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BULLETIN

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Indian Dairy's White Revolution 2.0: Farmer First

Printed & published by Shri Hariom Gulati on behalf of Indian Dairy Association and printed at National Printers, B-56 Naraina Industrial Area, Phase-II, New Delhi and published at IDA House, Sector-IV, R.K. Puram, New Delhi-110022. Edited by Dr. Suneel Kumar Onteru; Cover Design and Layout by Mr. N.K. Pandey, Sr. Executive-Publications



From Celebration to Commitment—Shaping the Future of Indian Dairying

The Indian Dairy Association proudly joined the global community in celebrating World Milk Day 2026 with great enthusiasm and active participation across its Head Office, Zones, State Chapters, and affiliated institutions throughout the country. The widespread celebrations once again reaffirmed the importance of milk as a source of nutrition, livelihood, and sustainable rural development, while showcasing the vibrancy and commitment of the Indian dairy fraternity. With milk production exceeding 250 million tonnes and contributing significantly to rural livelihoods, India's dairy sector continues to be one of the strongest pillars of the agricultural economy.

The national celebration at the IDA Head Office in New Delhi, organized by the North Zone, brought together distinguished leaders from government, dairy cooperatives, producer organizations, academia, and industry. The event highlighted India's remarkable dairy journey—from a milk-deficient nation to the world's largest

milk producer—and emphasized the need for continued focus on productivity, quality, sustainability, and women-led dairy development. The deliberations reinforced the critical role of dairying in ensuring nutritional security, enhancing rural incomes, and empowering millions of smallholder farmers.

What makes World Milk Day truly special is the collective participation witnessed across the country. One of the most inspiring initiatives was organized by IDA West Zone at Mumbai's iconic Juhu Beach, where the Association directly engaged with the public to spread awareness about the nutritional benefits of milk. More than 250 fitness enthusiasts participated in the programme during their morning walks and exercise sessions. Another notable initiative was undertaken by IDA South Zone in association with the ICAR-National Institute of Animal Nutrition and Physiology (ICAR-NIANP), Bengaluru, through a National Seminar on **"Ayurveda-driven Innovation in Dairy Foods."** The seminar explored the timeless relationship between dairy, Ayurveda, and human wellness and highlighted opportunities for developing scientifically validated, health-oriented dairy products rooted in India's traditional knowledge systems.

IDA Chapters in Bihar, Eastern Uttar Pradesh, Karnataka, Telangana, Tamil Nadu, Kerala, and several other regions organized seminars, technical sessions, awareness campaigns, webinars, rallies, outreach programmes, student competitions, and farmer interaction meetings. These events brought together dairy professionals, researchers, entrepreneurs, students, women farmers, cooperatives, private dairy organizations, and policymakers on a common platform to celebrate the achievements of the dairy sector and deliberate on its future.

A particularly encouraging aspect of this year's celebrations was the strong emphasis on women's empowerment through dairying. Across various programmes, speakers highlighted the transformational role played by women in milk production, animal care, family welfare, and rural entrepreneurship. The success stories of women-led producer organizations, self-help groups, and dairy enterprises served as a powerful reminder that the future growth of Indian dairying will be closely linked to the economic and social empowerment of rural women. As India advances toward higher levels of milk production and value addition, ensuring greater participation of women in leadership, entrepreneurship, and decision-making will remain central to the sector's long-term success.

While we celebrate these achievements, it is equally important to remain attentive to developments that may

influence the dairy sector in the coming months. One such development is the evolving monsoon outlook for 2026. Recent forecasts indicate the possibility of below-normal rainfall during the southwest monsoon season due to the emergence of El Niño conditions in the Pacific Ocean. Rainfall distribution across several parts of the country may remain uneven, with some regions experiencing prolonged dry spells and above-normal temperatures.

For the dairy sector, the implications extend well beyond crop production. Lower rainfall and heat stress can adversely affect fodder availability, increase feed costs, reduce animal productivity, and place additional pressure on water resources. High temperatures also affect animal health, fertility, and milk yields, particularly in climate-vulnerable regions.

At the same time, the sector has become increasingly resilient through improved breeding programmes, scientific feeding practices, fodder development initiatives, and greater farmer awareness of climate adaptation measures. The coming months will require close monitoring and proactive action to ensure adequate fodder availability, efficient water management, and timely support to dairy farmers. The situation reinforces the need to accelerate investments in climate-resilient dairying and sustainable livestock production systems.

The evolving weather situation is also being closely monitored by the global dairy industry. Historically, strong El Niño events have affected pasture growth and milk production in Australia and New Zealand. Although production in major exporting regions has remained positive during the first half of 2026, supported by favourable weather and improved milk prices, a strengthening El Niño could alter this outlook during the second half of the year. Any disruption in Oceania would have significant implications for global dairy commodity markets.

Another noteworthy trend is the rapid growth in demand for high-protein dairy products, including cheese, whey proteins, cottage cheese, and functional nutrition products. As traditional commodity markets mature, processors worldwide are shifting towards higher-value and nutrition-focused offerings. These developments underline the importance for India to not only increase milk production but also strengthen investments in productivity, quality assurance, dairy ingredients, protein products, and value-added dairy segments.

Equally encouraging is the growing emphasis on sustainability across the dairy value chain. A significant milestone in this direction is the introduction of India's

first naturally degradable milk pouch by Mother Dairy, a breakthrough innovation that addresses one of the industry's most visible environmental challenges-plastic waste generated from milk packaging. Such initiatives demonstrate that sustainability and growth can go hand in hand. As consumers become increasingly conscious of environmental impacts, the dairy sector has an opportunity to lead by adopting climate-smart production systems, circular economy practices, sustainable packaging, renewable energy, and resource-efficient processing technologies.

The future competitiveness of Indian dairying will not be determined solely by the quantity of milk produced but also by our ability to produce, process, package, and market dairy products in a manner that is environmentally responsible, economically viable, and socially inclusive. As we move forward, the sector must continue to balance growth with sustainability, productivity with resilience, and innovation with inclusiveness. With the collective efforts of farmers, cooperatives, private industry, research institutions, policymakers, and dairy professionals, I am confident that Indian dairying will continue to serve as a powerful engine of nutrition, rural prosperity, and national development for generations to come.


