmers must adopt forward-thinking practices. Better-designed barns, smart ventilation, and precision nutrition will shape the future of winter dairy management.

Ultimately, a warm, dry, and stress-free cow is a productive cow. Prioritizing winter comfort safeguards not only animal welfare but also the long-term sustainability of dairy farming.

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PRESS RELEASE

ARTICLE

Digital Technologies and Intellectual Property Rights (IPR) in Animal Health Monitoring

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Introduction

The livestock sector is undergoing a digital revolution. With the integration of cutting-edge technologies such as Artificial Intelligence (AI), Internet of Things (IoT), biosensors, blockchain, and big data analytics, animal health monitoring has become smarter, faster, and more precise. These technologies not only enhance disease detection and animal welfare but also optimize productivity and sustainability in animal husbandry. However, with innovation comes the need to protect intellectual property rights (IPR) — ensuring that inventions, software, and data systems are legally secured and ethically used.

1. Role of Digital Technologies in Animal Health Monitoring

Modern digital technologies are transforming how veterinarians, researchers, and farmers monitor animal health. Some key technologies include:

a) Internet of Things (IoT) and Biosensors

IoT-based biosensors can continuously track vital parameters like body temperature, heart rate, rumination, and activity levels in livestock. Devices such as smart collars, ear tags, and rumen boluses send real-time health data to cloud platforms, enabling early disease detection and timely intervention.

b) Artificial Intelligence (AI) and Machine Learning (ML)

AI algorithms analyze vast amounts of sensor and health data to predict diseases, reproductive status, and behavioral changes. ML models can identify subtle patterns indicating conditions such as mastitis, ketosis, or heat stress even before clinical signs appear.

c) Blockchain Technology

Blockchain ensures transparency and traceability in the animal production chain. It can be used to track vaccination history, drug usage, and movement records — thereby improving food safety and consumer confidence.

d) Big Data and Cloud Computing

Cloud-based health monitoring systems collect and store massive datasets from various farms, allowing researchers to conduct epidemiological studies and governments to implement preventive health programs more effectively.

2. Intellectual Property Rights (IPR) in Digital Animal Health

The rapid growth of digital animal health innovations has created new forms of intellectual property that need protection. IPR helps innovators safeguard their technologies, data, and inventions from misuse while promoting fair access and collaboration.

a) Types of IPR Applicable

1. Patents: Protect novel inventions such as diagnostic sensors, data analysis algorithms, or smart wearable devices for animals.

2. Copyrights: Secure original software, mobile applications, and database management systems used in animal health monitoring.
3. Trademarks: Identify and distinguish digital platforms or devices through unique brand names and logos.
4. Trade Secrets: Protect confidential algorithms, data processing techniques, and proprietary analytics models.
5. Data Ownership and Licensing: Regulate how farm-generated data (from sensors or devices) is stored, shared, and monetized.

3. Challenges in IPR Management

Despite its importance, IPR in digital animal health faces several challenges:

- Ambiguity in Data Ownership: Determining who owns the health data — the farmer, the tech company, or the government — remains a complex issue.
- Cross-border Legal Issues: Digital health platforms operate globally, but patent and copyright laws differ from country to country.
- Ethical Concerns: Excessive data surveillance may raise privacy and animal welfare concerns if misused.
- Cost and Accessibility: High patenting costs may discourage small innovators and veterinarians from protecting their inventions.

4. Future Prospects and Way Forward

To fully harness the potential of digital animal health while safeguarding innovation, the following steps are essential:

- Establish Clear IPR Policies: Veterinary authorities and governments should draft clear legal frameworks defining data ownership and usage rights.
- Encourage Public-Private Partnerships: Collaboration between universities, startups, and government bodies can promote responsible innovation.
- Promote Open Innovation with Protection: Balancing open data sharing for research with secure IP frameworks ensures both progress and protection.
- Capacity Building: Training veterinarians and researchers about digital literacy and IPR procedures is crucial.

Conclusion

Digital technologies are redefining animal health management by enabling precision livestock farming, early disease prediction, and welfare monitoring. However, these advancements also necessitate strong IPR mechanisms to ensure that innovation remains ethical, fair, and sustainable. Protecting intellectual property not only rewards inventors but also fuels further research and development — ultimately contributing to better animal health, food safety, and economic growth in the livestock sector.

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Emerging Threat: Lumpy Skin Disease in India's Cattle – A Call to Action for Veterinary Practitioners

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Livestock health forms the backbone of India's agricultural economy, sustaining millions of smallholder farmers and contributing significantly to the nation's dairy and meat production. However, the recent surge of Lumpy Skin Disease (LSD) among cattle has emerged as a formidable challenge for the veterinary community. First detected in India in 2019, the disease has since spread rapidly across multiple states, causing substantial economic losses and threatening rural livelihoods. Characterized by fever, skin nodules and a sharp decline in milk yield. LSD has disrupted farm productivity and exposed critical gaps in biosecurity and disease management.

As veterinarians stand on the frontline of animal health, understanding the nature, spread and prevention of LSD is essential to safeguard livestock and ensure food security.

Why This Matters

India's livestock sector is foundational—not only for rural livelihoods and dairy incomes but also for national food security. Recent outbreaks of Lumpy Skin Disease (LSD) in cattle have demonstrated how endemic-animal diseases can rapidly escalate into significant threats. According to a study from Indian Institute of Science, around 100,000 cattle have died in India in recent years from LSD. Veterinarians, farm-managers and veterinary support systems must stay alert — because the disease:

- Spreads via insect vectors and contact, making bio-security more challenging
- Severely reduces productivity (milk yield, fertility), even if animals survive
- It is present across many states and continues to pose risk given large cattle populations and frequent animal movement.

Understanding LSD: The Basics

Agent & hosts

Lumpy Skin Disease is caused by a virus in the family Poxviridae, genus Capripoxvirus. It primarily affects cattle (cows & buffaloes).

How it spreads

Transmission occurs via blood-feeding insects (mosquitoes, flies, biting-flies, ticks) and also through direct contact with infected animals or contaminated material (e.g., secretions). The disease is facilitated by communal grazing, animal movement, introduction of new

animals, and vector presence.

Clinical signs

- Nodules ("lumps") appear on the skin, often widespread.
- Fever, reduced appetite, salivation, nasal discharge, rapid weight loss.
- Reduced milk yield in lactating cows, sometimes infertility or abortion.
- Mortality can occur, especially when secondary infections complicate the case.

Zoonotic Risk

At present, there is no scientific evidence that Lumpy Skin Disease (LSD) can infect or spread to humans. The causative agent—Lumpy Skin Disease Virus (LSDV), a member of the Capripox virus genus—shows a high degree of host specificity, meaning it primarily affects cattle and to a limited extent, buffaloes. Studies conducted by the Indian Council of Agricultural Research (ICAR) and international bodies such as the World Organisation for Animal Health (WOAH) have confirmed that LSDV does not replicate or cause illness in people. Wearing gloves, maintaining proper hand hygiene and avoiding direct contact with lesions or bodily fluids still remain important safety practices.

Thus, while LSD poses no direct threat to human health, it indirectly impacts public health and rural livelihoods by reducing milk supply, disrupting trade and threatening the stability of the livestock economy—a reminder that animal health and human well-being are closely interconnected within the *One Health* framework.

Why India Should Be Especially Concerned

- High density of cattle/buffaloes, mixed small- and large-holder farms and frequent movement of animals between states.
- Geographic and climatic zones favour vector populations (monsoon, humid areas).
- Gaps in bio-security: For example, a recent article noted that outbreaks of LSD and Foot-and-Mouth Disease (FMD) highlight India's weak enforcement of cattle laws, animal tagging and quarantine measures.
- Economic damages are serious: For instance, reports indicate that since July 2022, approx. 200,000 cattle died in India due to LSD.
- Resource constraints: In many animal-husbandry divisions, veterinary manpower, rapid-response teams and lab surveillance are stretched thin.

Prevention & Control: A Veterinary Action Checklist

As a veterinary professional (clinician, field officer, extension-vet), you can lead control efforts via the following measures:

1. Farm-level bio-security & vector control

- **Eliminate or reduce vectors:** Drain stagnant water, use insect traps or insecticides around barn/paddock, provide screened housing or shelters for cattle especially young or new stock.
- **Limit animal movement:** Quarantine new animals for a defined period; restrict mixing of herds, communal grazing where possible.
- **Control biting flies/mites/ticks:** Regular acaricide/ insecticide use; clean environment.
- **Isolate affected animals:** Prompt separation of suspected animals reduces spread.
- **Clean/disinfect** housing, feeding troughs, water points.
- **Proper disposal** of carcasses or severely affected animals to prevent vector attraction or further spread.

2. Early detection & surveillance

- During visits, check for nodular lesions, fever, drop in milk yield or abortions in cattle.
- Educate farmers to report sudden onset of skin lesions, fever, or unexplained drop in productivity.
- Work with state animal-husbandry labs to get suspected samples (blood, skin biopsy) tested.
- Map hot-zones: If a nearby district has outbreak, increase vigilance locally.

3. Vaccination & herd health programmes

- India has vaccines available (an indigenous vaccine called "Lumpi-ProVac Ind").
- Encourage farmers to participate in mass vaccination drives where available.
- Maintain documentation of vaccination (batch no, date).
- Vaccination should be part of

broader herd-health plans: nutrition, de-worming, overall immunity helps.

4. **Farmer education & extension outreach**

- Use simple language for farmers: Signs to watch for, what to do when they observe them (isolate, call vet, don't move animals). Early detection + isolation should be done.
- Emphasize hygiene: Clean housing, safe disposal of manure, limiting vectors.
- Encourage regular veterinary check-ups and vaccinations.

5. **Coordination & 'One Health' mindset**

- Liaise with animal-husbandry departments for outbreak alerts and containment.
- Enforce movement controls and inform dairy cooperatives on risks and preventive actions.
- Though LSD is not zoonotic, it impacts livelihoods, trade, and public health indirectly.

Challenges and Considerations for Indian Context

- Many smallholders may lack resources to provide insect-screened housing or insecticide treatments. Cost-effective solutions (e.g., neem sprays, basic hygiene) may need emphasizing.
- Animal movement (trade between states, livestock markets) is widespread; enforcing quarantine or movement bans is difficult.
- Vaccine availability and coverage vary between states; some remote districts may not have timely access.
- Vector ecology: In India's diverse climates, vector populations surge during monsoon/post-monsoon—timing control efforts ahead of vector peaks is wise.
- Data & tracing: Lack of tagging / traceability means difficult to map exactly where infected animals came from, which impairs control.

Practical Case Flow: What to Do When You Suspect LSD

1. **Farm call:** A farmer reports that several cows in the herd have developed firm skin lumps, fever, and milk yield has dropped sharply.
2. **Assess risk:** You note that the farm shares grazing with other herds, is in a region with abundant biting-flies, and there has been recent animal purchase without quarantine.
3. **Immediate actions:**

- Isolate affected animals and restrict movement of the herd.
- Advise owner to reduce vector exposure: insecticide spray around housing, remove standing water, keep animals under shelter during high-vector periods.
- Collect samples: skin lesion biopsy, blood sample for lab testing; coordinate with the state animal-husbandry lab.
- Identify potential spread: check nearby farms if they have similar signs; advise farmer to avoid fairs and animal trade for now.

4. **Treatment & management:**

- There is no specific anti-viral cure; treatment is generally supportive (fluids, good nutrition, treating secondary infections).
- Monitor herd productivity, segregate calves and pregnant animals for extra care.

5. **Vaccination plan:**

- Check whether state vaccination drive is ongoing; schedule vaccinations for healthy cattle if available.
- Record the vaccination details.

6. **Follow up & monitoring:**

- Visit farm at set intervals to check for new cases, vector control efficacy, bio-security measures.
- Report outbreak to local animal-husbandry authorities as per statutory requirements; assist in movement restriction implementation if needed.

7. **Farmer communication:**

- Explain to farmer that although disease can be controlled, recovery takes time; milk yield may take weeks to return, so prepare for financial short-term stress.
- Encourage improved hygiene and vector-control as long-term investments.

Concluding Thoughts

Lumpy Skin Disease presents a realistic and growing challenge to cattle health, farm economics and veterinary public service in India. With thoughtful action by veterinary professionals, the impact can be substantially mitigated — but it requires early detection, strong bio-security, vaccination and effective extension-education.

Importance of IPR in Veterinary Science

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Introduction

In recent years, veterinary science has evolved significantly beyond conventional animal treatment and husbandry: advances in molecular biology, biotechnology, diagnostics, animal nutrition, precision livestock farming, and animal genomics have created a new surrounding of invention and innovation. In this context, Intellectual Property Rights provide a legal and economic framework for protecting the fruits of research, encouraging investment, and enabling commercialization. For veterinarians, researchers, feed technologists and animal-science institutes, understanding IPR is no longer optional: it is integral to capturing the value of innovation, transferring technology to industry, and participating meaningfully in the global animal health economy.

2. Major Forms of IPR in Veterinary Science

Type of IPR	Description	Veterinary Examples
Patent	Legal protection for new inventions, processes, products	Vaccine for Foot-and-Mouth Disease, diagnostic kits for brucellosis
Copyright	Protection of written, visual, or software-based works	Veterinary textbooks, digital herd health software
Trademark	Protection of product names, logos, or brands	Registered brand names of animal feed or medicines
Design Rights	Protection of aesthetic aspects of a product	Veterinary instrument designs
Trade Secrets	Confidential business information	Feed additive formulations, microbial strains
Geographical Indications (GI)	Recognition of regional animal products	Gir cow ghee, Malabari goat meat

Benefits of IPR in Veterinary Science

The benefits of a strong IPR regime in this field include:

1. Encouraging Innovation: Protection of inventions via patents, design rights, trademarks or copyrights fosters willingness of researchers and industry to invest time and capital in novel animal-health solutions.
2. Technology Transfer & Commercialisation: Institutes and universities in animal sciences generate innovations; effective IPR management enables licensing, partnerships with private industry, spinouts/start-ups, thereby translating lab based research into products or services. For example, one study reported that an Indian animal-science research institute signed 473 licensing agreements and transferred 234 technologies over a period. Indian Agricultural Research Journals+1
3. Protecting and Exploiting Genetic Resources: Livestock biodiversity, native animal breeds with unique traits (heat tolerance, disease resistance)

can be documented and protected (via sui generis rights or patents) to ensure value for breeders/farmers rather than uncontrolled appropriation. IJC Mas+1

4. Enhancing Institutional Capacity and Global Competitiveness: Research institutes which adopt IPR systems build stronger portfolios, can attract investments, collaborations and compete internationally. For instance, the study of the Indian Council of Agricultural Research (ICAR) showed increasing patent filings over time. Indian Agricultural Research Journals
5. Facilitating Industry-Academia Linkages: IPR provides a language and structure for universities to engage with industry (licensing, joint ventures), helping veterinary science translate into marketable solutions (diagnostics,feed technologies, vaccines).
6. Supporting Rural Livelihoods and Animal Production: By protecting innovations (including local breeds, feed additives) and enabling their dissemination, IPR can indirectly support farmers, promote value addition, and improve animal health and productivity.

Animal Science

For veterinary science to leverage IPR effectively, institutional mechanisms are vital. From the Indian context:

- The ICAR has implemented a three tier IP management system (Institute Technology Management Units at institute level, Zonal Technology Management Centres, central IP & TM unit) for animal-science inventions. PMC+1
- A recent study of ICAR's animal-science collection showed over 485 patent applications, 40 designs and 87 trademarks filed over twenty years, plus 473 licensing agreements signed with 279 organisations. Indian Agricultural Research Journals+1
- SWOT-analyses reveal key strategies to strengthen IPR management: build legal expertise, develop incubation/market support, strengthen in-house patent advisory, promote industry linkages. PMC+1

These institutional approaches demonstrate that veterinary science institutions can adopt systematic IPR strategies analogous to human health or general biotech sectors.

Protection of Animal Genetic Resources and Livestock Biodiversity

One critical area where IPR intersects veterinary science is livestock biodiversity and breeding resources:

- Native animal breeds often exhibit unique traits (e.g., heat tolerance, disease resistance, ability to utilise low-quality feed) which have value in the global livestock production scenario. IJC Mas
- However, traditional IPR authority may not appropriately capture the value of livestock genetic resources or indigenous knowledge. The review on IPR issues in livestock biodiversity highlights that although the Food and Agriculture Organization (FAO) and World Intellectual Property Organization (WIPO) frameworks exist, a legal authority comparable to the International Treaty for Plant Genetic Resources is lacking for animals. Indian Agricultural Research Journals+1
- Appropriate policy mechanisms, such as sui generis systems for animal genetic resource protection, benefit-sharing frameworks for access/use, and documentation of traditional knowledge, are necessary to secure sustainable use and conservation. IJC Mas
- For example, patents may be sought for novel traits or breeding methods, but an unbalanced system could lead to loss of farmers' rights, genetic erosion or biopiracy.

Thus, the role of IPR in veterinary science extends beyond commercial innovation to conservation, unbiased benefit-sharing and sustainable livestock systems.

Legal and Ethical Dimensions

From a legal perspective:

- Patent law applied to veterinary medicine, while similar to human pharmaceuticals, has specific subtleties (e.g., animal-use exemptions, "safe-harbor" provisions for research, patent-term extension issues). SpringerLink
- The interface of IPR with agreements such as the World Trade Organization's TRIPS, the Convention on Biological Diversity (CBD) and national legislation (e.g., India's Biological Diversity Act) are relevant especially in the framework of genetic resources. IJC Mas
- Ethical considerations include the patenting of biological materials obtained from animals, transgenic animals, gene editing, welfare concerns, and the availability of veterinary technologies.
- Access to vital animal health

technologies: strict IPR implementation may have an impact on the cost and availability of vaccinations and diagnostics in low-income livestock farming environments unless it is counterbalanced by technology transfer, licensing, or public interest clauses.

- Data and digital assets: issues of data ownership, privacy, data sharing, and IPR protections of algorithms and analytics emerge with precision livestock farming, AI, sensors, and data platforms (though less researched in the veterinary context).

Practical Recommendations for Veterinary Science Stakeholders

Based on the literature, the following practical steps are suggested for veterinary scientists, institutions and policymakers:

1. **Build IPR awareness and capacity** in veterinary faculties, research institutes and veterinary colleges: training in patent drafting, licensing, freedom-to-operate analysis.
2. **Establish institutional IPR/technology-transfer units** within veterinary-animal-science institutions (e.g., ITMUs, technology-management cells).
3. **Create clear institutional policies** on ownership of inventions, revenue-sharing, incubators, spin-out support, industry partnerships.
4. **Document and valorise indigenous livestock genetic resources** and associated traditional knowledge; establish domestic protection regimes (sui generis) and benefit-sharing mechanisms.
5. **Adopt strategic patenting and licensing—**focus on high-impact innovations (veterinary diagnostics, vaccines, feed technologies) while balancing accessibility for livestock farmers.
6. **Foster industry–academia links and public–private partnerships** to convert innovations into products/services for animal health and production.
7. **Encourage open innovation and data-sharing frameworks** where appropriate (especially in precision livestock farming, AI for animal health), combined with appropriate IPR safeguards.
8. **Monitor ethical, legal, environmental implications** of patenting animal biotechnologies, gene-editing, transgenics, and ensure regulatory compliance and welfare considerations.
9. **Design policies for low-resource contexts:** ensure that IPR systems in developing countries are tailored to livestock farmers, small producers and public good concerns.
10. **Measure and track institutional IPR performance** (patent filings, licences, technology transfers) as a metric of innovation impact in veterinary science.

Conclusion

The strategic significance of intellectual property rights for veterinary science is increasing. Vaccines, innovative breeding, feed innovations, diagnostics, and precision animal health are all examples of how the field is becoming increasingly innovative. IPR offers the institutional, financial, and legal framework needed to safeguard ideas, promote research, facilitate technology transfer, and create value. In order to adequately utilize IPR, veterinary research must simultaneously address particular issues (genetic resources, biodiversity, ethical problems, commercialization markets) and develop institutional capacities. To advance the veterinary sector in the global animal-health economy, nations like India must incorporate robust IPR management inside animal-science research institutes, catalog native livestock resources, and connect innovation to industrial and farm outcomes.

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Keeping Cows Comfortable: Reducing Winter Stress for Better Productivity

Winter brings a unique set of challenges for the dairy industry. As temperatures drop, winds intensify, and humidity rises, dairy cattle experience physiological stress that can directly affect their health, milk production, and overall performance. While cows are generally more tolerant to cold than heat, extreme winter conditions can still create significant discomfort and have a cascading effect on productivity. Ensuring their comfort during the winter months is therefore not just an animal welfare responsibility—it is also an economic necessity.

This article explores how winter stress affects dairy cattle, the science behind cold stress, and practical strategies dairy farmers can adopt to maintain cow comfort and productivity throughout the season.

Understanding Winter Stress in Dairy Cattle

Winter stress occurs when a cow's body needs to use additional energy to maintain its core body temperature. Cows have a natural thermal neutral zone (TNZ) between 5°C to 20°C. Below this range, they start expending energy to keep warm. Although cows handle cold better than heat, several environmental factors intensify winter stress:

- Wind chill
- Rain, snow, and wet bedding
- High humidity
- Sudden temperature fluctuations
- Poor housing or ventilation

When these factors combine, the cold becomes more severe than the thermometer suggests. As a result, cows must burn more calories to stay warm, and energy that would normally go toward milk production, growth, or reproduction is diverted toward body maintenance.

How Winter Stress Impacts Productivity

1. Reduced Milk Production

Milk yield declines when cows use more dietary energy to generate body heat. Research shows that cold stress can reduce milk production significantly, especially when it coincides with poor nutrition or wet bedding conditions.

2. Lower Feed Efficiency

Cold weather increases cows' dry matter intake needs by 10–20% to maintain energy balance. If this increased nutritional need is not met, cows may lose body weight and condition.

3. Compromised Immunity

Cold stress weakens immunity,

making cows more prone to infections such as mastitis, respiratory diseases, and metabolic disorders. Calves in particular face a higher risk of pneumonia during winter.

4. Reproductive Challenges

Poor energy balance and chronic cold stress can affect conception rates, postpartum recovery, and estrus expression.

5. Welfare and Comfort Concerns

Cows experiencing cold stress will show behavioral signs such as huddling, shivering, or seeking shelter. Prolonged discomfort affects welfare and may increase susceptibility to injuries and lameness.

Key Factors That Influence Winter Comfort

Creating a winter comfort strategy for dairy cows requires an understanding of the major environmental and management elements that shape their experience during the cold season.

1. Housing Design and Shelter

An effective winter shelter keeps cows dry, safe from wind, and comfortable. Proper barn design includes:

- Windbreaks on the north and west sides
- Adequate insulation
- Dry, warm resting areas
- Controlled ventilation to avoid humidity buildup
- Space for cows to lie down comfortably

Housing may vary depending on system—tie stalls, free stalls, open lots, or loose housing—but the principles remain the same: protect from wind, ensure dryness, and maintain proper airflow.

2. Bedding Management

Bedding plays a crucial role in winter comfort. Wet or frozen bedding causes heat loss and exposes cows to infection. Effective bedding materials include:

- Straw (excellent insulation)
- Sand (clean but can be cold unless topped with manure solids)
- Sawdust or wood shavings
- Dried manure solids (when properly managed)

The bedding must be kept dry at all times. Frequent replenishment is essential to ensure warmth and prevent mastitis.

3. Ventilation Without Drafts

Ventilation is often misunderstood during winter. Many barns become sealed to "keep cows warm," but this traps moisture, ammonia, and pathogens.

Proper winter ventilation should:

- Remove humidity and stale air
- Minimize cold drafts directly onto cows
- Maintain a fresh-air environment

Using adjustable curtains, ridge vents, and perforated sidewalls helps achieve the balance between airflow and thermal protection.

4. Nutrition Adjustments for Cold Weather

Cows need additional energy during winter. For every 1°C drop below the lower critical temperature, cows may need up to 2% more energy intake. Farmers should adjust feed rations accordingly.

Key winter nutrition considerations:

- Increase energy density (additional grains or fat supplements)
- Ensure adequate fiber for rumen heat production
- Provide high-quality forages
- Maintain steady feed availability and feeding frequency
- Prevent frozen water sources
- Add minerals and vitamins essential for immunity

Cows should always have access to clean, temperate drinking water, as water intake directly influences milk yield.

5. Calf Care During Winter

Calves are far more vulnerable to winter stress than adult cows. Newborns especially struggle to regulate body temperature.

Effective winter calf management includes:

- Providing deep, dry bedding (straw is ideal)
- Using calf jackets in cold regions
- Ensuring adequate colostrum intake
- Maintaining warm, dry hutches or pens
- Offering warm milk or milk replacer
- Minimizing drafts in calf housing

Healthy calves today become high-producing cows tomorrow,

making winter calf care a high priority.

Practical Strategies to Reduce Winter Stress

Successfully managing winter stress requires a combination of infrastructure improvements, smart feeding strategies, and careful daily management.

1. Strengthen Wind Protection

Windbreaks—either natural (trees) or artificial (walls, tarps, or slatted structures)—significantly reduce wind chill. Even a reduction of wind speed by 5–10 km/h can dramatically improve cow comfort.

2. Maintain Dry Bedding and Resting Areas

Cows lying on wet bedding lose body heat rapidly. Increasing bedding frequency or using bedding warmers in extreme climates can help maintain temperatures.

3. Prevent Slippery Surfaces

Icy or muddy floors increase lameness risk. Use grit, sand, or rubber mats to improve traction. Maintain pathways, feeding alleys, and water trough areas.

4. Adjust Milking Routines

During winter:

- Keep holding areas dry and draft-free
- Ensure cows do not leave the parlor with wet teats (post-dip barrier dips help)
- Maintain comfortable temperatures in the parlor

This reduces mastitis risk and improves cow comfort.

5. Proactive Health Monitoring

Winter increases disease risk. Keep an eye on:

- Respiratory symptoms
- Drop in feed intake
- Reduced milk yield
- Changes in gait
- Frostbite (especially on teats or ears)
- Calf coughing or nasal discharge

Early intervention reduces treatment time and cost.

6. Improve Lighting and Daylength Management

Cows benefit from consistent lighting schedules. Adequate lighting helps maintain immune function, milk production, and general activity levels during the shorter winter days.

The Economic Benefits of Reducing Winter Stress

Many farmers think of winter management as an additional cost, but it's actually an investment with measurable returns.

Improved cow comfort leads to:

- Higher milk yields
- Lower veterinary costs
- Better reproductive performance
- Reduced culling rates
- Healthier calves
- Improved feed efficiency

A well-managed winter comfort program often pays for itself within a single season.

Sustainable Winter Management: A Future Outlook

As climate patterns shift—bringing colder winters in some regions and unpredictable temperature swings—farmers need long-term strategies for winter resilience.

Possible future advancements may include:

- Climate-controlled barns
- Smart ventilation systems
- Heated water troughs
- Insulated calf housing
- IoT-based temperature monitoring devices
- Energy-efficient barn designs
- Precision feeding technologies

These innovations will help farmers maintain productivity while enhancing animal welfare.

Conclusion

Winter stress in dairy cattle is a significant challenge that directly impacts herd health, milk production, and farm profitability. However, with proactive management, the negative effects of cold weather can be minimized. The goal is simple: keep cows warm, dry, healthy, and well-fed.

Improving housing, enhancing bedding practices, adjusting nutrition, ensuring proper ventilation, and protecting young calves are all essential steps toward a comfortable winter season. By prioritizing cow comfort, farmers not only improve welfare standards but also unlock better productivity and long-term economic benefits.

In the dairy industry, comfort is productivity—and a stress-free winter is a cornerstone of a successful year-round operation.

Role of Intellectual Property Rights (IPR) in the Veterinary Field

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Introduction

Intellectual Property Rights (IPR) have a major impact to encourage innovation, safeguarding creators interests, and ensuring the ethical use of scientific innovation. In the veterinary field where research spans animal health, production, genetics, and pharmaceuticals, IPR serves as a catalyst behind technological advancement and commercialization. The growing importance of intellectual property rights in veterinary sciences is evident from the surge in patents related to vaccines, diagnostic kits, feed formulations, medicines, and biotechnological innovations.

Intellectual property rights importance in Veterinary Science

The veterinary sector is increasingly espousing advanced technologies obtained from biotechnology, molecular biology, and nanotechnology. These innovations require legal protection to enhance further investment and ensure fair outputs to inventors. Intellectual property rights ensure that veterinarians, researchers, and industries receive recognition and economic benefits for their work, thereby inspiring uninterrupted improvement in animal health and production.

Types of Intellectual Property Relevant to Veterinary Field

1. Patents – Protect inventions such as novel veterinary drugs, vaccines, diagnostic methods, diagnostic devices. For example - patents cover recombinant vaccines or diagnostic kits for zoonotic diseases.
2. Trademarks – protect brand names of veterinary products, ensuring product authenticity and consumer trust.
3. Copyrights – Protect veterinary software, veterinary text, and educational materials.
4. Industrial Designs – Protect the exterior and design of instruments, packaging, or veterinary devices.
5. Geographical Indications-

   Applicable for products derived from specific regions, such as indigenous livestock breeds or dairy products.
6. Trade Secrets – Protect confidential formulas or methods used in feed or pharmaceutical production.

IPR and Veterinary Pharmaceuticals

Veterinary pharmaceutical companies invest highly in research to develop new vaccines, drug and feed additives. Patent protection provides these companies with exclusive rights for a certain period, motivating innovation while also allowing recovery of research costs. After patent expiry and generic products can be introduced, promoting affordability and accessibility

IPR in Animal Breeding and Biotechnology

Advancement in genetics and biotechnology have led to genetic modification, cloning, marker-assisted selection. IPR provides legal frameworks for protecting genetically improved breeds or biotechnological processes. Although ethical concerns remain regarding ownership of living organisms, necessitating balanced policies between innovation and animal welfare.

Role of IPR in Veterinary Education and Research

IPR awareness among veterinarians and researchers is essential. Many universities and research institutions are establishing IPR cells to provide knowledge about patent filing, publication ethics, and commercialization pathways. Incorporating IPR into veterinary field helps young professionals and researchers to understand the value of technology transfer and innovation protection.

Challenges and Ethical Considerations

Intellectual Property Rights (IPR) in the veterinary field faces challenges such as high patenting costs, lack of awareness among researchers, and limited access to protected technologies in developing nations. Ethical problems also enhance concerning animal welfare, biodiversity conservation, and benefit-sharing from indigenous genetic resources.

Conclusion

IPR serves as a milestone for innovation and growth in the veterinary field. It encourages researchers and professionals to develop new novel technologies, ensures effective commercialization practices, and ultimately contributes to animal health and productivity. Strengthening IPR education, policy frameworks, and international cooperation will enhance the responsible use and protection of veterinary innovations.

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Shielding Dairy Animals from Winter Chills

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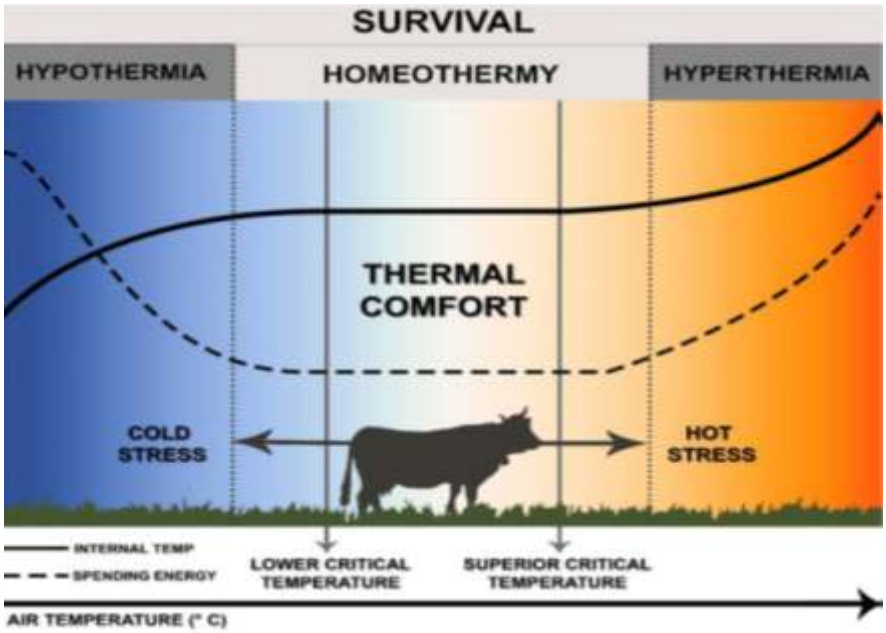
Introduction

Global warming has affected every aspect of life, influencing both humans and livestock while disrupting the planet's natural balance. Rising incidences of extreme weather events such as cyclones, floods, droughts, and disease outbreaks contribute to environmental and physiological stress. Livestock, especially cows, experience thermal stress when temperatures stray from their thermoneutral zone, impacting productivity and health. Cows must maintain a body temperature of about 38 °C, and deviations below or above critical limits cause energy inefficiency and performance loss. In cold climates, dairy cattle suffer cold stress, needing extra energy to maintain warmth—particularly when their coats are wet. Environmental factors such as solar radiation, wind speed, and humidity further influence stress levels. The extent of adaptation varies by breed, age, sex, and body traits, with Bos taurus better suited to temperate regions and Bos indicus adapted to warmer tropical environments.