(Sudhir Kumar Singh)



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Rapid and Specific Detection of Foodborne Pathogens in Milk and Milk Products

K.P. Singh, T. Chakraborty, S. Verma, N. Chaudhary
and A. Kandhari

Milk and dairy products are highly nutritious but can serve as vehicles for foodborne pathogens, posing significant public health risks. Traditional microbiological methods for pathogen detection are often time-consuming and may delay corrective actions. Rapid detection technologies, particularly nucleic acid-based methods such as PCR, real-time PCR, LAMP, and next-generation sequencing, offer faster, sensitive, and specific identification of pathogens in milk and dairy products. These modern approaches enhance food safety monitoring, support regulatory compliance, and help the dairy industry ensure the production of safe, high-quality products.

Introduction

Milk and milk products are rich in nutrients such as protein, vitamins, and calcium. However these nutrients also support growth of pathogens leading to Foodborne outbreaks (Yan *et al*, 2024). Foodborne diseases caused by pathogenic microorganisms, including bacteria, viruses and parasites are major public health concerns. Due to great demands for daily consumption of milk and milk originated products, the microbial safety has emerged as one of the major and important global issues for public health.

Nowadays, milk and milk originated dairy foods mainly raw milk, have been frequently implicated in Foodborne outbreaks. The Dairy production is very rapidly increasing due to high demands in developing countries and making significant contributions to health, nutrition, environments, and livelihoods, with the potential for greater contributions. However, milk and milk originated dairy products can also contribute to human disease in many ways with dairy borne disease.

Milk and other products derived from milk could be important sources for Foodborne pathogens because milk is itself a very good growth medium for microbial growth and their multiplication. The presence of Foodborne pathogens in milk and milk derived products is due to direct contact with contaminated sources in the farm environment. Most of the available milk is pasteurized but still there are several valid reasons such as (1) unpasteurized milk consumed by dairy producers, farm workers (2) cheeses manufactured by unpasteurized milk (3) entry of Foodborne pathogens via contaminated raw milk into the dairy processing plants could lead to subsequent contamination of processed milk products and exposure of pathogenic bacteria to consumers (4) the method of pasteurization may not destroy all Foodborne pathogens in milk and (5) insufficient pasteurization process will not destroy all Foodborne pathogens.

Furthermore, some of the pathogens such as *Listeria monocytogenes* can survive in post-pasteurization processing environments, thus leading to recontamination of dairy products. These pathways pose a risk to the consumer from direct exposure to Foodborne pathogens present in unpasteurized dairy products as well as dairy products that become re-contaminated after pasteurization (Oliver *et al*, 2005). The Foodborne disease in milk and milk products associated with *Campylobacter spp.*, *Salmonella spp.*, shiga toxins producing *E coli*, *Cryptosporidium*, *Brucella*, *Coxiella burnetii*, etc. and some other bacterial toxins produced

Foodborne Pathogens Detection

by *Bacillus*, *Clostridium* and *Staphylococcus spp.* These food pathogens are the major challenge for the manufacturer. Some of the pathogens like *Listeria* and *Coxiella burnetii* are tough bacterium considered for the most heat resistant and non-spore forming pathogens and can survive sometime after pasteurization. *Coxiella burnetii* is the cause of Q-fever in humans.

Traditionally, cultivation methods ranging from plate counting to biochemical characterization have been used to monitor pathogenic microorganisms in foods and dairy products. However these traditional methodologies are laborious and time consuming, requiring from days to weeks to get bacterial growth with the consequence that products are often released for sale before the microbiological results become available. However, these traditional methods as well as their advanced such as cell wall composition analysis, fatty acid analysis often lead to uncertain identification or even misidentification, especially in cases of phenotypically closely related species.

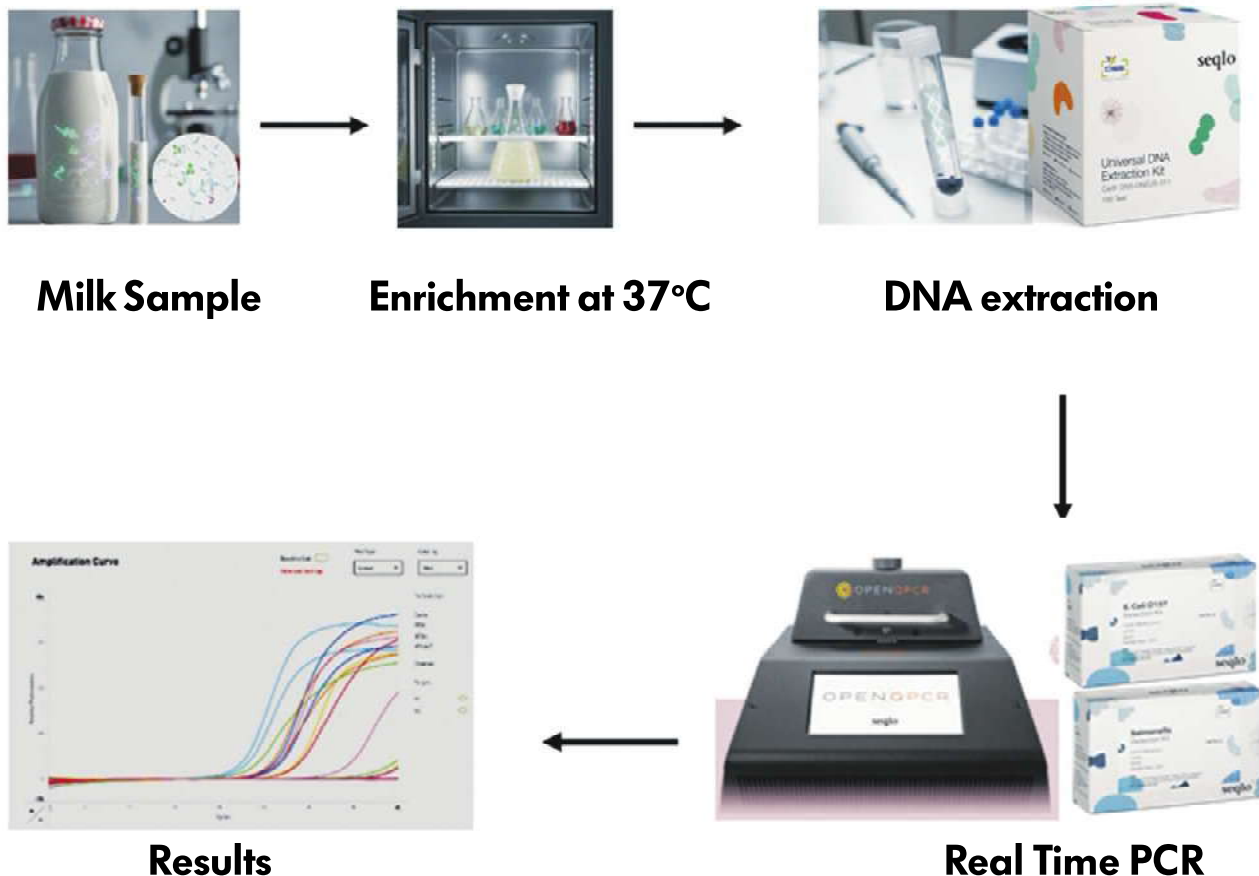
Failure to detect pathogens can have adverse health effects as well as economic losses and fatalities. New approaches based on the application of molecular

methods have been developed for the detection of pathogenic bacteria in milk and milk-based products.

Rapid Methods for Food Pathogens Detection

Recently, different rapid methods with high sensitivity and specificity have been developed to overcome the limitations of conventional methods for the detection and identification of Foodborne pathogens. Researchers are still working to develop novel methods with improvements in terms of rapidity, sensitivity, specificity and suitability for food analysis. Rapid detection methods are important, particularly in food industry, as they are able to detect the presence of pathogens in raw and processed foods immediately. Rapid methods are also enough sensitive to detect pathogens that present in low numbers in the food. Sensitivity is important because a single pathogen present in food has the risk to cause infection. Rapid methods are more time efficient, labor saving and able to reduce human errors. The rapid detection methods are categorized in to nucleic acid based, biosensor-based and immunological-based methods (Zhao *et al*, 2014). Nucleic acid amplification based method has revolutionized the pathogen detection in food industry. These methods are popular due to their ability to

Fig. 1 : Diagrammatic Representations of the Food Pathogens Detection Process



Foodborne Pathogens Detection

accurately detection of the pathogens found in food and food products. Nucleic acid-based methods detecting specific DNA or RNA sequences in the target pathogens by PCR (polymerase chain reaction), RT-PCR (real time polymerase chain reaction) next generation sequencing (NGS), loop mediated isothermal amplification (LAMP) and lateral flow assay (LFA).

PCR is a widely used rapid analytical technique that has revolutionized food safety and quality control it enables the amplification of specific DNA targets, but the conventional PCR-based detection requires post-amplification confirmative analysis which are time and labor consuming. The real time PCR allowing the rapid and sensitive detection of various biological contaminants and adulterants in foods and proved to one of the rapid method for the detection of food pathogens in food and dairy industry. Real-time chemistry provides fast, precise and accurate results. Real-time PCR is designed to collect data as the reaction is proceeding, which is more accurate for DNA and RNA quantification. Now it has been proved to be a common tool for detecting the food pathogens and animal species in milk and milk products in Indian dairy industry. The real time PCR based method for food pathogens detection in different food samples is also approved by the FSSAI as morden, rapid and confirmatory test.

Some companies provide the complete solutions for the Molecular based testing. They offered RT-PCR based system including the real time PCR machine and real time PCR based kits for the detection of different food pathogens such as (*E. coli*, shiga toxin producing *E. coli* O157:H7, *Salmonella*, *Shigella*, *Listeria monocytogens*, *Staphylococcus aureus*, *Brucella*, *Clostridium perfringens*, *Cronobacter/Enterobacter sakazakii*, *Campylobacter jejuni*, *Bacillus cereus* and *Coxiella burnetii*, etc.) in milk and milk products. The kits from some suppliers are highly sensitive, specific, efficient and cost effective. The pathogens kits provide the highly reliable and rapid results compared to traditional culture method and the tests could be performed routinely with the minimum manpower. The kits for food pathogens detection are internally validated with different samples and certified reference materials, these kits are also validated outside from different Laboratories. The process involved for pathogen detection in milk and milk products is

(1) sample collection (2) enrichment of the sample. (Enrichment can enhance the sensitivity of the pathogen detection. The overnight enrichment is also recommended by the FSSAI for pathogen detection in food samples) (3) DNA extraction from the enriched sample (4) amplification with the respective pathogen detection kit and (5) result interpretation with respective positive and negative controls. The RT-PCR system is very handy and suitable for remote areas in Indian context. The system could also be installed in the movable van for onsite screening and monitoring.

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The authors may be contacted through email for references.

Authors

K.P. Singh

Sr. Scientist, DSS R&D Centre
DSS Imagetech Pvt Ltd.
A-5, Mohan Cooperative Industrial Estate
Mathura Road, New Delhi
karn.pratap@dssimage.com



T. Chakraborty

Business Head, FTK Division
DSS Imagetech Pvt Ltd.
A-5, Mohan Cooperative Industrial Estate
Mathura Road, New Delhi



S. Verma

Sr. Manager, FTK Division
DSS Imagetech Pvt Ltd.
A-5, Mohan Cooperative Industrial Estate
Mathura Road, New Delhi



N. Chaudhary

Sr. Executive, DSS R&D Centre
DSS Imagetech Pvt Ltd.
A-5, Mohan Cooperative Industrial Estate
Mathura Road, New Delhi



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Whey Protein Nanoparticles: The Whey Forward

Amandeep Singh, Heena Sharma and
Gaurav Kr Deshwal

Whey proteins, known for their high digestibility, cost-effectiveness, superior nutritional profile, and versatility, are well suited for nanoparticle synthesis. Whey protein nanoparticles (WPNs) can be produced using various methods, such as emulsification–solvent extraction, salting out, desolvation, and electrospraying. WPNs exhibit diverse applications, including the encapsulation of beneficial functional ingredients such as 3,3'-diindolylmethane, riboflavin, zinc, curcumin, epigallocatechin gallate, and ethyl hexanoate, thereby enhancing the antioxidant, antibacterial, and sensory attributes of food systems. WPNs provide an effective platform for the encapsulation, protection, and controlled, targeted delivery of bioactive compounds.

Introduction

Whey protein offers numerous health advantages due to its rich content of macronutrients and vitamins, making it a valuable nutritional source. Whey proteins have recently gained increased attention in the field of food nanotechnology because of their high nutritional value, natural origin, biocompatibility, low cost, GRAS (Generally Recommended as Safe) status and functional properties. Whey proteins are present in milk at a concentration of 5-7 g/L. At the isoelectric point of bovine milk (pH 4.6), casein precipitates and remaining soluble fraction contains whey proteins. Whey proteins consist mainly of β -lactoglobulin (β -Lg), α -lactalbumin (α -La), bovine serum albumin, immunoglobulins. β -Lg is the major whey protein in milk. Whey proteins exhibit several functional characteristics such as emulsification, foaming ability, gelling capacity and binding affinity. These properties come from the unique behaviour of whey proteins under heat, pH change, ionic strength and other processing conditions. Whey proteins often unfold and aggregate to produce nanoparticles that can encapsulate bioactive substances. Moreover, whey proteins interact with lipophilic components to create nano-complexes and can improve the solubility and absorption of compounds poorly soluble in water (Jiang *et al*, 2024). These proteins are globular in nature and their structural properties make them highly useful for producing nanoparticles and nano-delivery systems.