1. Haemato-biochemical profile of cattle in cold stress

Cold stress in cattle causes significant changes in their hematobiochemical profile, crucial for diagnosing health issues. Exposure to low temperatures leads to fluctuations in blood glucose, protein levels, and electrolyte balance, along with altered red and white blood cell counts. To maintain body temperature and energy, cattle increase metabolic activity, causing elevated cortisol levels, a stress indicator, and abnormal enzyme activities that may affect liver function. Monitoring these blood markers helps farmers and vets detect early stress or illness signs and apply effective management to maintain cattle health during cold conditions.

Effect of Cold Stress on Hematological Parameters: Cold stress in cattle causes an increase in red blood cell count and hemoglobin to improve oxygen delivery.



Neutrophil counts rise, indicating immune activation, while lymphocyte counts decrease, reflecting stress-induced immune suppression. These changes help cattle survive cold weather but may impair immune function, highlighting the balance between adaptation and vulnerability.

Biochemical Shifts During Cold Stress: Cold stress in cattle increases blood glucose and liver enzymes AST and ALT as energy demands rise to maintain body heat. Cortisol levels also rise, showing a stress response. Higher serum protein and albumin levels are seen in summer due to dehydration from increased respiration. These biochemical changes help monitor cattle health and their coping mechanisms during cold stress.

Immune Response Under Cold Stress: Cold stress weakens cattle's immune system by lowering lymphocyte and immunoglobulin levels, increasing infection risk, especially respiratory diseases. Proactive care during cold spells is essential to support cattle immunity and reduce illness.

Electrolyte Imbalances in Cold-Stressed Cattle: Cold exposure in cattle often causes electrolyte imbalances, mainly due to dehydration from reduced water intake in cold weather. Ensuring access to clean, unfrozen water helps prevent these imbalances and supports hydration, reducing physiological stress during winter months.

2. Cell response towards cold stress

Cells respond to cold stress by activating complex adaptations to maintain balance and protect themselves. Cold triggers stress pathways like p38 MAP kinase, which can lead to cell death (apoptosis) after rewarming, depending on exposure time and temperature. Extreme cold causes ice crystals that physically damage cells, leading to irreversible necrosis. Cold stress slows general protein synthesis to conserve energy but increases specific cold-responsive proteins to adapt. Gene expression changes involve cold-responsive elements that activate protective proteins like CIRP. Rewarming triggers heat shock proteins (HSPs) to repair damage and manage oxidative stress from reactive oxygen species. This intricate process enables cells to survive and recover from cold exposure and temperature shifts.

3. Cold stress disrupts reproductive efficiency

Cold stress disrupts livestock reproduction by causing hormonal imbalances that impair gamete development and fertility. In females, reduced LH and FSH interfere with ovulation and pregnancy maintenance. In males, lowered testosterone decreases sperm production and libido. Elevated cortisol from stress suppresses reproductive hormones, leading to delayed estrus, poor conception, and early pregnancy loss. These effects reduce overall reproductive efficiency and livestock productivity.

I) Female reproduction

Female reproduction is impaired by cold stress through:

a) Delayed or suppressed estrus cycles: due to energy diverted to maintaining body heat, reducing breeding frequency.

b) Embryonic development: reduced uterine blood flow in pregnant females, causing lower nutrient supply to embryos and increasing early embryonic loss.

c) Decreased conception rates: as cold stress prioritizes thermoregulation over reproduction, extending calving intervals and lowering herd productivity.

ii) Male Reproduction

a) Spermatogenesis: Prolonged cold stress disrupts testicular blood flow and temperature, hindering sperm production. Extreme cold lowers sperm motility and raises abnormalities, reducing semen quality in bulls and rams.

b) Libido Reduction: Cold stress energy demands lower mating drive and behavior in males, decreasing natural breeding success due to reduced libido and poorer semen quality.

4. Effect of cold stress on milk yield and milk composition

Cold stress negatively affects milk yield and composition in dairy cattle. It reduces protein, milk fat, and total dry matter due to decreased energy intake and increased metabolic demands. Seasonal changes also influence somatic cell counts in milk. Overall, cold exposure leads to lower milk production and altered quality, emphasizing the need for proper management to maintain dairy productivity.

5. Nutrition and Energy Allocation

Cold stress raises metabolic rates in livestock, increasing energy needed to maintain body heat and often reducing body condition. Both males and females may experience impaired reproduction due to energy being prioritized for survival. Providing adequate nutrition and sufficient energy reserves during cold periods is critical to support reproductive health and overall animal performance.

6. Management Practices to Mitigate Cold Stress

To reduce cold stress in livestock, provide adequate shelter to block harsh weather. Increase dietary energy to meet higher metabolic demands during cold periods. Use heated areas, dry bedding, and proper ventilation to enhance comfort and safeguard reproductive efficiency.

7. Management strategies to mitigate cold stress

Cold stress management involves raising barn temperature, reducing humidity, and improving ventilation. Provide dry bedding to protect from cold floors, lukewarm water to encourage drinking, and increased hay and concentrate feed for energy.

Use dry teats, heat lamps, calf jackets, and warm blankets to prevent frostbite and keep animals comfortable.

Various mitigation strategies are mentioned below

1. Nutritional management:

Increase feed energy to 77% TDN and crude protein to 17.5% for better growth and milk production. Include 20% fiber to boost milk fat and reduce cold stress effects. Outdoor animals need 15-20% more feed than housed ones. Use concentrates like feed blocks and provide a variety of cultivated fodders. Chaff straw to reduce wastage and treat straw with urea to improve digestibility.Increase feed energy to 77% TDN and crude protein to 17.5% for better growth and milk production. Include 20% fiber to boost milk fat and reduce cold stress effects. Outdoor animals need 15-20% more feed than housed ones. Provide concentrates and diverse cultivated fodders. Chaff straw to reduce waste; urea treatment improves digestibility.

2. Shelter Management:

Provide proper sheds to shield animals from cold winds and retain warmth using heaters and curtains. Ensure good ventilation without drafts and maintain humidity between 40-80%. Use clean, dry bedding—4-6 inches thick for large animals, 2 inches for smaller ones—on concrete floors to reduce heat loss. Clean sheds twice daily to reduce waste and ammonia buildup. Use calf jackets and blankets to keep young animals warm.

3. Health Management:

Follow vaccination, deworming, and nutritional supplements to keep animals healthy. Avoid wet, muddy areas and manure-contaminated feed to prevent coccidiosis. Use teat dip powder to protect teats from frostbite. Regularly check hooves, trim overgrowth, and prevent lameness to ensure overall health.

4. New technologies for management of dairy animals in winter season

The dairy industry has seen significant advancements in technology that can greatly improve the management of dairy animals during the winter season. These innovations help optimize comfort, nutrition, health, and overall productivity. Here are some of the new technologies for the winter management of dairy animals:

Automated Feeding Systems: Automated feeding systems can provide precise and timely feeding to dairy animals, ensuring they receive the right amount of nutrition. These systems can be programmed to adjust the feed composition based on the specific needs of individual cows or groups during the winter months.

Cow Wearables and Sensors: Wearable devices and sensors can monitor individual cow health and behavior. These devices can detect early signs of illness, monitor temperature, and activity levels, helping farmers identify and treat health issues promptly.

Climate Control Systems: Advanced climate control systems can regulate temperature, humidity, and ventilation in the barn or housing structure. These systems use sensors and automation to maintain optimal conditions, ensuring the comfort of dairy animals in cold weather.

Precision Nutrition and Ration Balancing Software: Software programs and apps are available to calculate precise nutrition requirements for each cow or group, taking into account factors like age, weight, and milk production. This technology helps optimize feed composition and reduce waste during the winter.

Automated Milking Systems: Automated milking systems can be equipped with features that are particularly useful during the winter season. These systems can provide warm, clean water for udder cleaning, and they can be integrated with health monitoring to detect issues such as mastitis early.

Energy-Efficient Lighting: Energy-efficient LED lighting systems are designed to maintain proper lighting conditions for dairy animals. These systems can be programmed to simulate natural daylight and promote animal comfort and production.

Data Analytics and Farm Management Software: Advanced data analytics and farm management software enable farmers to collect and analyze data related to their dairy animals' performance, health, and comfort. These tools offer insights that help improve decision-making during the winter season.

GPS and Precision Livestock Farming: GPS technology is used to track the location and movement of dairy animals, ensuring they are safe and accounted for in harsh winter conditions. Precision livestock farming also uses data to optimize feeding, breeding, and healthcare practices.

Remote Monitoring and Control: Remote monitoring systems enable farmers to keep an eye on their dairy animals and barn conditions from a distance. This can include video surveillance, temperature monitoring, and remote control of equipment and systems.

Conclusion

Cold stress significantly affects cattle health and productivity. It alters haematological and biochemical profiles, impacting metabolism and immune response. These changes disrupt reproductive hormones, reducing fertility in both sexes. Milk yield and quality also decline. At the cellular level, cattle adjust gene expression and protein synthesis to maintain balance. Effective management, including improved shelter, nutrition, and health care, is essential to reduce cold stress impacts and support cattle welfare and productivity.

Flood-Related Disease Risks in Cattle – and How Farmers Can Protect Their Herds

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Floods cause more than immediate crop and fodder losses; they trigger a hidden wave of flood-related and vector-borne diseases that threaten dairy cattle health and milk production. Stagnant water becomes a breeding ground for mosquitoes, flies, and ticks, while damp, overcrowded, and muddy housing promotes bacterial and parasitic infections. Contaminated water, spoiled feed, and poor hygiene weaken immunity, making cattle vulnerable and often leading to disease outbreaks weeks after waters recede.

Common flood-linked cattle diseases

- **Babesiosis and Theileriosis** (tick-borne parasites) cause fever, pale gums, weakness, and reduced milk yield; prolonged illness impairs reproduction and weight gain.
- **Three-Day Sickness** (bovine ephemeral fever) spreads via mosquitoes; sudden fever, lameness, and joints swelling can sharply drop milk production.
- **Leptospirosis** (water-borne bacteria) presents with fever, jaundice, abortions, and decreased milk yield; it is zoonotic, posing public health risks.
- **Mastitis** (udder infection) flourishes in damp bedding and dirty milking conditions; reduced milk quality and yield are common.
- **Foot Rot and Tetanus** (mud and wounds) cause lameness and severe pain; tetanus can be fatal without prompt treatment.
- **Enteric diseases** (E. coli, Salmonella) spread through contaminated water and feed; calves are especially vulnerable, risking dehydration and mortality.

Early warning signs to monitor

- Sudden drop in milk yield within a day or two
- Loss of appetite, dullness, and lethargy
- Fever, nasal discharge, coughing
- Swollen lymph nodes or udder; changes in milk
- Diarrhea or discolored urine
- Lameness or reluctance to move

Prevention and control measures

- **Veterinary care:** isolate sick animals promptly; obtain professional diagnosis; use

appropriate antiparasitics, antibiotics, and fluids; avoid self-medication.

- **Vaccination:** ensure timely vaccination against hemorrhagic septicemia, black quarter, leptospirosis, and foot-and-mouth disease before monsoon or flood-prone periods.
- **Vector control:** reduce vector populations with regular insecticide spraying, acaricides, fly traps, and nets; maintain clean, dry housing.
- **Clean water and feed:** provide boiled, filtered, or treated water; store fodder off the ground and elevated; discard moldy or water-damaged feed.
- **Sanitation:** drain stagnant water quickly; disinfect sheds with lime or approved cleaners; keep bedding dry; remove manure to cut fly breeding.
- **Supportive care:** provide mineral supplements (especially calcium and magnesium when needed), vitamins, probiotics, and good ventilation; minimize stress and ensure adequate shade.
- **Biosecurity:** control access to the herd to prevent disease introduction; monitor new stock and quarantine as needed.

Additional considerations for practical application

- **Calf care:** protect young stock from flood exposure; ensure warm, dry housing and access to colostrum and fluids during illness.
- **Calving management:** monitor for mastitis signs in fresh cows; keep calving areas clean and dry.
- **Feed strategy:** prioritize high-quality, dry forage; avoid feeding moldy feed; consider ration adjustments to meet energy and protein needs under stress.
- **Water management:** test water sources after floods; treat or alternate supplies if contamination is suspected

Bottom line for farmers

A proactive blend of vaccination, clean housing, safe feed and water, and rapid veterinary intervention dramatically lowers death losses and preserves milk production in flood-affected areas. Preparedness reduces economic and emotional strain when floods recur.

The way forward

Floods are no longer rare, one-off disasters—they are becoming a recurring reality in many parts of the world, with climate change intensifying their frequency and severity. For dairy farmers, this means that flood preparedness must go beyond rebuilding sheds and restocking fodder. It requires a shift toward preventive animal health management that reduces the risk of disease outbreaks before they happen.

The first line of defense lies in preventive vaccination. Administering vaccines for major diseases such as hemorrhagic septicemia, black quarter, foot-and-mouth disease and leptospirosis before the onset of monsoon provides a protective shield for herds. Coupled with regular vector control measures like spraying sheds, using acaricides and reducing mosquito breeding grounds, farmers can significantly cut down the chances of large-scale epidemics.

Equally important is infrastructure planning at the farm level. Simple practices such as building proper drainage systems, raising the floor level of cattle sheds and storing dry fodder in waterproof containers go a long way in preventing waterlogging, feed spoilage and pathogen buildup.

The role of veterinary institutions and government services is also crucial. Many states are now deploying mobile veterinary clinics, rapid response teams and farmer awareness campaigns to help livestock owners during and after floods.

Looking ahead, there is also a growing role for technology-driven solutions such as mobile apps for early disease reporting, AI-based monitoring systems, and digital advisory platforms that connect farmers directly with veterinary experts. Ultimately, the way forward is about preparedness over reaction.

Strengthening Dairy Biosecurity: The Key To Sustainable Milk Production

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Abstract

Biosecurity in dairy farming is no longer a luxury—it is an essential foundation for sustainable milk production and animal welfare. Across the globe, dairy herds are increasingly threatened by infectious diseases, antimicrobial resistance, and environmental stressors that jeopardize farm profitability and public health. The concept of biosecurity extends far beyond disease prevention; it encompasses a holistic framework for risk reduction, animal movement control, hygienic management, and the responsible use of biological resources.

This article examines biosecurity from a comprehensive perspective—covering external and internal management systems, zoonotic disease prevention, vaccination strategies, sanitation, and emerging smart technologies. It emphasizes how disciplined biosecurity programs protect animal health, ensure product safety, enhance farm efficiency, and support the global transition toward climate-resilient, sustainable dairy systems. The goal is to guide farmers, consultants, veterinarians, and policymakers in designing and implementing robust biosecurity frameworks adapted to diverse regional realities.

1. Introduction: The Rising Importance Of Dairy Biosecurity

The global dairy industry is experiencing a rapid transformation driven by technology, consumer expectations, and sustainability challenges. With increasing herd sizes, intensification of production, and cross-border trade, the risk of disease transmission has grown exponentially. Outbreaks such as Foot-

and-Mouth Disease (FMD), Bovine Tuberculosis, Lumpy Skin Disease, and Brucellosis have repeatedly demonstrated how quickly a single lapse in farm biosecurity can cascade into national economic losses and public health crises.

Biosecurity, in its simplest form, means "the set of preventive measures designed to reduce the risk of transmission of infectious diseases, parasites, and contaminants into, within, and from a herd." Yet in practice, it integrates scientific, managerial, and behavioral dimensions—requiring not just infrastructure, but also awareness, training, and discipline.

In developing dairy sectors—such as in South Asia, Africa, and parts of Latin America—biosecurity is often undervalued. Farms may have excellent genetics and feed, but without strong biosecurity, disease undermines performance. Even advanced dairy operations in Europe or the Middle East are realizing that biosecurity is both an economic and ethical necessity—essential for animal welfare, consumer safety, and trade compliance.

As climate change brings unpredictable weather patterns, new disease vectors, and stress on feed and water systems, the importance of preventive health and controlled farm environments becomes even greater. Biosecurity stands as the first line of defense—protecting not only animals but the entire dairy value chain.

2. UNDERSTANDING BIOSECURITY: CONCEPTS AND PRINCIPLES

2.1 The Three Pillars of Dairy Biosecurity

Biosecurity in dairy farming can be divided into three interlinked pillars:

1. **External Biosecurity (Bio-exclusion):**

Preventing the introduction of pathogens from outside the farm. This includes controlling visitors, vehicles, feed sources, new animals, and pests.

2. **Internal Biosecurity (Bio-management):**

Minimizing disease spread within the farm once pathogens are present. This involves hygiene protocols, segregation, milking order, equipment cleaning, and worker routines.

3. **Output Biosecurity (Bio-containment):**

Preventing pathogens from leaving the farm via milk, manure, animals, or products—critical for protecting nearby farms and markets.

A balanced biosecurity plan integrates all three pillars through risk assessment, daily management practices, and continuous monitoring.

2.2 Risk Pathways in Dairy Systems

Pathogens can enter a dairy farm through multiple routes. Key risk pathways include:

- Animal introduction: Purchased or borrowed animals may carry latent infections.
- Visitors and workers: Human movement between farms is a common transmission route for bacteria, viruses, and fungal spores.
- Vehicles and equipment: Trucks, milk tankers, or shared machinery can carry contaminated materials.
- Feed and water: Poorly stored feed or contaminated water can harbor pathogens or mycotoxins.
- Wildlife and pests: Rodents, birds, flies, and stray animals act as reservoirs and vectors.

Airborne transmission: Some diseases like FMD or IBR can spread through the air over distances.

Recognizing and managing these pathways is fundamental for preventing disease outbreaks.

2.3 Economic Impact of Poor Biosecurity

The financial burden of weak biosecurity is often underestimated. For example:

- Mastitis alone costs global dairy farmers billions annually through reduced milk yield, discarded milk, and treatment costs.
- Lumpy Skin Disease outbreaks can decimate regional trade and require mass culling.
- Subclinical infections like Johne's disease silently reduce productivity and lifespan.

When such issues multiply, overall farm efficiency collapses. Studies estimate that effective biosecurity can reduce herd health costs by up to 40% while improving milk quality and fertility rates.

Hence, biosecurity is not an expense—it's an investment in long-term sustainability.

3. Major Disease Threats In Dairy Herds

Dairy animals face a wide spectrum of diseases influenced by management systems, regional ecology, and genetic susceptibility. Understanding these diseases is crucial to designing effective biosecurity protocols.

3.1 Bacterial Diseases

- Mastitis (Staphylococcus aureus, Streptococcus spp., E. coli): Affects milk production and quality; spread through poor milking hygiene.
- Brucellosis (Brucella abortus): A zoonotic disease causing abortion in cows and undulant fever in humans.
- Bovine Tuberculosis (Mycobacterium bovis): Chronic disease with major public health implications.
- Johne's Disease (Mycobacterium

Biosecurity Culture: Turning Practice into Habit

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avium subsp. paratuberculosis): Long incubation period, leading to chronic diarrhea and emaciation.

3.2 Viral Diseases

Foot-and-Mouth Disease (FMD): Extremely contagious; outbreaks cause devastating economic losses.

Lumpy Skin Disease (LSD): Vector-borne disease affecting skin and milk yield.

Bovine Viral Diarrhea (BVD): Causes immune suppression and reproductive failure.

Infectious Bovine Rhinotracheitis (IBR): Respiratory infection causing infertility and abortion.

3.3 Parasitic and Fungal Diseases

- Ticks, lice, and mites: Reduce weight gain, milk yield, and cause hide damage.
- Coccidiosis: Common in calves raised under unhygienic conditions.
- Fungal infections: Often associated with poor ventilation and damp bedding.

3.4 Emerging and Zoonotic Concerns

In recent years, dairy farms have become part of the global discussion on zoonoses—diseases transmissible between animals and humans. Issues like antibiotic-resistant Salmonella, Campylobacter, and Listeria have made farm hygiene and milk safety a public health concern.

Moreover, climate-driven vector expansion is introducing diseases like Rift Valley Fever or Bluetongue into new regions.

This means biosecurity in dairy is no longer just about protecting the herd—it's about protecting human health and market trust.

3.5 The Biosecurity-Milk Quality Nexus

High somatic cell counts, bacterial contamination, and antibiotic residues in milk are often the direct outcomes of poor on-farm biosecurity. Consumers today demand traceability and hygiene assurance.

Implementing strict biosecurity not only safeguards herd health but also enhances brand value and export eligibility. In essence, biosecurity equals quality assurance.

4. External Biosecurity: The First Line Of Defense

External biosecurity, also known as bio-exclusion, focuses on preventing the introduction of infectious agents from outside the dairy farm. It is the most critical stage because, once a pathogen enters, complete eradication becomes extremely difficult and costly.

4.1 Controlled Access and Movement Protocols

Every dairy farm should function as a biosecure zone. The entry and exit of people, vehicles, and animals must be strictly regulated.

- Perimeter Fencing: Clearly mark the farm boundary with durable fencing to keep out stray animals, rodents, and unauthorized personnel.
- Entry Gates and Checkpoints: Limit access to one or two entry points where all visitors and vehicles are logged, disinfected, and inspected.
- Visitor Logbooks: Record visitor details—name, purpose, previous farm visited, and date—to trace any potential source of infection.
- Footbaths and Handwashing Stations: Place disinfectant footbaths at all barn entrances and require everyone to clean boots and wash hands before entering livestock areas.
- Protective Clothing: Provide disposable coveralls, gloves, and boots for all visitors and workers entering animal zones.

These simple yet powerful procedures dramatically reduce disease transmission.

4.2 Quarantine and Introduction of New Animals

New or returning animals are one of the highest biosecurity risks. Every incoming cow or calf should undergo a minimum 30-day quarantine before joining the main herd. During this period:

- Conduct health checks for diseases like Brucellosis, Tuberculosis, and Johne's disease.
- Observe for fever, nasal discharge, diarrhea, or skin lesions.
- Ensure vaccination and deworming schedules are up to date.

Use separate feeding equipment and attendants for quarantined animals.

Only after a clean bill of health should animals be integrated with the main herd.

4.3 Vehicle and Equipment Sanitation

Farm vehicles (feed trucks, milk tankers, veterinary vans) can easily carry pathogens from one location to another.

- Wheel Dip Trays: At the gate, install disinfectant baths for vehicle tires.
- Dedicated Equipment: Assign specific tools (e.g., buckets, shovels, brushes) to each barn—never share between quarantine and milking areas.
- High-Pressure Washers: Use for cleaning vehicles and equipment after each use.

Even milk collection routes can spread diseases if tankers move from infected to healthy farms. Coordination between farms and milk processors is essential to prevent this.

4.4 Pest and Wildlife Control

Rodents, birds, insects, and stray animals act as mechanical and biological vectors for disease.

- Rodent Management: Seal feed storage areas; use traps or bait stations around barns.
- Bird Control: Install nets and spikes to discourage perching above feed or water areas.
- Fly Control: Manage manure properly; use biological larvicides and maintain dry litter.
- Dog and Cat Control: Prevent stray animals from accessing barns or feed zones.

Good pest management ensures a clean, low-stress environment for dairy cattle.

4.5 Water and Feed Safety

Water is often overlooked in biosecurity planning. Contaminated water supplies spread E. coli, Salmonella, and Leptospira.

- Regularly test water quality for microbial load, hardness, and chemical contamination.
- Ensure tanks are covered and cleaned frequently.
- Store feed off the ground, in dry, well-ventilated structures.
- Reject moldy or foul-smelling feed; use preservatives or acidifiers during humid seasons.

5. Internal Biosecurity: Managing Risks Within The Farm

Once animals and materials enter the farm, internal biosecurity (bio-management) prevents pathogens from spreading between groups, pens, or barns.

5.1 Herd Segregation and Zoning

Divide the farm into three clearly identified zones:

1. High-Risk Zone: Quarantine area and isolation barns.
2. Medium-Risk Zone: Production and milking barns.
3. Low-Risk Zone: Feed storage, office, and staff areas.

Movement should always flow from low-risk to high-risk zones—never the reverse. Workers should follow this directional flow and disinfect boots and hands at each transition.

5.2 Milking Order and Hygiene

Milking is a high-risk activity for disease transmission, especially mastitis.

- Milking Sequence: Milk healthy cows first, followed by suspect animals, and finally mastitic or treated cows.
- Teat Preparation: Clean with a disinfectant pre-dip; dry with disposable paper towels.
- Post-Milking Dipping: Apply iodine or chlorhexidine-based dips immediately after milking.
- Cluster Sanitation: Between cows, sanitize milking clusters with disinfectant spray or UV sterilizers.

Regular testing for somatic cell count (SCC) and total bacterial count (TBC) should be part of milk quality monitoring.

5.3 Worker Hygiene and Training

Human behavior determines 80% of biosecurity success.

- Workers must wear designated uniforms and boots for each barn.
- Provide regular training sessions on disease identification and emergency response.
- Enforce strict no eating, smoking, or mobile phone use within barns.
- Use color-coded tools and protective gear for each section (e.g., red for quarantine, blue for milking).

Motivated, educated workers form the backbone of a healthy herd.

5.4 Manure and Waste Management

Poor manure handling contributes to fly infestation, odor, and pathogen recycling.

- Immediate Removal: Clean stalls daily; remove manure to a designated composting site.
- Proper Composting: Maintain 55–60°C for several days to kill pathogens and parasite eggs.
- Effluent Disposal: Treat wastewater from milking parlors before discharge or reuse.
- Recycling: Use treated manure as organic fertilizer, ensuring pathogen-free compost.

Good manure management turns waste into value and supports circular farming.

5.5 Disease Surveillance and Record Keeping

Every biosecure farm should have a health monitoring system.

- Record every treatment, vaccination, and disease event.
- Conduct routine testing for milk quality, reproductive diseases, and metabolic disorders.
- Keep veterinary prescriptions and lab reports for traceability.
- Use herd management software for easy tracking and analysis.

Such records not only ensure biosecurity compliance but also improve productivity analysis.

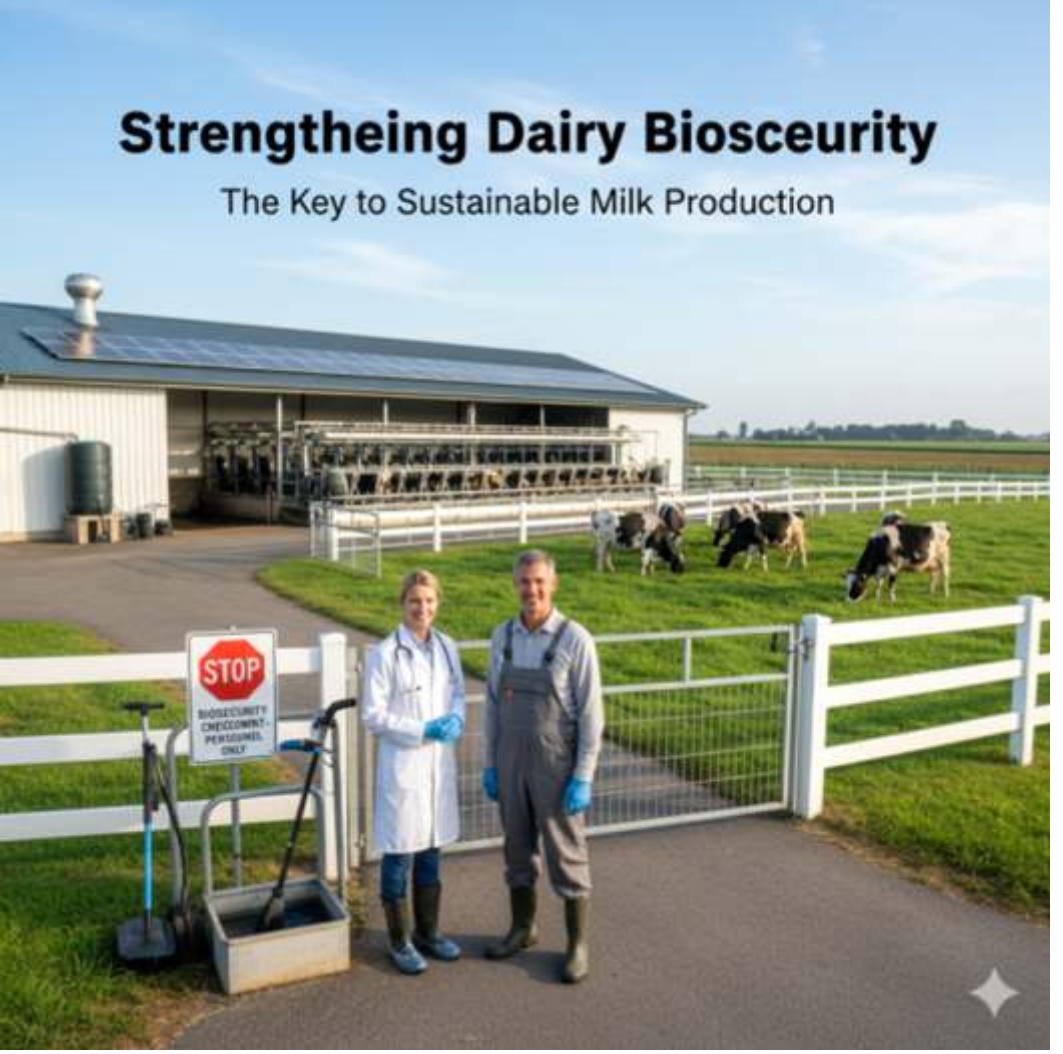
6. Feed, Water, And Equipment Sanitation

The saying "Feed and water are the first medicines" holds true for dairy cattle. Clean feed and water are essential to maintaining immunity and milk quality.

6.1 Feed Biosecurity

Feed contamination is a silent threat. Pathogens, molds, and toxins can enter through raw materials or poor storage.

- Procurement Control: Source feed from certified suppliers.



- Storage Hygiene: Clean silos and bins regularly; prevent condensation and insect infestation.
- Feed Additives: Use acidifiers, probiotics, or essential oils to suppress harmful microbes.
- Feed Handling: Use clean tools; avoid contact with manure or animals during distribution.

Implementing a Hazard Analysis and Critical Control Point (HACCP) system for feed helps maintain consistent quality.

6.2 Water Sanitation

Contaminated water is a vector for Leptospirosis, Salmonellosis, and diarrhea.

- Testing Schedule: Check bacterial counts monthly.
- Chlorination: Maintain residual chlorine at 0.5 ppm in drinking water.
- Tank Cleaning: Empty and scrub tanks every two weeks.
- Alternative Disinfection: Use ozone or UV treatment where applicable.

Cows prefer clean, cool water. Improving water quality directly enhances feed intake and milk yield.

6.3 Equipment Cleaning and Disinfection

All farm tools, feeders, and milking equipment must be cleaned after every use.

- Use alkaline detergents to remove organic matter, followed by acid-based cleaners to prevent scaling.
- Maintain proper temperatures (45–60°C) for effective cleaning.
- Rinse thoroughly to remove detergent residues.
- Sanitize with peracetic acid or chlorine dioxide before reuse.