The word nano comes from the Greek word "nanos" which means "dwarf". A nanoparticle may be defined as a substance with dimensions between approximately 1 and 100 nm (ASTM International, 2006). Nanoparticles provide better protection to bioactive compounds and allow their slow and controlled release. Several bioactive substances such as polyphenols, vitamins and other functional molecules generally show poor stability or low absorption inside the human body. Hence, nanoencapsulation is being used to improve stability, protect during digestion and increase bioavailability of functional components (Ha *et al*, 2019). Whey proteins are highly suitable for preparing nano-sized delivery systems because of their high solubility, structural flexibility and ability to interact with various bioactive substances (Jain *et al*, 2018; Jiang *et al*, 2024). Therefore, the use of whey protein nanoparticles has become an important area for improving the delivery of sensitive food ingredients and health-promoting compounds. The present article discusses various methods for the preparation of whey protein nanoparticles, their key properties and highlights their applications in the food science and technology.

Production of Whey Protein Nanoparticles

The production of whey protein nanoparticles mainly depends on the structural flexibility of whey proteins under different physical and chemical processing conditions. Whey proteins can undergo unfolding, aggregation and self-assembly when exposed to controlled heat, pH changes, ionic concentration or desolvation. This results in nano-sized particles suitable for encapsulation and delivery of functional compounds. Different methods such as emulsification, desolvation/coacervation, salt precipitation, electrospraying, heat treatment and pH adjustment are used to prepare whey protein nanoparticles as shown in **Fig. 1**. Each method affects the final structure and properties of the nanoparticles including particle size, surface charge, stability, release behaviour and loading efficiency. For example, heat-induced methods help in controlled denaturation of the protein, while ionic methods help in cross-linking of the molecules. Because of these advantages, whey nanoparticles can be prepared according to the requirement of food formulations and drug delivery systems.

Emulsion or solvent extraction process

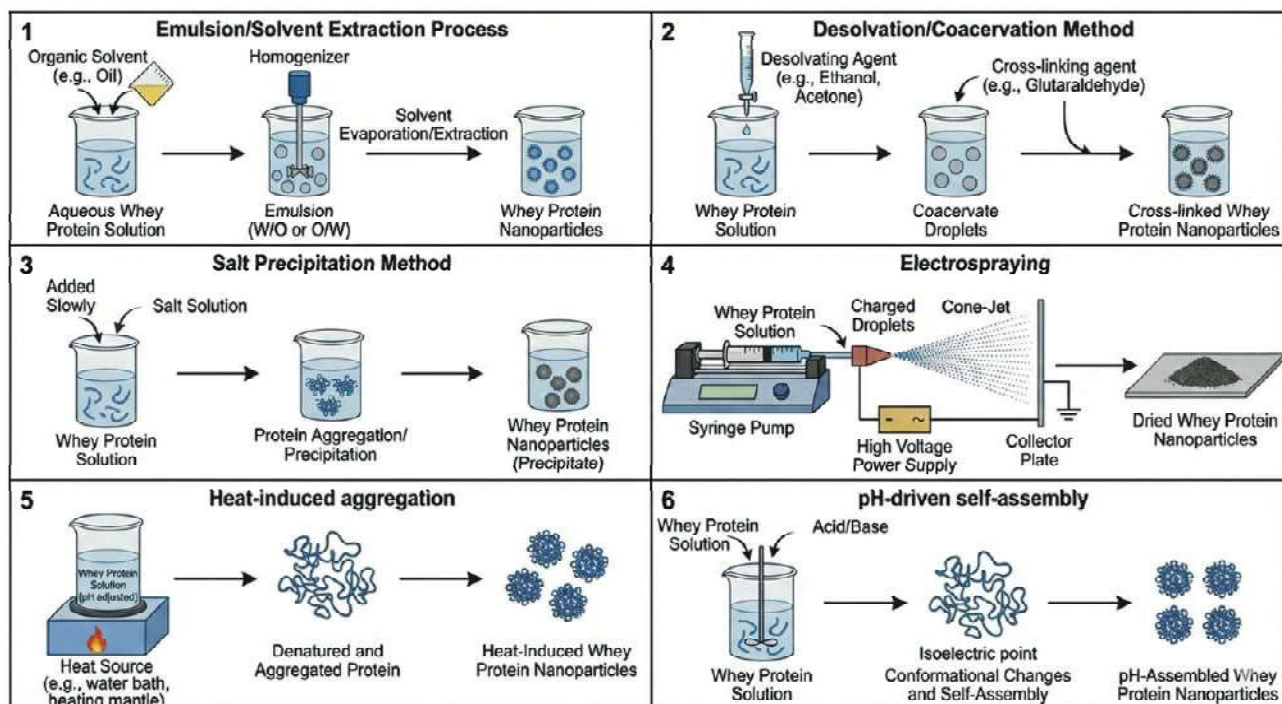
In this method, whey proteins are dissolved in an aqueous phase and subsequently emulsified with an immiscible organic solvent i.e., acetone, cyclohexane or corn oil to create fine droplets. Then, the solvents and non-solvents are taken out to produce the nanoparticles

(Hong *et al*, 2020). The extraction or evaporation of the solvent decreases protein solubility and promotes the controlled aggregation and stabilization of whey protein molecules into nanoparticles. The surfactants such as polyglycerol polyricinoleate (PGPR), sorbitan monooleate and polyoxyethylene sorbitan monooleate can be used for the protein nanoparticles formation. PGPR is the most commonly used surfactant for emulsion formation. Some of the organic solvents such as ethyl acetate, chloroform, polyvinyl alcohol and polysorbate-80 are not recommended for the protein nanoparticles formation as it can affect the biological activity of the protein therapeutics (Hong *et al*, 2020). Spotti *et al* (2024) produced a whey protein nanoparticles using emulsification technique followed by heat treatment (80°C/15 minutes). PGPR and combination of sorbitan monooleate and polyoxyethylene sorbitan monooleate (3:1) in W/O (WPI-corn oil) type emulsion was utilised.