A good rule of thumb: If it touches the cow or the milk, it must be spotless.

6.4 Bedding and Housing Sanitation

Clean, dry bedding prevents mastitis and hoof diseases.

- Replace soiled bedding daily, especially in humid conditions.
- Use lime powder beneath straw to reduce bacterial growth.
- Periodically disinfect barn floors with phenolic or iodine-based solutions.
- Maintain good drainage to avoid water stagnation.

Proper housing sanitation improves animal comfort, reduces odor, and enhances milk hygiene.

6.5 Biosecurity Culture: Turning Practice into Habit

Biosecurity is not a one-time task—it's a culture of continuous discipline. It requires a mindset shift from reactive treatment to proactive prevention.

Farm owners must lead by example, ensuring that all staff understand why each rule exists. Rewarding compliance and maintaining visual reminders (signboards, charts, color codes) can make biosecurity second nature to everyone on the farm.

7. Housing Design And Environmental Control In Biosecure Dairies

The physical structure of a dairy farm has a profound influence on disease control. Well-designed housing systems reduce animal stress, minimize contact with pathogens, and make cleaning efficient. A farm built with biosecurity in mind naturally supports healthier herds and higher milk yields.

7.1 Layout and Zoning for Biosecurity

A biosecure dairy layout separates clean and dirty areas, preventing disease spread through movement and waste.

Zoning:

1. Clean Zone: Milking parlour, calf pens, feed storage.
2. Transition Zone: Worker changing rooms, footbaths, loading areas.
3. Dirty Zone: Manure storage, waste treatment, isolation barns.

Movement should always follow a one-way flow: Feed → Cows → Manure → Compost. Reverse movement reintroduces pathogens.

- **Drainage:** Ensure smooth flow of effluents away from clean zones. Stagnant water creates mosquito and bacterial breeding points.
- **Roads and Pathways:** Design separate paths for vehicles carrying milk and those carrying waste.

7.2 Ventilation and Air Quality Management

Fresh air is one of the cheapest and most effective disease-control tools. Poor ventilation increases humidity, ammonia levels, and pathogen load.

- Maintain air exchange rate of at least 4–6 air changes per hour.
- Use ridge vents, side curtains, or fans to promote natural or mechanical airflow.
- Keep ammonia levels below 10 ppm and relative humidity under 75%.
- Install positive-pressure tubes in calf barns to prevent respiratory infections.

A clean, well-ventilated environment improves appetite, reduces heat or cold stress, and supports immune strength.

7.3 Lighting and Photoperiod

Proper lighting influences milk yield, fertility, and behavior.

- Maintain 16–18 hours of light and 6–8 hours of darkness for lactating cows.
- Use LED lights that mimic natural daylight, providing uniform brightness (150–200 lux).
- Clean light fixtures monthly to maintain intensity.

Correct photoperiod management enhances hormonal balance and biosecurity indirectly by improving cow vitality.

7.4 Bedding and Stall Comfort

Biosecurity begins where the cow lies. Dirty or damp bedding invites mastitis-causing bacteria.

- Use sand, dry straw, or rice hulls as bedding material.
- Replace wet material daily and sanitize cubicles weekly.
- Provide adequate space: at least 1.2–1.4 meters per cow in tie-stall barns.
- Smooth, slip-resistant flooring prevents injury and infection entry through wounds.

A comfortable cow is a productive and disease-resistant cow.

8. Milking Parlour Hygiene And Mastitis Control

The milking parlour is the heartbeat of every dairy farm—and also the most sensitive point for disease transmission. Even slight negligence here can contaminate bulk milk, affecting hundreds of liters at once.

8.1 Designing a Biosecure Milking System

A hygienic milking parlour should have:

- Separate entry and exit gates for cows to maintain one-way traffic.
- Non-slip floors and good drainage to prevent pooling.
- Wash basins for pre- and post-milking equipment cleaning.
- Automatic teat cup disinfection or cluster flush systems.
- A closed milk pipeline system with sanitary valves.

Regular cleaning-in-place (CIP) operations using alternating alkaline and acid washes keep pipelines bacteria-free.

8.2 The Five Golden Rules of Mastitis Prevention

1. Clean, Dry, and Comfortable Bedding – Reduces environmental bacterial load.
2. Consistent Milking Routine – Cows thrive on predictability; erratic schedules cause stress.
3. Proper Teat Hygiene – Pre-dip, dry, and post-dip every time.
4. Milker Discipline – Use gloves, clean towels, and avoid touching the teat end unnecessarily.
5. Machine Maintenance – Vacuum levels and pulsation must be calibrated monthly.

Following these rules can reduce mastitis incidence by up to 60% in most herds.

8.3 Milk Storage and Cooling Hygiene

- Cool milk to below 4°C within 2 hours after milking.
- Wash milk cans and chillers with hot water (70°C) daily.
- Keep separate hoses for washing and milk transfer.
- Never reuse water used for cleaning clusters to wash udders or floors.

Remember: milk is an excellent bacterial medium—only rigorous hygiene can preserve its quality and safety.

9. Calf Management And Replacement Biosecurity

Calves represent the future of the herd. However, they are also the most vulnerable animals on the farm, with immature immune systems that make them prone to disease.

9.1 Calving Area Management

- Maintain a clean, dry calving pen—separate from the milking herd.
- Disinfect the area after every birth.
- Use disposable gloves and sterilized ropes for assisting parturition.
- Remove the calf from the dam within 30 minutes to prevent pathogen exposure.

Each birth should be treated as a biosecurity-sensitive event.

9.2 Colostrum Hygiene and Feeding

Colostrum is the first and most powerful vaccine a calf receives.

- Test colostrum quality using a Brix refractometer (≥22% ideal).
- Feed 10% of body weight in colostrum within the first 4 hours.
- Store excess colostrum in sanitized containers and refrigerate or freeze.
- Pasteurize colostrum (60°C for 60 minutes) to kill pathogens without damaging antibodies.

Poor colostrum handling can introduce E. coli or Mycoplasma, undermining calf survival.

9.3 Calf Housing and Grouping

- House calves individually for the first 60 days to minimize contact transmission.
- Use well-drained, ventilated pens with raised floors.
- Keep feeding buckets and bottles separate per calf.
- After weaning, group calves of similar age and size only.

Biosecurity in calf management ensures strong growth and lifelong productivity.

9.4 Replacement Heifer Biosecurity

Replacement heifers often mingle with animals from different sources at markets or fairs.

- Always quarantine purchased heifers for 30 days.

- Conduct health screening for Brucellosis, BVD, and Paratuberculosis.
- Vaccinate before entry into the main herd.
- Avoid mixing with older cows until fully immunized.

Healthy replacements sustain the genetic and productive progress of the farm.

10. Role of Vaccination, Quarantine, And Record Keeping

Vaccination complements biosecurity but cannot replace it. A vaccination program should be customized to regional risks and herd history.

10.1Strategic Vaccination Planning

Maintain an annual vaccination calendar covering key diseases such as:

- FMD: twice yearly
- Brucellosis: once in young females (4–8 months)
- LSD: annual booster
- IBR and BVD: once yearly or as advised by local vets
- Store vaccines at 2–8°C and transport using insulated boxes.

Record vaccine batch numbers, expiry dates, and administration details.

Vaccination failures often occur due to improper handling, not vaccine quality.

10.2Quarantine and Observation Protocols

Even vaccinated animals may carry infections. Implement strict isolation for all new arrivals and observe for 2–3 weeks after introduction.

- Monitor temperature, appetite, and manure consistency.
- Separate attendants for isolated groups.
- Disinfect equipment after every use in quarantine barns.

Quarantine is the most effective barrier against imported diseases.

10.3Health Records and Data Management

Systematic record keeping forms the backbone of any biosecurity program.

- Maintain individual animal records (ID, birth, vaccination, disease history, milk yield).
- Track feed consumption and breeding data.
- Use digital herd management systems or farm apps for traceability.

In case of disease outbreaks, good records allow rapid tracing, minimizing losses and controlling spread.

11. Smart Biosecurity: Technology-driven Dairy Health Management

In the era of precision livestock farming, biosecurity is evolving from manual protocols to intelligent systems powered by sensors, data analytics, and automation. Smart technology not only improves disease detection and response time but also enhances daily efficiency and animal welfare.

11.1Internet of Things (IoT) in Biosecurity Monitoring

The Internet of Things (IoT) integrates sensors, cameras, and automated devices into a connected network that continuously monitors farm health indicators.

- Temperature and Humidity Sensors: Detect microclimatic fluctuations that promote pathogen survival.
- Wearable Cow Sensors: Track rumination, movement, and body temperature to identify illness early.
- Automatic Door Access Systems: Restrict movement between biosecurity zones using smart cards or facial recognition.
- Digital Footbaths and Hand Sanitizer Stations: Record user compliance through RFID tags.

Data from these devices can be transmitted to mobile apps or dashboards, allowing managers to monitor multiple barns remotely.

11.2Artificial Intelligence and Predictive Analytics

Artificial Intelligence (AI) transforms how dairy farms manage health risks. By analyzing patterns in feed intake, milk yield, and animal behavior, AI algorithms can predict disease outbreaks before visible symptoms appear.

Examples include:

- Machine Learning Models predicting mastitis from milk conductivity and temperature data.
- Predictive Biosecurity Maps showing infection hotspots in a region.
- Automated Alerts for deviations in cow activity, calving events, or feed consumption.

AI-based systems reduce human error and enable preventive interventions instead of reactive treatments.

11.3Drones and Remote Sensing

Drones are emerging as tools for farm surveillance and perimeter security:

- Inspect fencing and boundary integrity.
- Monitor waste disposal and pest activity.
- Capture thermal images to locate sick or isolated animals.
- Reduce human entry into high-risk zones, preserving biosecurity barriers.

When integrated with GPS, drones can also document farm biosecurity audits for compliance purposes.

11.4Automated Cleaning and Disinfection Systems

Manual cleaning is labor-intensive and often inconsistent. Modern dairy facilities are adopting:

- Automated barn flush systems with disinfectant dosing.
- Self-cleaning milking robots that sanitize teats and liners between cows.
- UV sterilization tunnels for equipment and small tools.

Such automation ensures standardization, precision, and measurable hygiene performance.

12. Sustainable Biosecurity And Environmental Stewardship

True biosecurity must balance animal health, environmental protection, and resource efficiency. Unsustainable sanitation practices—such as excessive chemical use or uncontrolled effluent discharge—can harm ecosystems and compromise long-term farm viability.

12.1Green Disinfectants and Natural Alternatives

The next generation of dairy sanitation is focusing on eco-friendly disinfectants derived from plant extracts, enzymes, or organic acids.

- Lactic and citric acids are effective

against bacteria while biodegradable.

- Essential oils (like thyme, oregano, or eucalyptus) provide antimicrobial and deodorizing effects.
- Electrolyzed water systems create on-site disinfectants using salt and electricity, eliminating chemical residues.

These sustainable options maintain biosecurity while minimizing chemical footprints.

12.2Waste-to-Energy and Circular Farm Systems

Manure, once seen as waste, is now viewed as a renewable resource.

- Biogas Plants: Convert manure into methane for electricity and heating, simultaneously reducing pathogen load.
- Composting Units: Produce organic fertilizer for nearby crop farms, closing nutrient loops.
- Solar Dryers: Sanitize bedding materials using renewable energy.

Integrating waste management into the biosecurity plan transforms pollution control into profit generation.

12.3Water Recycling and Pollution Control

Effluent from milking parlors and wash areas must be managed responsibly.

- Install sedimentation tanks and constructed wetlands to treat greywater.
- Reuse treated water for irrigation or flushing pathways.
- Monitor Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) regularly to ensure compliance with environmental regulations.

Clean water management protects animal health and public reputation.

12.4Climate-Resilient Biosecurity

Climate change is expanding the habitat range of disease vectors such as ticks, flies, and mosquitoes. Farms must adapt by:

- Installing vector-proof housing systems with mesh barriers.
- Using biological pest control agents (e.g., predatory mites, beneficial nematodes).
- Adjusting vaccination calendars based on seasonal vector patterns.

Climate-smart biosecurity ensures resilience against emerging zoonotic threats.

13. Regional Case Studies And Lessons Learned

13.1Europe: Precision Biosecurity in Automated Dairies

In Northern Europe, dairy operations are increasingly adopting robotic milking systems integrated with health monitoring software. For example, Dutch farms use AI to track hygiene compliance, while Scandinavian farms utilize geothermal systems to maintain consistent barn temperatures in winter.

Results:

- Mastitis incidence reduced by 45%.
- Antibiotic use dropped by 30%.
- Worker productivity increased due to automation.

These models show how technology-driven biosecurity enhances both welfare and sustainability.

13.2South Asia: Community-Based Biosecurity Models

In regions like India, Pakistan, and Sri Lanka, smallholder dairy farms dominate. Here, community biosecurity networks are emerging—farm clusters sharing:

- Common vaccination schedules.
- Mobile veterinary teams.
- Joint quarantine centers and waste composting sites.

This cooperative approach reduces costs and controls disease spread at a regional level. For example, Sri Lanka's dairy cooperatives implementing shared disease surveillance have seen a 60% reduction in FMD outbreaks within five years.

13.3Middle East: Desert Dairy Resilience

In desert regions like Saudi Arabia and the UAE, dairy farms face unique biosecurity challenges: high heat, water scarcity, and sand-borne contamination. Farms have responded by:

- Adopting closed-loop cooling systems for parlor hygiene.
- Using filtered air-intake units to block dust pathogens.
- Implementing AI-driven microclimate control.

These strategies ensure animal comfort while maintaining high milk yields in extreme climates.

13.4Africa: Integrating Biosecurity and Food Safety

African dairy programs supported by NGOs and governments are linking biosecurity with milk collection hygiene. Training programs emphasize milk testing, equipment sanitation, and cold chain management. In Kenya, farms adopting full biosecurity protocols have gained premium access to formal milk markets, proving that biosecurity equals market opportunity.

14. Future Prospects: Building A Biosecure Dairy Future

The dairy sector's future depends on balancing productivity with sustainability and health security. Several emerging trends are shaping the next era of biosecurity:

14.1Digital Traceability and Blockchain

Blockchain technology ensures transparent milk traceability from farm to consumer. It records every biosecurity-related event—vaccination, feed sourcing, testing—on an immutable ledger. This enhances consumer confidence and facilitates international trade certification.

14.2Genomics and Disease-Resistant Breeding

Genetic selection for disease resistance is gaining momentum. Marker-assisted breeding helps identify animals naturally resistant to mastitis, tick infestations, or heat stress. Such genetic strategies reduce dependency on antibiotics and strengthen herd resilience.

14.3Integrated One Health Approaches

Biosecurity is not confined to farms—it connects animal, human, and environmental health. Collaboration between veterinarians, doctors, and environmental scientists is essential to address zoonotic threats. This One Health approach ensures collective well-being and global food safety.

14.4Education and Policy Support

Training, certification programs, and government incentives are crucial for

broad adoption. Policies promoting biosecure dairy zones, subsidized vaccination, and farmer training centers can transform regional health outcomes.

In the future, biosecurity will not just be a rule—it will be a culture embedded in every decision, from barn design to breeding strategy.

15. Conclusion: Building A Culture Of Biosecurity

Biosecurity in dairy farming is not a one-time intervention; it is a way of life.

The success of any biosecurity program depends on attitude, awareness, and accountability at every level of the production chain. Farmers, veterinarians, milk collectors, processors, and policymakers must act as co-guardians of herd health and food safety.

Modern dairy production is a delicate balance of productivity and protection. Each litre of milk produced under hygienic, biosecure conditions represents more than nutrition—it represents trust. When farms operate with strict entry control, responsible antibiotic use, and regular monitoring, they protect not only animals but also the consumers and environment that sustain them.

A resilient dairy sector will therefore rely on:

- Continuous education and training of workers.
- Strict enforcement of movement control and quarantine rules.
- Integration of technology for real-time disease surveillance.
- Transparent documentation of every health and hygiene event.
- Regional and international collaboration under the One Health framework.

As global demand for milk grows, biosecurity will define competitiveness. Nations that adopt science-based standards today will be tomorrow's leaders in sustainable dairy trade.