Desolvation or coacervation method

In this method, protein nanoparticles are prepared by addition of desolvating agents i.e., ethanol and acetone in the protein solutions. A desolvating agent alters the native structure of the protein and reduces its solubility resulting in precipitation of proteins as nanoprecipitates. This method offers excellent control over particle size and is useful for encapsulating hydrophobic compounds. Desolvation method is preferred because of its simplicity and produces smaller sized protein nanoparticles (Saif

Fig. 1: Schematic Representation of Various Techniques used for the Preparation of Whey Protein Nanoparticles



et al, 2023). The particle size of whey protein nanoparticles can be controlled by varying pH, temperature, homogenization and type of desolvating agent (Hong *et al*, 2020). Gülseren *et al* (2012) synthesized a stable nanoparticle from whey protein isolate using ethanol as a desolvating agent at pH 3. β -lactoglobulin nanoparticles with 59 nm diameter has also been produced using controlled acetone addition as desolvating agent and later stabilised using crosslinkers such as glutaraldehyde (Ko and Gunasekaran, 2006).

Salt precipitation method

The salt precipitation method involves the production of protein coacervates by promoting hydrophobic-hydrophobic protein interactions in a high salt concentration environment. Similar to desolvation method, salt precipitation technique includes the gradual incorporation of a salting agent into the protein solution instead of desolvating agent. This procedure is often termed as "salting out" and diminishes protein solubility but promotes regulated aggregation of nanoparticles. Whey proteins have charged groups and changing the ionic strength lowers electrostatic repulsion and encourages intermolecular association leading to the formation of nanoparticles in mild aqueous conditions (Hong *et al*, 2020). Salt precipitation is regarded as a straightforward and solvent-free method associated with ionic complexation techniques for the synthesis of whey protein nanoparticles (Saif *et al*, 2023). Salt precipitation method is simple and does not influence the conformational structure and biological activity of the whey protein molecules (Jain *et al*, 2018). The major limitation is the formation of non-uniform size of the nanoparticles.

Electrospraying

In electrospraying, protein solution is ejected from the capillary nozzle in the presence of electric field. The electrical field allows the meniscus to form a jet. Due to the presence of electrostatic force, the pressurized jet is transformed into the nano-sized semi spherical droplets. Nozzle flow rate and electric voltage influence the particle size of whey protein nanoparticles (Chatzitaki *et al*, 2024).

Heat-induced aggregation

Heat treatment causes partial unfolding of native structure of whey proteins and promotes the molecular interactions leading to the formation of nanoparticles. Such heat-induced particles show improved stability and can encapsulate bioactive components by trapping them within aggregated structures (Jain *et al*, 2018). The final characteristics of whey protein nanoparticles depend on temperature, heating time, ionic environment and protein concentration. Whey protein nanoparticles

obtained by heat-induced aggregation is also suitable for food applications as organic solvents are not utilised.

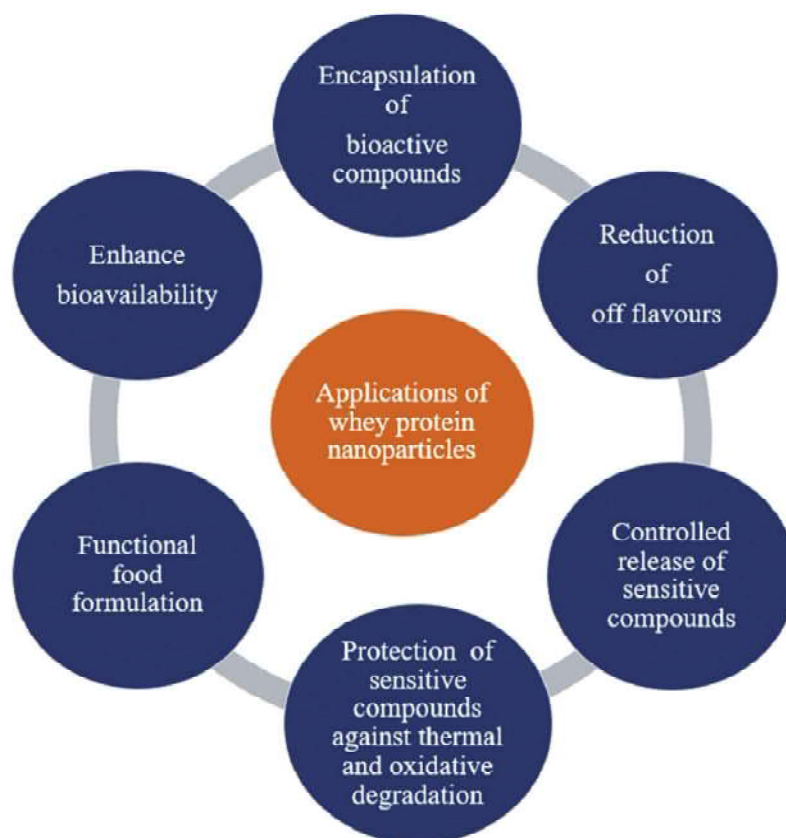
pH-driven self-assembly

The pH adjustment is widely used approach for producing whey protein nanoparticles. The pH reduction leads to partial unfolding of proteins followed by rearrangement into nano-sized complexes. At acidic conditions, whey proteins undergo structural changes that result in nanoparticles while pH neutralisation helps in stabilising the particles (Jiang *et al*, 2024). pH-shift methods are simple and suitable for food-grade nano-formulations.

Properties of Whey Protein Nanoparticles

The size of whey protein nanoparticle affects its properties including stability, mobility and cellular uptake. As the size of nanoparticles decreases, their surface area increases resulting in enhanced stability against aggregation and gravitational separation (Pisoschi *et al*, 2018). Smaller particles exhibit enhanced intracellular absorption, increased mobility and superior cellular uptake. The dimensions of whey protein nanoparticles changes with the adoption of fabrication method employed. Whey protein nanoparticles are majorly found in the shape of nanospheres or nanocapsules and exhibit a spherical configuration with smooth surfaces (Li *et al*, 2024). Spherical shaped nanoparticles of β -Lg had high mobility inside the gastrointestinal tract and facilitated their effective targeting (Liang *et al*, 2024). The zeta potential value serves as a measure of nanoparticle stability. Higher the zeta-potential values, whether positive or negative, signify more repulsive forces between nanoparticles, hence higher stability. Zeta-potential values exceeding ± 30 mV suggest excellent stability, whereas values between -5 to +5 mV shows inadequate stability. β -Lg nanoparticles had zeta potential values between -14.8 to -17.6 mV (Ha *et al*, 2019).