16. Actionable Recommendations For Dairy Biosecurity

Below is a concise checklist distilled from global best practices—an implementable guide for farms of all sizes.

Farm Entry & Perimeter

- Install disinfectant footbaths and wheel dips at all gates.
- Keep double-layer fencing with a single controlled entry.
- Register all visitors and vehicles; deny unscheduled access.

Animal Health & Quarantine

- Purchase animals only from certified disease-free sources.
- Quarantine new or sick animals for at least 30 days.
- Keep vaccination schedules visible in farm records.

Housing & Environment

- Maintain dry, well-ventilated barns.
- Disinfect housing weekly and after every batch of animals.
- Control rodents, flies, and wild birds through integrated pest programs.

Milking Parlour & Equipment

- Sanitize milking clusters after every cow using approved disinfectants.
- Ensure proper udder preparation—wash, dry, and pre-dip teats.
- Store milk at ≤ 4 °C immediately after milking to prevent bacterial growth.

Feed & Water Safety

- Source feed ingredients from verified suppliers.
- Protect feed from moisture and vermin.
- Test water quality quarterly for bacterial and chemical safety.

Human Hygiene & Training

- Provide hand-washing and protective gear stations.
- Train workers on zoonotic risks and standard operating procedures.
- Promote a "clean-in, clean-out" policy for all employees.

Waste & Manure Management

- Use biogas or composting systems to neutralize pathogens.
- Store manure away from feed and water sources.
- Dispose of carcasses through rendering or deep burial under supervision.

Record Keeping & Traceability

- Maintain detailed logs for treatments, mortality, visitors, and cleaning cycles.
- Use digital tools or mobile apps for real-time updates.
- Audit biosecurity performance monthly.

Emergency Preparedness

- Draft a written contingency plan for disease outbreaks.
- Stock essential disinfectants, PPE, and first-aid materials.
- Establish rapid communication lines with veterinarians and authorities.

Implementing these measures converts theory into daily discipline—turning biosecurity from a cost into an investment.

17. Final Message: Towards A Biosecure Dairy Future

As the dairy industry navigates the challenges of climate change, population growth, and global trade, biosecurity stands as its strongest defense and smartest growth strategy.

Every drop of milk reflects the health of the cow, the integrity of the farm, and the safety of the food chain.

Let every dairy professional pledge to:

"Produce safe milk through safe animals in a safe environment."

Through continuous innovation, training, and collaboration, dairy farming can achieve the triple goal of profitability, sustainability, and responsibility.

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Winter Stress in Dairy Animals: Managing the Cold Challenge for Better Productivity

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Introduction

Winter brings relief from the scorching heat of summer, but for dairy animals, it introduces a new set of challenges. As temperatures drop and cold winds intensify, dairy cows and buffaloes face winter stress, which can significantly affect their health, milk production, and reproductive efficiency.

Cold stress is not only about low temperatures—it's a complex interaction between environment, nutrition, management, and animal physiology. When the animal's energy requirements for maintaining body temperature exceed what it receives from feed, it begins to divert nutrients away from milk production and immune function to preserve warmth. The result is reduced productivity, increased disease susceptibility, and economic losses for the farmer.

Understanding how winter affects dairy animals, and adopting science-based management practices, can help maintain performance and ensure animal welfare throughout the cold season.

Understanding Winter Stress in Dairy Animals

Dairy cattle and buffaloes are warm-blooded animals that function best within a thermoneutral zone — the range of ambient temperatures where they do not need to expend extra energy to maintain their body temperature. For most adult dairy cattle, this range is between 5°C and 25°C, while for newborn calves it is much higher, around 15°C to 27°C.

When the temperature falls below the lower critical temperature (LCT), animals must generate more internal heat to stay warm. This increases their maintenance energy requirement by 10–30% depending on the severity of the cold and wind chill. If additional feed is not provided, animals lose weight, milk yield drops, and reproductive efficiency suffers.

Common signs of winter stress include:

- Shivering and huddling
- Reduced feed intake or difficulty accessing feed

- Dry, rough skin and coat
- Drop in milk yield and fat percentage
- Irregular estrus or delayed conception
- Increased susceptibility to respiratory and digestive disorders

Understanding these signs helps farmers act early to minimize losses.

Impact of Cold Stress on Milk Production

Cold stress has a direct and indirect effect on milk production. As animals use more energy to maintain body temperature, less energy remains available for milk synthesis.

Research shows that severe cold can reduce milk yield by 10–25%, depending on breed, nutrition, and shelter conditions. Moreover, the fat and protein content in milk may decline due to changes in metabolism and reduced dry matter intake.

In buffaloes, which are naturally more sensitive to cold due to their thinner skin and sparse hair coat, the impact can be even more pronounced. Prolonged exposure to cold winds often leads to lower feed efficiency and late conception after calving, extending the calving interval.

Nutrition Management During Winter

Nutrition plays a central role in helping dairy animals cope with cold stress. Since the energy requirement increases in winter, feed formulations must be adjusted accordingly.

1. **Increase Energy Density:** Provide additional concentrates, grains, or fat supplements to meet the higher caloric demand. Molasses, maize, or oil cakes can be incorporated to enhance palatability and energy intake.
2. **Maintain Adequate Roughage:** Good-quality green fodder or silage provides fiber that supports rumen fermentation, which generates body heat. Leguminous fodders like berseem, lucerne, or oats are excellent choices in winter.
3. **Ensure Mineral and Vitamin Balance:** Cold weather often leads to reduced sunlight exposure, lowering vitamin D synthesis. Supplementation with vitamin A, D, and E, along with balanced minerals (calcium, phosphorus, and trace elements), supports immunity and reproduction.
4. **Provide Warm Water:** Animals consume less water when it's cold, leading to reduced feed intake and milk yield. Offering lukewarm water (20–25°C) twice daily encourages drinking and supports digestion.
5. **Feed Timing:** Providing the main meal during warmer parts of the day, especially late morning or early afternoon, helps maintain rumen activity and internal heat production.

Housing and Shelter Management

Proper housing is the most effective non-nutritional defense against winter stress. The goal is to reduce wind exposure, maintain dryness, and provide comfort while ensuring adequate ventilation.

Key measures include:

- Windbreaks and Insulation: Use curtains, bamboo mats, or polythene sheets on the windward side of sheds. Roof insulation and side covers help retain warmth.
- Dry Bedding: Provide thick, dry bedding materials such as straw or sawdust. Wet bedding increases heat loss and promotes infections like mastitis.
- Group Housing: Allow animals to huddle together, which helps conserve heat naturally.
- Proper Ventilation: Avoid sealing barns completely. Stale air and high humidity can lead to respiratory issues. Maintain a balance between warmth and fresh air.
- Sunlight Access: Exposure to morning sunlight helps regulate body temperature and supports vitamin D metabolism.

In extreme cold, simple heating methods such as heat lamps or warm air blowers can be used in calf pens or maternity areas.

Special Care for Calves and Pregnant Animals

Calves are highly vulnerable to cold stress because they have a small body size and limited fat reserves. Hypothermia can quickly develop in newborns if not properly managed.

Calf management tips:

- Dry the calf immediately after birth and provide warm bedding.
- Feed colostrum within 1–2 hours of birth to boost immunity.
- Use calf jackets or blankets in extremely cold weather.
- House calves in draft-free, well-bedded pens with adequate ventilation.
- Offer warm milk and starter feed to support energy needs.

Pregnant and recently calved animals require additional attention. Cold stress can interfere with hormonal balance, causing delayed estrus or poor conception rates. Provide these animals with additional energy, minerals, and protection from drafts.

Health and Disease Management

Winter conditions favor the spread of certain diseases, especially respiratory and digestive disorders. Pneumonia, foot rot, and mastitis are particularly common in poorly managed winter shelters.

Preventive health strategies:

- Maintain cleanliness in sheds and remove wet bedding regularly.
- Vaccinate animals as per the herd health plan before the onset of winter.
- Monitor for early signs of illness — coughing, nasal discharge, or reduced feed intake — and seek veterinary advice promptly.
- Keep udders clean and dry to prevent mastitis.
- Avoid sudden feed changes, which can stress the digestive system.

Regular exercise and access to sunlight also help strengthen immunity and improve overall wellbeing during cold months.

Behavioral and Environmental Adjustments

Observing animal behavior provides valuable insight into their comfort level. Animals that huddle tightly, refuse to lie down, or show reduced mobility may be experiencing cold stress.

Simple behavioral management practices — such as letting animals bask in the sun during mid-morning or providing dry resting spaces — can greatly enhance comfort.

In open housing systems, orientation of sheds in the east-west direction helps maximize sun exposure and minimize wind impact.

Farmers can also install thermometers or low-cost temperature-humidity meters to monitor barn conditions and adjust management practices accordingly.

Economic and Welfare Implications

Ignoring winter stress can lead to substantial economic losses from decreased milk yield, fertility problems, and increased disease incidence. A drop of even 1–2 liters of milk per cow per day over several months can translate to major financial setbacks for small and medium-scale farmers.

Moreover, welfare concerns are gaining importance among consumers and policymakers. Managing cold stress is not only about maximizing production but also about ensuring ethical and humane livestock management.

Conclusion

Winter stress in dairy animals is a multifactorial challenge that requires proactive management. By focusing on nutrition, shelter, and health care, farmers can protect their herds from the adverse effects of cold weather and sustain productivity throughout the season.

As climate variability increases, extreme cold spells may become more frequent. Preparedness, awareness, and timely action will determine how effectively dairy farmers can adapt. Ultimately, keeping animals warm, healthy, and comfortable during winter is not just good animal husbandry — it's sound business practice and a cornerstone of sustainable dairy farming.

Banas Dairy and BBSSL Sign MoU to Strengthen Potato Value Chain

- ***Inspired with PM Narendra Modi's vision of "Sahakar se Samriddhi", the signed MoU is taking forward Ministry's initiative of 'Cooperation among Cooperatives'***
- ***The MoU aims to develop a comprehensive seed-to-market value chain for potatoes***

An continuous endeavour is being undertaken to realise Hon'ble Prime Minister Shri Narendra Modi's vision of "Sahakar se Samriddhi" under the leadership of Hon'ble Minister of Home and Cooperation Shri Amit Shah by promoting many initiatives of 'cooperation among cooperatives'. In this direction, Banas Dairy (part of Amul and Asia's largest cooperative dairy) and Bharatiya Beej Sahakari Samiti Limited (BBSSL) signed a Memorandum of Understanding (MoU) to produce and distribute high-quality seed potatoes. The agreement was signed on 10th November, 2025 at Atal Akshay Urja Bhavan, New Delhi, in the presence of Dr. Ashish Kumar Bhutani, Secretary (Cooperation), Government of India, and senior officials, with Shri Sangram Chaudhary, MD of Banas Dairy, and Shri Chetan Joshi, MD of BBSSL.

On this occasion, Secretary, Ministry of Cooperation Dr. Ashish Kumar Bhutani stated that the partnership is an important milestone in empowerment and prosperity of farmers by strengthening value chains and boosting productivity.

This partnership aims to establish an comprehensive "seed-to-market" potato value chain that ensures the production of certified, disease-free seed potatoes while promoting scientific cultivation methods, contract farming arrangements, and efficient market linkages. By aligning technological innovation with cooperative strength, the initiative seeks to enhance productivity, reduce input losses, and ultimately raise the income and resilience of potato-growing farmers across the value chain. Under the MoU, BBSSL will use Banas Dairy's tissue culture and aeroponic facilities, while Banas Dairy will provide technical and market support. Shri Sangram Chaudhary highlighted Banas Dairy's "Beyond Dairy" expansion, while Shri Chetan Joshi emphasized boosting self-reliance in seed potatoes.

Ecolex-Renata PLC Innovation Forum Unveils Next-Gen Feed Technologies in Dhaka

Ecolex Animal Nutrition and our business partner Renata PLC recently hosted the "Partnering for Progress" seminar in Dhaka, Bangladesh, representing the launch of Ecolex into the Bangladesh market.

Established in 2005 and currently exporting to almost 40 countries, we are excited to now support Bangladesh with our innovative nutritional solutions for the poultry, ruminant and aquaculture sector.

With the increasing awareness in Bangladesh to the critical issue of antibiotic resistance, not only for livestock production but also human health risks, embracing the One Health approach across biosecurity, good husbandry and sustainable nutritional interventions is a necessity, not an option.

At Ecolex Animal Nutrition, we are strong supporters of the One Health initiative, and this recent launch forum allowed a platform to introduce our latest science-driven innovations to support the Bangladesh livestock industry and allow reduction in antibiotic interventions. Addressing novel strategies to mitigate challenges in raw material quality, particularly from a mycotoxin and microbial contamination aspect, we then went on to discuss solutions to support gut health integrity.

Maximising performance through latest innovations for enhancing nutrient absorption, we introduced our approach of integrating specific blends of emulsifier molecules that

focus on improvements in protein, carbohydrate as well as lipid digestibility. This breaks away from the traditional approach, where other emulsification strategies are working primarily on fat digestibility, and now allows for an innovative strategy to enhance the efficacy of NSP enzyme applications.

Finally, the forum was wrapped up with an introduction of a latest development from Ecolex that is focused towards health and perfomance for extended-cycle layer birds, where the market trend is increasing towards in excess of 100 weeks age. By encompassing an emulsified alpha-monolaurin as a powerful antimicrobial with a strategic blend of emulsifier molecules, peak lay period can be extended whilst still ensuring the health and vitality of the birds, again assisting to alleviate the need for antiobiotic interventions.

The forum proved a huge success, attracting more than 110 delegates and created an interesting dialogue during the post-event dinner.

On behalf of Ecolex Animal Nutrition, a big thankyou to Rajan SERALATHAN, and the Renata PLC team Md.Sirajul Hoque, Md. Taleb and Dr. Md. Atiqur Rahman And a big thankyou to the local Bangladeshi industry press for supporting our launch.

Godrej Agrovet to invest Rs 70 cr in Andhra Pradesh dairy, oil palm expansion

Godrej Agrovet Ltd on Thursday signed a non-binding memorandum of understanding (MoU) with the Andhra Pradesh state government to invest Rs 70 crore to expand dairy processing capacity and establish farmer support centres.

The investment will go toward expanding dairy processing and value-added product facilities through its wholly owned subsidiary Creamline Dairy Products Ltd, which operates under the Godrej Jersey brand, and setting up five new Samadhan Centers -- a one-stop service hubs for oil palm farmers.

The MoU was signed in the presence of Andhra Pradesh Chief Minister Nara Chandrababu Naidu, along with Sunil Kataria, Managing Director and CEO of Godrej Agrovet, and Rakesh Swami, Group President of Corporate Affairs at Godrej Industries Group, according to a regulatory filing.

"Strengthening the agri-food processing sector is imperative for farmers of our soil to prosper," Naidu said.

"I am confident that this partnership will not only help strengthen our agricultural ecosystem but also create sustainable livelihoods for the community at large while driving economic growth." The dairy expansion will be executed in three phases, the company said without providing a timeline.

Godrej Agrovet's oil palm business, which the company describes as India's largest oil palm processor, works directly with farmers throughout the crop lifecycle. The new samadhan centres will provide oil palm farmers with knowledge, tools, services and technical solutions.

"Today's MoU is a testimony of our intent to strengthen our agri-food processing capabilities while continuing to empower farmers," Kataria said.

Swami said Andhra Pradesh has been a key state for the Godrej Industries Group, adding that the company remains committed to expanding its footprint across consumer, real estate and finance businesses in the state. PTI LUX TRB

Union Home Minister and Minister of Cooperation Shri Amit Shah inaugurates the Shri Motibhai R. Chaudhary Sagar Sainik School (MRCSSS) and the Sagar Organic Plant in Gujarat through video conferencing

Union Home Minister expresses deep condolences to the families of those who lost their lives in car explosion in Delhi

All those responsible for the terrorist incident will be given strict punishment — Amit Shah

The punishment for the culprits of the Delhi car blast will send a message to the world that no terrorist should even dare to think of committing such an act in India

The Motibhai Chaudhary Sagar Sainik School in Gujarat will pave the way for serving in the Indian Armed Forces

The Modi government is establishing 100 new Sainik Schools across the country under the PPP model, and among them, the Motibhai Chaudhary Sainik School will become a symbol of pride for Mehsana

Doodhsagar Dairy is playing a major role in Gujarat's White Revolution today

Banaskantha and Doodhsagar Dairy have provided a model for transforming the dairy economy

The Modi government will ensure that 50 per cent of the milk produced by cooperative societies reaches national and international markets, benefiting the cattle rearers

The Union Home Minister and Minister of Cooperation, Shri Amit Shah today inaugurated the Shri Motibhai R. Chaudhary Sagar Sainik School (MRCSSS) and the Sagar Organic Plant in Gujarat through video conferencing. On this occasion, several dignitaries, including the Chief Minister of Gujarat, Shri Bhupendra Patel, were present.