Encapsulating efficiency (EE) represents the proportion of the active ingredient contained within the nanoparticles in relation to the total quantity present. Whey protein nanoparticles generally exhibit high encapsulation efficiency of 80 to 99% (Li *et al*, 2024). High protein content, hydrophobic bioactives, optimum pH and protective coatings enhance the EE. It diminishes under conditions of overloaded and suboptimal ionic environments. The higher concentration of whey protein typically enhances EE due to the increased availability of binding sites for the bioactive. However, excessive concentration may lead to aggregation, diminishing entrapment and EE. Cytotoxicity is defined as the degree to which nanoparticles interact with cells, disrupting cellular structures and impairing the processes essential for cell survival. The size, surface characteristics and composition of nanoparticles can significantly affect their

Fig. 2: Schematic Representation of the Potential Applications of Whey Protein Nanoparticles

interactions with cells and cytotoxicity. Hence, evaluation of cytotoxicity is essential for determining the biocompatibility and safety profile of protein-based nanoparticles. β -Lg and bovine serum albumin nanoparticles showed no cytotoxicity towards Caco-2 cells (Ha *et al*, 2019).

Applications of Whey Protein Nanoparticles

Whey protein nanoparticles are used for the nanoencapsulation of antioxidants, polyphenols, vitamins and essential oil to enhancing their stability, solubility and bioavailability by safeguarding them against oxidative and thermal degradation (Saif *et al*, 2023). The structural characteristics of whey protein nanoparticles provide regulated release of bioactive or sensitive compounds throughout gastrointestinal passage proving their potential as efficient carriers for functional food and nutraceutical applications (Hong *et al*, 2020; Saif *et al*, 2023). **Fig. 2** presents a schematic representation of the potential applications of whey protein nanoparticles. Some of the applications of whey protein nanoparticles are discussed here as follows:

Encapsulation of 3,3'-Diindolylmethane (DIM)

3,3'-Diindolylmethane (DIM) is a bioactive compound naturally present in cruciferous vegetables and

recognized for its antioxidant, anticancer and anti-inflammatory properties. However, its hydrophobic and photolabile characteristics restrict its direct utilization in pharmaceutical or functional food formulations. The encapsulation of DIM with whey protein isolate nanoparticles stabilises and protects it from breaking down for use in food and nutraceutical formulations (Khan *et al*, 2019).

Encapsulation of riboflavin by β -Lg nanoparticles

Riboflavin is crucial for human growth, metabolic processes and health maintenance. It also exhibited efficacy in the treatment of certain cancers *e.g.*, leukemia. However, it is highly light sensitive. Madalena *et al* (2019) successfully used β -lactoglobulin (β -Lg) nanoparticles as carriers to encapsulate riboflavin. β -Lg nanoparticles act as protective shells during the gastric digestion and controlled release of the riboflavin in small intestine.

Zinc delivery and bioavailability enhancement

Zinc is an essential trace mineral required for optimal immunological function, cognitive development and the prevention of paediatric illnesses. Zinc deficiency is also associated with disorders such as impaired cognitive function, diarrhoea, lower respiratory infections, malaria,

Whey Protein

and lower birth weight. However, incorporating zinc into foods frequently alters their sensory characteristics particularly flavor and aroma, hence reducing consumer purchasing likelihood. Whey protein nanoparticles have been used for the effective encapsulation of zinc molecules and masking undesirable taste and odour while enhancing zinc bioavailability (Gülseren *et al*, 2012).

Reduction of off-flavours in omega-3 fatty acid fortification

Omega-3 fatty acids, particularly docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), offer numerous health advantages such as protection against cardiovascular diseases and illnesses associated with aging. However, their incorporation into food products is problematic due to susceptibility to oxidation and pronounced fishy off flavour. The encapsulation of omega-3 oils with whey protein nanoparticles markedly diminished the formation of off-flavours and enhanced their oxidative stability (Ha *et al*, 2019).

Aroma and flavour encapsulation

Whey protein isolate (WPI) nanoparticles derived from denatured whey proteins have been utilized to encapsulate volatile flavor chemicals including ethyl hexanoate. Whey nanoparticles create porous nanostructures that effectively retain flavours. Nano-encapsulation technologies can regulate fragrance release in food and beverage applications, enhance flavor stability and control sensory perception. This underscores the appropriateness of whey nanoparticles for sophisticated flavor delivery applications within the food industry.

Conclusion

Whey protein nanoparticles possess potential applications in food, nutraceuticals and medicinal industry. Various methods like desolvation, emulsification and electrospraying has been used for their production.

Particle size, shape and stability vary depending on the type of method used. Whey proteins produce stable nanoparticles due to their functional groups and adaptable molecular structure. Due to their natural origin, GRAS status and biodegradability, whey protein nanoparticles can be utilized safely in food systems. These nanoparticles enhance the solubility, stability and safety of sensitive bioactive compounds. Additionally, they facilitate controlled release during digestion in the gastrointestinal tract and enhance the efficacy of antioxidants, vitamins, minerals and essential oils in functional foods. Whey protein nanoparticles are found to be safe and efficacious.

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The authors may be contacted through email for references.

Authors

Amandeep Singh

Ph.D. Scholar
Dairy Technology Division
ICAR-NDRI, Karnal, Haryana
amandeepsingh2363@gmail.com



Heena Sharma

Scientist
Dairy Technology Division
ICAR-NDRI, Karnal, Haryana
s.heenavet@gmail.com



Gaurav Kr Deshwal

Scientist, Dairy Technology Division
ICAR-NDRI, Karnal, Haryana
gaurav.deshwal@icar.org.in