Union Home Minister and Minister of Cooperation Shri Amit Shah expressed deep condolences to the families of those who lost their lives in the recent car explosion in Delhi. He said that all those responsible for the terrorist incident will be given strict punishment. Union Home Minister said The punishment for the culprits of the Delhi car blast will send a message to the world that no terrorist should even dare to think of committing such an act in India.

Shri Amit Shah said that under the leadership of Prime Minister Shri Narendra Modi, the entire world has recognized India's fight against terrorism over the past 11 years, and Prime Minister Modi is at the forefront of leading this fight globally. He stated that all those who committed this cowardly act and those behind it will be brought before the law and given the strictest possible punishment. The Government of India and the Ministry of Home Affairs are fully committed to ensuring this.

Union Home Minister and Minister of Cooperation said that today marks the inauguration of the Sagar Organic Plant and the Motibhai Chaudhary Sagar Sainik School. He said that Motibhai Kaka is an ideal and inspiration for all the citizens of Mansa. Motibhai led a life that was completely based on the principles of Mahatma Gandhi—honest, transparent, and devoted to spreading these values among countless people. He added that during that time, all

great people worked to open the doors of prosperity for the cattle rearers, farmers, and villages of Gujarat. Shri Shah said that today, Amul has become the world's number one cooperative brand, and its foundation was laid by eminent personalities of that era.

Shri Amit Shah said that the Sagar Sainik School, established in the name of Motibhai Chaudhary, will open the path for children from several districts of Gujarat to serve in the Indian Armed Forces. Spread over 11 acres, this school has been built at a cost of ₹50 crore and is equipped with facilities such as smart classrooms, hostels, a library, and a canteen. He said that under the leadership of Prime Minister Shri Narendra Modi, the Government of India has decided to establish 100 new Sainik Schools across the country under the PPP model, and among them, the Motibhai Chaudhary Sainik School will certainly become a symbol of pride for Mehsana.

Union Minister of Cooperation said that today the Sagar Organic Plant has also been inaugurated. He stated that this plant is very important to ensure that reliable organic products under the Amul brand reach across the country and the world, and that all farmers engaged in organic farming receive fair profits. This plant, with a daily capacity of about 30 metric tons, is certified under the National Programme for Organic Production (NPOP) and by the Agricultural and Processed Food Products Export Development Authority (APEDA). He said that because of APEDA certification, farmers engaged in natural farming in North Gujarat will greatly benefit, as their produce can now reach global markets. Shri Shah added that the expansion of this organic plant will not only improve the health of citizens across the country but also increase the income of farmers involved in organic farming.

Union Home Minister and Minister of Cooperation urged all farmers engaged in organic farming and their families to use organic products themselves so that their entire families remain healthy. He said that in 1960, Doodhsagar Dairy collected only 3,300 liters of milk per day, which has now increased to 35 lakh liters per day. This dairy is connected to cattle rearers from 1,250 villages in Gujarat and to more than 10 lakh milk production groups across Rajasthan, Haryana, Madhya Pradesh, Uttar Pradesh, and Himachal Pradesh. He said that its turnover has reached ₹8,000 crore. With 8 modern dairies, 2 milk chilling centers, 2 cattle feed plants, and 1 cement production unit, Doodhsagar Dairy today plays a major role in Gujarat's White Revolution.

Shri Amit Shah said that Banaskantha and Doodhsagar Dairy together have provided a model for transforming the dairy economy. He mentioned that several initiatives have been undertaken to promote the circular economy of this dairy, including the formation of 75,000 new primary dairy cooperative societies across the country. He said that the Modi government will ensure that 50 per cent of the milk produced by cooperative societies reaches national and international markets, benefiting the cattle rearers.

Union Home Minister and Minister of Cooperation said that to ensure the benefits of the circular economy reach cattle rearers across Gujarat and the entire country, the Modi government has established three multi-state cooperative societies. He also mentioned that 70 per cent of Amul's total turnover comes from the contribution of women—our mothers and sisters—who have become self-reliant through it. Shri Shah said that this year, Gujarat experienced unseasonal heavy rainfall, and to assist the affected farmers, the Bhupendra Patel-led state government has announced a very generous relief package. He added that the Gujarat government has resolved that it will not step back from helping the farmers.

Union Home Minister and Minister of Cooperation, Shri Amit Shah, addresses the international conference on the urban cooperative credit sector, "Co-Op Kumbh 2025," in New Delhi as the Chief Guest

The 'Delhi Declaration 2025' of the international conference organized by NAFCUB will serve as a roadmap for the expansion of Urban Cooperative Banks

Today, the Umbrella Organization launched the 'Sahkar Digi-Pay' and 'Sahkar Digi-Loan' apps, which will become symbols of the cooperative sector's participation in the digital revolution

Urban Cooperative Banks and Cooperative Credit Societies have moved forward with new enthusiasm under the Modi government

Within the next five years, an Urban Cooperative Bank will be established in every city with a population of over 2 lakh

The Ministry of Cooperation has taken several steps to modernize the cooperative sector, resolve its issues, and expand its reach

In the past two years, we have succeeded in reducing the NPA from 2.8 per cent to 0.6 per cent

Urban Cooperative Banks are becoming a means for the upliftment of small traders, entrepreneurs, and youth

Amul and IFFCO securing the first and second positions globally in the cooperative sector is proof of the relevance of cooperatives

The Union Home Minister and Minister of Cooperation, Shri Amit Shah, today addressed the international conference on the urban cooperative credit sector, 'Co-Op Kumbh 2025' in New Delhi as the Chief Guest. On this occasion, the Union Minister of State for Cooperation, Shri Krishan Pal Gurjar, the Secretary of the Ministry of Cooperation, and several other dignitaries were present.

In his address, Union Home Minister and Minister of Cooperation, Shri Amit Shah, said that the Cooperative Kumbh of urban cooperative banks and credit societies is being

organized to mark the International Year of Cooperatives. He said that over the past 3–4 years, the country's urban cooperative banking sector and cooperative credit society sector have been moving forward with renewed enthusiasm. He added that during Co-Op Kumbh 2025, there will be discussions on policy, technology, and innovation to tap several possibilities related to this sector. He said, the 'Delhi Declaration 2025' of the international conference organized by NAFCUB will serve as a roadmap for the expansion of Urban Cooperative Banks.

Shri Amit Shah said that through Co-Op Kumbh 2025, our dream of expanding urban cooperative banks will be fulfilled very soon. He said that today, Sahkar Digi-Pay and Sahkar Digi-Loan have been launched here by the umbrella organization. Through the Sahkar Digi-Pay app, even the smallest urban cooperative banks will be able to offer digital payment facilities.

Union Home Minister and Minister of Cooperation said that since the establishment of the Ministry of Cooperation, the Modi government has taken several important policy decisions to bring about fundamental changes in every sector related to cooperatives. Along with this, many steps have also been taken to modernize the cooperative sector, resolve its challenges, and expand the reach of cooperatives. He said that all state governments in the country have accepted the model bylaws for PACS.

Shri Amit Shah said that the Ministry of Cooperation has set four goals. The first is the development of Generation Sahakar, meaning connecting the young generation with the cooperative movement. For this, the Tribhuvan Sahkari University has been established, which will meet every kind of need in the cooperative sector. He said, another goal is to prepare cooperative societies that are capable of facing all kinds of challenges. He added that the government has also set a target of establishing one urban cooperative bank in every city with a population of more than two lakh within five years. Shri Shah said that urban cooperative banks must carry out their core functions with a multi-sector approach for the empowerment of young entrepreneurs, self-help groups, and weaker sections of society. He said, our goal is to strengthen cooperatives and, at the same time, to strengthen the weaker sections, and no institution other than urban cooperative banks can achieve this. He said that empowering vulnerable individuals through urban cooperative banks must also be one of our goals.

Union Minister of Cooperation said that in the past two years, we have succeeded in reducing Non-Performing Assets (NPA) from 2.8% to 0.06%. Along with this, we must improve operational standards and further strengthen the improvements achieved in financial discipline. Establishing one urban cooperative bank in every city will be possible only when we work toward converting cooperative societies into banks. He said that Gross Domestic Product (GDP) figures alone cannot reflect our progress; along with them, we must also ensure that every person gets some work and that their standard of living improves, which cannot happen without cooperatives. Shri Shah said that the Government of India and all state governments fully understand the concept and importance of cooperatives, and now there is a need to work with renewed confidence and effort in a transparent and result-oriented manner.

Shri Amit Shah said that the International Cooperative Alliance has placed Amul at the first position and IFFCO at the second position in the global ranking. This shows that even today, the idea and culture of cooperatives have not become outdated. Amul has become the driver of the White Revolution in the country, and through its 3.6 million farmer members, 18,000 village societies, and 18 district unions, it collects 30 million liters of milk every day across India. He said that in the year 2024–25, Amul's turnover crossed 90,000 crore rupees, which shows that 3.6 million farmers, more than 65 per cent of whom are women, have together been successfully running such a large cooperative for so many years with small individual contributions. Shri Shah added that this reflects the vast potential available for cooperatives in our country.

Union Minister of Cooperation said that IFFCO has secured the position of the second-largest cooperative organization in the world. IFFCO has recorded a turnover of 41,000 crore rupees and a profit of 3,000 crore rupees. He said that IFFCO is a society of cooperative societies, and across the country, 35,000 cooperative societies, most of which are Primary Agricultural Credit Societies (PACS) and marketing-related societies, are its members. Through these societies, more than 5 crore farmers have become members of IFFCO, and today IFFCO has become a pillar of India's Green Revolution by producing 93 lakh metric tonnes of urea and DAP. He added that IFFCO's nano urea and nano DAP are now being exported to 65 countries, including Brazil, Oman, the United States, and Jordan.

Aavin Butter Scandal: TN Minister Vows to Recover Full Cost of 37 Tonnes of Spoiled Butter

A major controversy has hit Tamil Nadu's dairy sector after 37 metric tonnes of butter purchased for Aavin was declared unfit for use and condemned. The incident has triggered public outrage and raised serious concerns about procurement transparency, supply chain monitoring, and the effectiveness of quality control systems within one of the state's largest cooperative brands.

Tamil Nadu Milk and Dairy Development Minister Mano Thangaraj has taken a decisive stance, confirming the spoilage and promising to recover 100% of the loss from the Uttar Pradesh-based cooperative that supplied the defective batch. His assurance aims to protect state funds and restore confidence in the operations of Aavin—a brand relied upon daily by millions.

How the Issue Came to Light

The spoiled butter was part of a procurement meant to support Aavin's production of ghee and other value-added dairy products. Such purchases from cooperatives outside the state are not uncommon, especially when internal butter production dips during certain seasons.

However, upon arrival, the entire consignment was found to be substandard and unfit for processing. The batch was immediately condemned and disposed of, preventing it from entering the production cycle—but not before it caused significant financial loss and concern.

Minister's Firm Stand on Accountability

Speaking to the media, Minister Thangaraj emphasized that the Tamil Nadu government will not allow taxpayers to bear the burden of the supplier's lapse.

"The entire cost of the spoiled butter will be recovered from the cooperative dairy in Uttar Pradesh," he stated firmly, assuring that the department was already taking steps through appropriate legal and commercial channels.

This commitment comes as an important reassurance, especially at a time when public trust in food quality and safety is under scrutiny.

Why Aavin Procures Butter Externally

While Aavin is widely recognised for its robust milk procurement and dairy production network, demand spikes and seasonal fluctuations sometimes necessitate the import of raw materials such as butter.

The Minister clarified that such procurement is routine and well within policy—but stressed that product quality standards remain non-negotiable, regardless of the supplier's location.

A Call for Stronger Quality Control

The incident has sparked a targeted internal review. The government has ordered an in-depth investigation into:

- **Gaps in quality inspection protocols,** both at the supplier level and within Aavin
- **Weaknesses in the procurement process,** including vendor verification
- **Supply chain vulnerabilities** that may expose the dairy federation to similar risks in the future

Minister Thangaraj assured that corrective measures will follow, not only to fix accountability but also to safeguard the integrity of Aavin's production systems.

Restoring Public Confidence

For decades, Aavin has been a household name in Tamil Nadu, recognized for its reliability and quality. Any compromise in raw materials—even those never reaching consumers—has the potential to damage brand trust.

By pledging swift action, financial recovery, and procedural tightening, the government aims to:

- Reassure consumers
- Maintain Aavin's quality reputation
- Reinforce industry confidence—especially among international partners and cooperatives who view Aavin as a prominent dairy institution

What This Means for the Dairy Sector

The incident underscores a broader lesson for India's cooperative dairy network: as procurement chains expand, quality assurance must expand with them. With dairy supply chains becoming more interconnected across states, even a single lapse can lead to large-scale financial and reputational damage.

For consumers, this episode is also a reminder of the layers of safety checks that exist to prevent poor-quality products from entering the market. The spoiled butter was intercepted before reaching production—highlighting that while the system faltered at one point, it functioned effectively at another.

The Aavin butter spoilage case has become a wake-up call for the dairy sector in Tamil Nadu and beyond. With the Minister assuring full recovery of losses and a thorough probe, the focus now shifts to

strengthening procurement protocols and improving quality control frameworks.

As reforms unfold, the hope is that such incidents will pave the way for a more transparent, reliable, and accountability-driven dairy ecosystem—one that continues to uphold the trust of millions who depend on it every day.

Carus Feed Division Launches "Fertihike" to Boost Dairy Animal Productivity

Carus Feed Division has unveiled Fertihike, a next-generation trace mineral and vitamin formulation developed to enhance the health, fertility, and overall productivity of dairy animals. The official launch took place during the company's September Quarterly Meeting in Ludhiana, which brought together key leaders including Dr. Manish Pathak, General Manager of Sales & Marketing, along with regional managers and senior executives.

Fertihike is formulated under Carus' Precision Nutrition concept and is aligned with both NRC (National Research Council) and BIS (Bureau of Indian Standards) guidelines. The company emphasizes that the product delivers highly bioavailable minerals and vitamins—helping farmers achieve better conception rates, stronger immunity, improved udder health, and optimal milk yield.

During the launch, Dr. Pathak highlighted the need for scientifically crafted nutritional solutions in India's evolving dairy sector.
"With Fertihike, we are offering farmers a product grounded in research and designed to deliver visible improvements in herd performance," he noted. He added that today's dairy farmers face numerous challenges, from fertility problems to mineral deficiencies, and products like Fertihike can bridge this critical gap.

The event also included detailed knowledge-sharing sessions where technical teams explained the science behind the formulation, field feedback from early users, and strategies for expanding Fertihike's presence across major dairy markets. Managers discussed how the product's balanced blend of trace minerals can help address common reproductive disorders and enhance metabolic efficiency.

Carus Feed Division aims to leverage Fertihike to support dairy farmers in improving their herd productivity in a sustainable manner. With a strong focus on research-backed nutrition, the company continues to strengthen its commitment to delivering high-quality solutions that cater to the practical needs of India's dairy sector.

With Fertihike's launch, Carus reinforces its mission of empowering farmers with advanced nutrition—for healthier animals, higher yields, and a more profitable dairy future.

DKMUL Targets 4.5 Lakh Litres Milk Production by Year-End, Eyes Further Growth

Mangaluru: The Dakshina Kannada Co-operative Milk Producers' Union Limited (DKMUL) is on track to boost its milk procurement to 4.5 lakh litres per day by the end of December, up from the current 4.3 lakh litres. Despite this improvement, the total demand in the region stands at 5.2 lakh litres, with the deficit being met through milk supplied from Hassan and Shivamogga unions.