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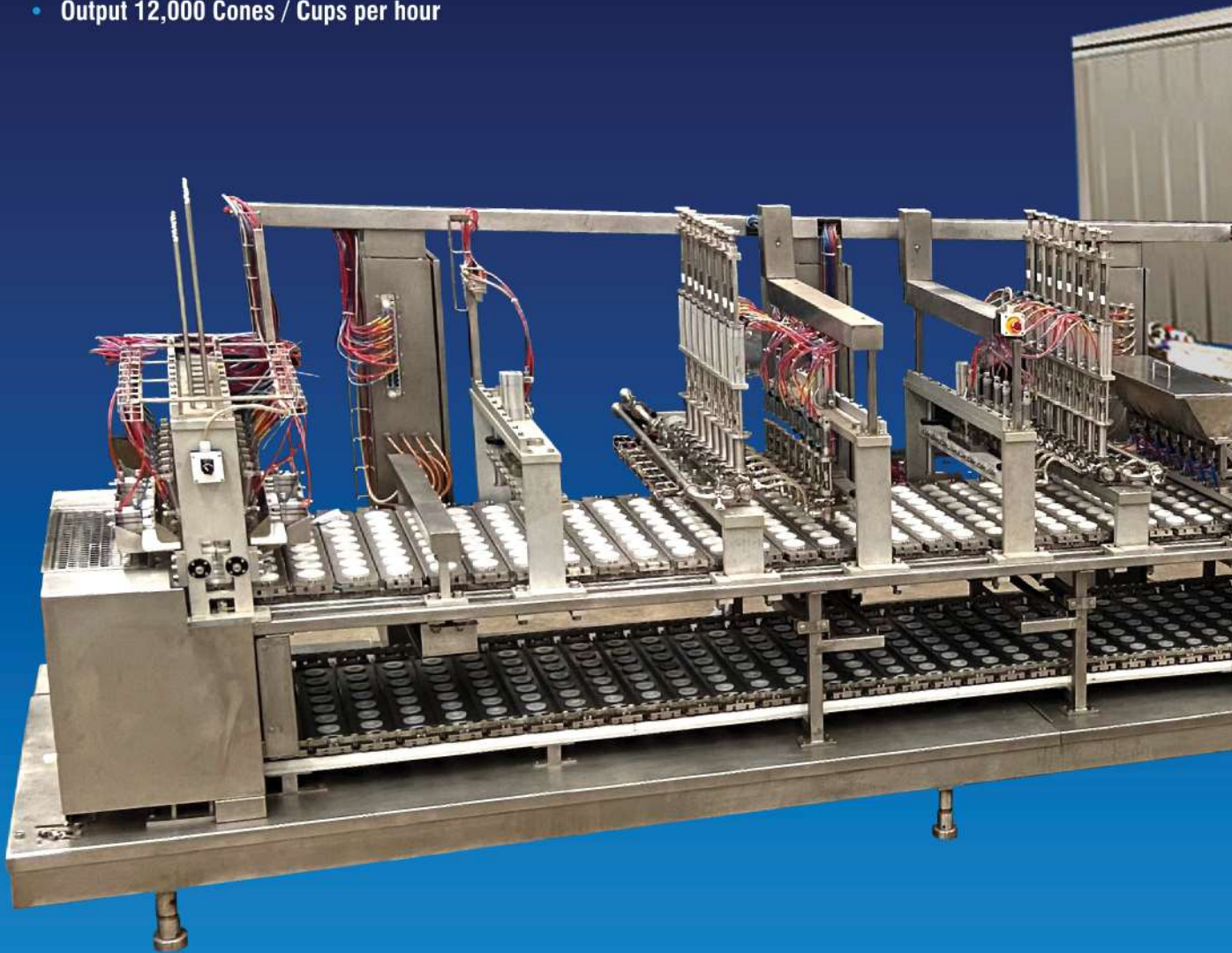


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Calpro Specialties Private Ltd. (Haryana)
Chikkaballapur District Co Operative Milk Producer
Societies Union Ltd. (Kerala)
Creamline Dairy Products Limited (Telangana)
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Hatsun Agro Products Ltd., Chennai (TN)
HAIMS VENTURES LLP (Kerala)
Heritage Foods Limited, Hyderabad (AP)
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IMTB Engineering Pvt. Ltd. (Uttar Pradesh)

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MARKET WATCH

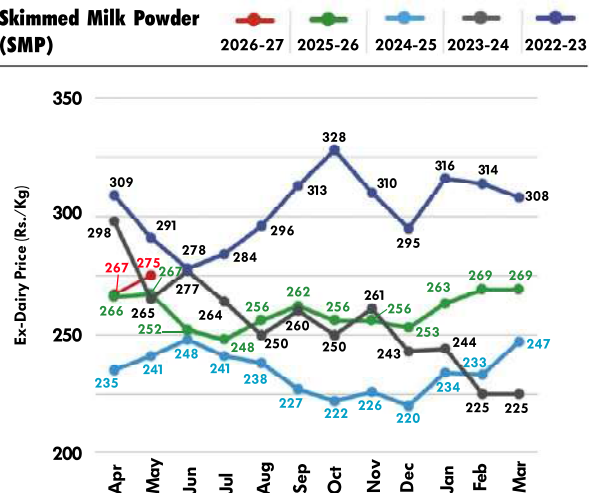
Fresh Pouch Milk MRP (500 ml Pack) as on June 15, 2026

Market	Brand	FAT %			
		3.0	3.5	4.5	6.0
Ahmedabad	Amul	29		32	35
	Maahi	29			35
Bengaluru	Nandini	24	26	27	30
Bhopal	Sanchi	29		32	35
Chandigarh	Verka			33	36
	Vita	30		33	36
Chennai	Aavin	20		22	30
Delhi	Amul	30			36
	DMS	29			35
	Mother Dairy	30		31 ^b	36
Gangtok	Sikkim Milk			35 ^b	
Guwahati	Purabi	32		35	38
Hyderabad	Vijaya	30	30	33	38
Jaipur	Saras	28		31	35
Jammu	Amul	30		33	36
Srinagar	Snow Cap	28		33	
Kolkata	Banglar Dairy	27 ^a		30	
Leh	Ladakh Oma		35		
Lucknow	Parag	30		33	35
Mumbai	Amul		30		
	Gokul	29			38 ^c
	Mahanand		30		
	Mother Dairy		30	31 ^b	
	Warana				37 ^c
Panaji	Goa Dairy	25 ^c	28	30	
Patna	Sudha		28	31	35
Raipur	Devbhog		30	33	
Ranchi	Medha			31	
	Sudha			31	
Shimla	HIM	31		34	37
Thiruvananthapuram	MILMA	28		32	

a : 3.2%, b: 4.0%, c: 6.5%, d: 450ml, e: 475ml, f: 510ml

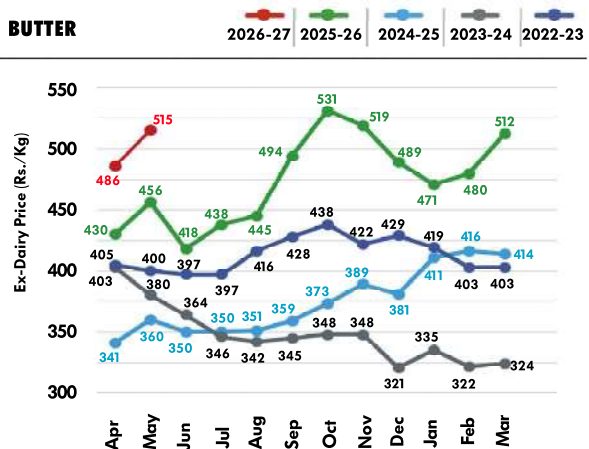
SMP (Weighted Avg.) Price (Rs./Kg)

Skimmed Milk Powder (SMP)



Butter (Weighted Avg.) Price (Rs./Kg)