The positive shift comes after DKMUL faced a significant dip in production earlier this year across its jurisdictions of Dakshina Kannada and Udupi districts. In March, milk availability had dropped sharply to 3.2 lakh litres, raising concerns among the cooperative and its members. Today, thanks to a series of targeted interventions, production has rebounded strongly.

What Led to the Production Dip?

According to Vivek D., Managing

Director of DKMUL, the decline was the result of multiple challenges converging at once:

- Acute fodder shortages
- The widespread impact of Lumpy Skin Disease (LSD)
- Issues related to milk pricing
- Reduction in cattle numbers by several dairy farmers

These factors collectively impacted productivity, pushing the union to take rapid corrective measures.

Initiatives That Turned the Tide

Vivek explained that DKMUL immediately rolled out a series of farmer-focused interventions that helped revive milk production within months:

1. **Silage Supply at Subsidized Rates**

To combat fodder scarcity, traditional fodder was replaced with nutrient-rich silage, made available to dairy farmers at subsidized prices. This single step improved cattle feeding consistency and helped boost milk yield.

2. **Financial Aid for High-Yield Cattle**

To help farmers upgrade their herds, DKMUL provided ₹12,000 in financial support per cow to procure high-yielding Erode breed cows. So far, 500 cows have already been brought into the region under this scheme.

3. **Incentivizing Milk Production Through Better Pricing**

The union revised and increased the milk procurement price, ensuring farmers received a more attractive and stable return on their supply.

4. **Farmer Outreach and Counselling**

Data-driven outreach efforts were carried out at the village level. Officials visited farmers who had reduced herd sizes and motivated them to rebuild cattle numbers and resume full-scale dairy activities.

These efforts combined helped DKMUL recover from last year's setback and position itself for steady growth.

Ambitious Future Goals

With production back on the rise, DKMUL has set broader expansion plans in motion. The union aims to reach 4.7 lakh litres per day by June 2026, signaling confidence in long-term sustainability and supply strength.

The cooperative also has two major infrastructural projects on the horizon:

1. **New Ice Cream Factory**

A dedicated ice cream manufacturing unit is planned, with the location currently being finalized.

2. **Mega Dairy in Dakshina Kannada**

Plans for a modern, large-scale mega dairy facility are being developed to handle increasing milk volumes and support value-added production.

Both projects are expected to create employment and enhance DKMUL's product portfolio across Karnataka.

Youth Participation Still a Concern

While the union is making progress on multiple fronts, one challenge remains persistent—lack of youth interest in dairy farming.

DKMUL Director Sudhakar Shetty highlighted that younger generations are increasingly reluctant to enter the dairy sector, which limits long-term growth potential. He emphasized the need for awareness programs, financial incentives, and modernization of dairy practices to make the industry more appealing to youth.

DKMUL's rapid recovery and forward-looking strategies demonstrate the strength of cooperative dairy systems when supported by proactive planning and farmer-centric policies. With production expected to hit 4.5 lakh litres by year-end, and concrete plans for infrastructure expansion, the union is well-positioned to meet the region's growing dairy needs—provided it can address the long-term challenge of farmer engagement, especially among the younger population.

Global Market for Animal-Based Dairy Milk Alternatives Set to Reach USD 10 Billion by 2035

The global market for animal-based dairy milk alternatives—including goat, camel, sheep, and buffalo milk—is poised for substantial expansion over the next decade, driven by rising health

consciousness, growing lactose intolerance, and increasing product innovation. According to market projections, the sector is expected to nearly double in size, climbing from USD 4.7 billion in 2025 to a remarkable USD 10 billion by 2035, reflecting a steady CAGR of 7.8% during the forecast period.

Health Trends and Lactose Intolerance Fuel Market Growth

One of the strongest contributors to this rise is the global prevalence of lactose intolerance, particularly in Asia and Africa, where a majority of adults lack the ability to digest lactose efficiently. This demographic shift is pushing consumers toward non-cow animal milk, such as goat and camel milk, which is widely recognized for its easier digestibility.

- **Goat milk,** known for its smaller fat globules and higher digestibility, is rich in calcium, potassium, and vitamin A.
- **Camel milk** continues to gain attention for its higher iron and vitamin C content, along with claims of functional benefits.

As consumers seek nutritionally superior and gut-friendly alternatives, these products are emerging as viable choices for both daily consumption and specialty diets.

Innovation Expands Product Offerings Beyond Milk

The market is also benefiting from aggressive innovation in value-added products. Manufacturers are introducing a diverse portfolio that includes:

- Yogurts made from goat and sheep milk
- Camel milk-based cheese and ice creams
- Specialty lactose-free dairy beverages
- Nutritionally enhanced milk powders

This push toward greater product variety is helping brands cater to shifting consumer preferences, especially among millennials and health-conscious urban populations.

Regional Growth Patterns: Asia-Pacific Leads, West Follows

While Europe and North America continue to show robust growth due to high disposable incomes and increased awareness of digestive wellness, the Asia-Pacific region remains the fastest-growing market. This is partly due to:

- Long-standing cultural acceptance of non-cow milk
- Preference for goat and buffalo milk in traditional diets
- Expanding retail access to packaged specialty dairy products

Countries such as India, China, and the Middle East are expected to contribute significantly to overall market volume.

Sustainability and Ethical Farming Practices Gain Traction

Increasingly, consumers are placing importance on ethical and sustainable sourcing. Producers are responding with:

- Environmentally friendly farming systems
- Improved animal welfare practices
- Traceability and transparent supply chains

These factors are not only boosting consumer trust but also helping brands differentiate themselves in a competitive landscape.

Challenges Ahead: Costs, Awareness, and Regulation

Despite the encouraging outlook, the industry faces several hurdles:

- High production costs, particularly for camel and specialty goat breeds
- Limited consumer awareness in emerging markets
- Need for strict regulatory compliance to ensure product safety and quality
- Scalability issues for smallholder farmers and regional suppliers

Continued investment in infrastructure, education, and research will be essential to support long-term growth.

A Market Positioned for Strong Long-Term Expansion

With health-driven demand accelerating and innovation reshaping product lines, animal-based dairy milk alternatives are moving from niche markets into mainstream retail. By 2035, this sector is expected to play a critical role in the global dairy ecosystem—offering consumers a diverse array of nutritious, digestible, and sustainable dairy options.

India Firm on Protecting Dairy and MSMEs in FTA with New Zealand: Piyush Goyal

In a significant development for India's trade diplomacy, Commerce and Industry Minister Piyush Goyal reaffirmed that India will not compromise on the interests of its dairy sector, farmers, and MSMEs

while negotiating the proposed Free Trade Agreement (FTA) with New Zealand. Speaking in Auckland during the fourth round of negotiations, Goyal stressed that India has "consistently protected its vulnerable sectors" in all trade deals—and this FTA will be no exception.

The negotiations come at a crucial time as India looks to expand its global trade footprint, while New Zealand seeks deeper access to the Indian market, particularly for its strong agricultural and dairy exports.

New Zealand's Push for Market Access and India's Red Lines

New Zealand has been keen on securing better access for its agricultural products—especially dairy, which forms the backbone of its export economy. Dairy items such as milk powder, butter, cheese, and other processed products dominate New Zealand's global trade profile. In addition, the country is also pushing for concessions on alcoholic beverages, including premium wines.

However, India has made it clear that dairy is a non-negotiable area. For India, dairy is not only an economic sector but a political, cultural, and livelihood-sensitive domain. Millions of small and marginal farmers, women, and rural households depend on dairy as a primary or supplementary income source. Introducing imported dairy products at competitive prices could disrupt domestic markets and impact rural livelihoods.

Goyal reiterated that Indian dairy products, including milk and butter, are "red lines" in negotiations due to these deep socio-economic sensitivities.

"India never compromises on the interests of dairy, farmers, and MSMEs. We respect each other's sensitivities… we will not touch such issues,"
—Piyush Goyal, in Auckland

This strong statement not only reassures the Indian dairy ecosystem but also sends a clear message that India will maintain its protective stance.

Moving Beyond Tariffs: Exploring New Areas of Cooperation

Despite the differences on agricultural market access, both countries are exploring innovative, non-tariff opportunities for cooperation. The current round of discussions marks a shift from traditional tariff-focused talks to technology, innovation, and supply-chain partnerships.

Goyal highlighted that New Zealand's expertise in dairy technologies, mechanization, milking equipment, pasture management, and cold-chain development could align well with India's growing modernization needs. The Indian dairy sector, although the world's largest in volume, still faces challenges in mechanization, productivity, and efficiency.

This opens the door for New Zealand to collaborate not through direct product exports, but via:

- **Dairy machinery and equipment supply**
- **Farm technology transfer**
- **Best practices in herd management**
- **Cold-chain and milk processing technologies**
- **Joint research and innovation**

Such collaborations would strengthen India's farm production ecosystem without directly threatening Indian dairy farmers.

FTA Talks Resume After 10-Year Gap

The renewed momentum in the India–New Zealand FTA negotiations comes after nearly a decade of inactivity. The two countries first initiated negotiations 15 years ago, but discussions stalled after 10 rounds due to disagreements—largely around dairy access.

In March 2025, the two sides announced the restart of "comprehensive and mutually beneficial" negotiations. The current round held in Auckland marks the fourth formal round since talks resumed, and according to Goyal, the progress has been promising.

"There may not be a need for many more rounds as significant progress has been made,"
—Piyush Goyal

This indicates that both parties are working on a fast-track mode to

bridge gaps and find balanced solutions.

New Zealand's View: India Is a Key Economic Partner

New Zealand leaders have openly acknowledged the strategic importance of India in their economic outlook. Prime Minister Christopher Luxon, highlighting India's growing global influence and expanding consumer market, emphasized that the FTA could unlock massive opportunities for Kiwi businesses.

"India is a country of huge importance to New Zealand's prosperity, security, and society," —Prime Minister Christopher Luxon

Luxon noted that people-to-people ties and labour mobility will also hold a significant place in the FTA discussions. This includes smoother movement of professionals, students, and skilled workers—an area that many Indian expatriates in New Zealand eagerly follow.

New Zealand has been actively engaging with India as part of its strategy to diversify its trade beyond traditional partners such as China and Australia.

Trade Snapshot: India–New Zealand Economic Relationship

The bilateral trade relationship between the two countries remains modest despite strong diplomatic ties. In 2024:

- **Total trade:**
  - India's exports = **$752 million**
  - Imports from New Zealand = **$791 million**
- **Merchandise exports from India = $538 million**
- **Merchandise imports from New Zealand = $335 million**

India's major exports to New Zealand include:

- Pharmaceuticals and medicines
- Precious metals and gems
- Textiles and garments (especially non-knitted apparel)
- Agricultural and farm equipment

India's major imports from New Zealand comprise:

- Iron and steel
- Aluminium and scrap metals
- Logs and forestry products
- Wood pulp and wool
- Apples, kiwi fruits, and nuts
- Lamb meat
- Other agri-based products

The trade basket shows significant potential for expansion, particularly in high-value sectors such as technology, machinery, processed foods, and services.

Why India Protects Its Dairy Sector in FTAs

India's dairy industry is unique in both scale and structure. It is the world's largest milk producer, contributing nearly 24% of global output, yet it is dominated by small, family-run farms with 2–3 animals on average. The cooperative movement, led by institutions like AMUL, supports millions of rural households.

Allowing large-scale dairy imports from highly mechanized, low-cost producers like New Zealand could:

- Undermine rural incomes
- Reduce domestic procurement prices
- Impact women-led dairy enterprises
- Disrupt cooperative business models
- Affect India's self-reliance in food production

This is why dairy has been kept out of almost all of India's FTAs, including agreements with ASEAN, Japan, Korea, and Australia.

The Road Ahead: Balanced Growth and Mutual Benefits

The ongoing India–New Zealand FTA negotiations are more than just a trade discussion—they represent a broader attempt to redefine economic partnership in a changing global landscape.

For India, the priority is clear:

- Protect vulnerable sectors
- Safeguard rural livelihoods
- Ensure MSMEs remain competitive
- Prevent market disruption

For New Zealand, the focus is on accessing India's large consumer market and creating new channels for collaboration in health, education, technology, agriculture, and services.

Despite long-standing differences, the current tone of discussions is constructive and future-oriented. Both sides are keen to finalize a framework that respects domestic sensitivities while opening new avenues for growth.

India's stance in the FTA discussions with New Zealand reaffirms its commitment to protecting its dairy farmers and MSMEs—sectors that form the backbone of its rural and small-business economy. As global trade becomes increasingly complex, India is shaping its agreements with a clear vision: economic growth must not come at the cost of vulnerable communities.

With progress accelerating and both nations exploring collaboration beyond tariff cuts, the proposed FTA may soon emerge as a modern, balanced, and mutually beneficial partnership. For the dairy industry—both in India and New Zealand—the outcomes of these negotiations will be watched closely, as they could set precedents for future global trade deals.

Editorial Calendar 2026

Publishing Month:
January
Article Deadline :
18th, Dec. 2025
Advertising Deadline :
20th, Dec. 2025
Focus :
Opportunities and Challenges

Publishing Month:
February
Article Deadline :
18th, Jan. 2026
Advertising Deadline :
20th, Jan. 2026
Focus :
Budget

Publishing Month:
March
Article Deadline :
18th, Feb. 2026
Advertising Deadline :
20th, Feb. 2026
Focus :
Summer Stress Management

Publishing Month:
April
Article Deadline :
18th, March 2026
Advertising Deadline :
20th, March 2026
Focus :
Cold Chain

Publishing Month:
May
Article Deadline :
18th, April 2026
Advertising Deadline :
20th, April 2026
Focus :
Nutrition

Publishing Month:
June
Article Deadline :
18th, May 2026
Advertising Deadline :
20th, May 2026
Focus :
Milk - Production & Preservation

Publishing Month:
July
Article Deadline :
18th, June 2026
Advertising Deadline :
20th, June 2026
Focus :
Monsoon Management

Publishing Month:
August
Article Deadline :
18th, July 2026
Advertising Deadline :
20th, July 2026
Focus :
Sustainability

Publishing Month:
September
Article Deadline :
18th, August 2026
Advertising Deadline :
20th, August 2026
Focus :
Processing & Packaging

Publishing Month:
October
Article Deadline :
18th, September 2026
Advertising Deadline :
20th, September 2026
Focus :
Disease Prevention

Publishing Month:
November
Article Deadline :
18th, October 2026
Advertising Deadline :
20th, October 2026
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Publishing Month:
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18th, November 2026
Advertising Deadline :
20th, November 2026
Focus :
Winter Stress

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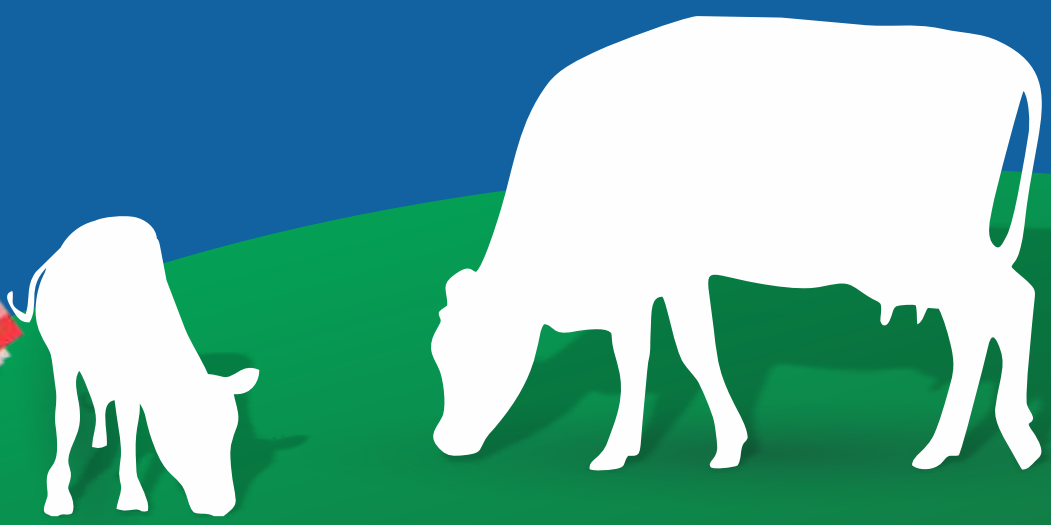

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