BUTTER



Source



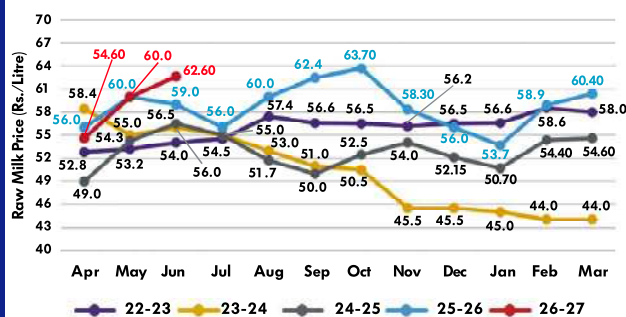
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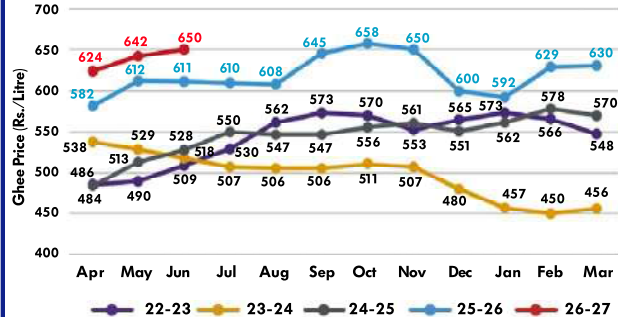
Raw Milk Price (Rs./Litre)

Source: www.vyaparkesari.com

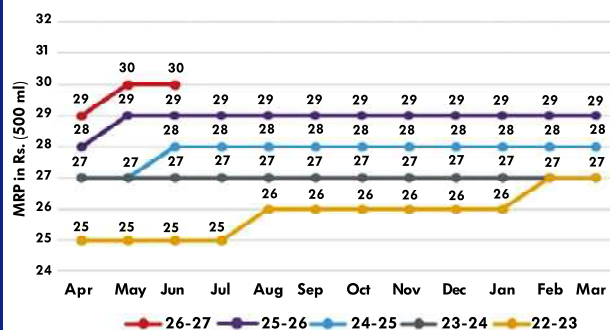


Ghee Wholesale Price (Rs./Kg)

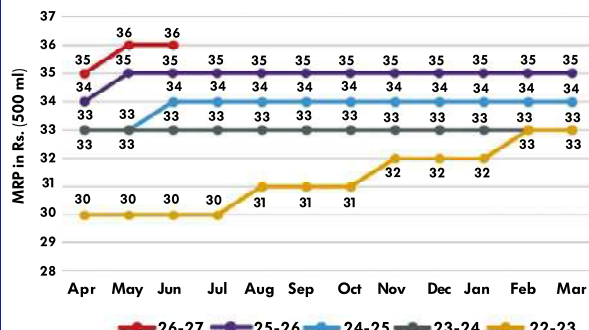
Source: www.vyaparkesari.com



Toned Milk (500 ml pack) MRP in Delhi (Fat 3.0%)

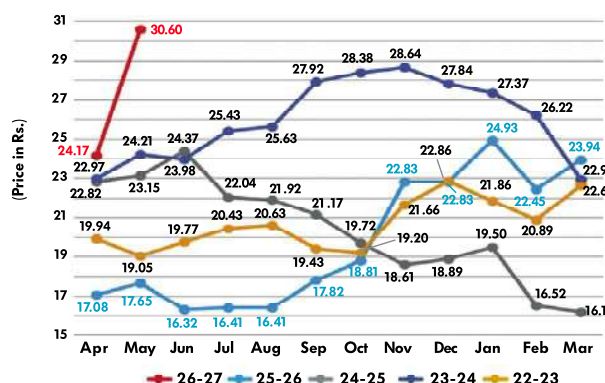


Full Cream Milk (500 ml pack) MRP in Delhi (Fat 6.0%)

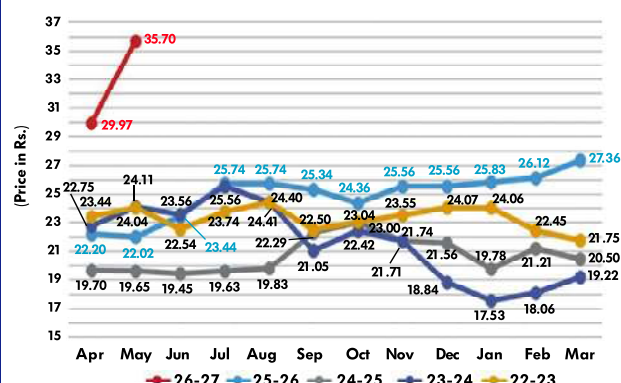


Weighted Average Prices of Cattle Feed Ingredients (FOR Prices in Madhya Pradesh)

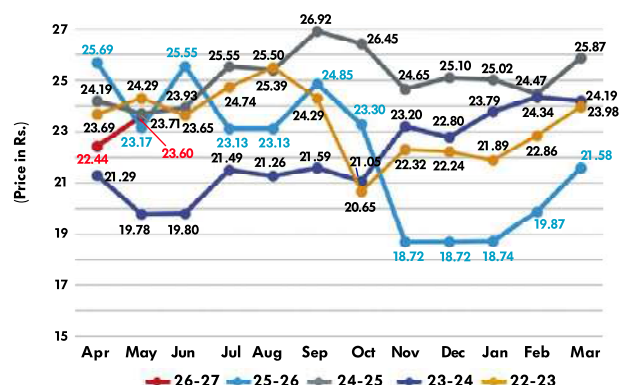
Rapeseed DOC (Rs/Kg)



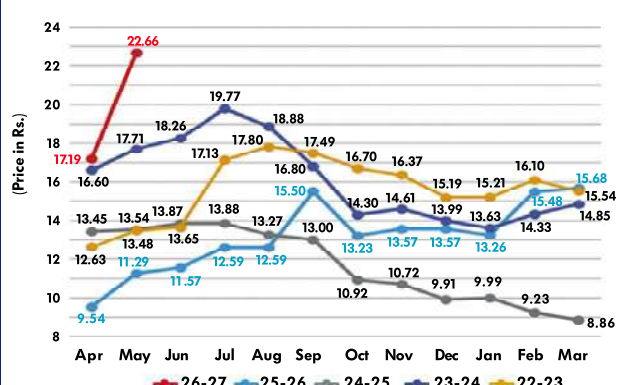
Rice Bran (Rs/Kg)



Maize (Rs/Kg)



De Oiled Rice Bran (Rs/Kg)



Source



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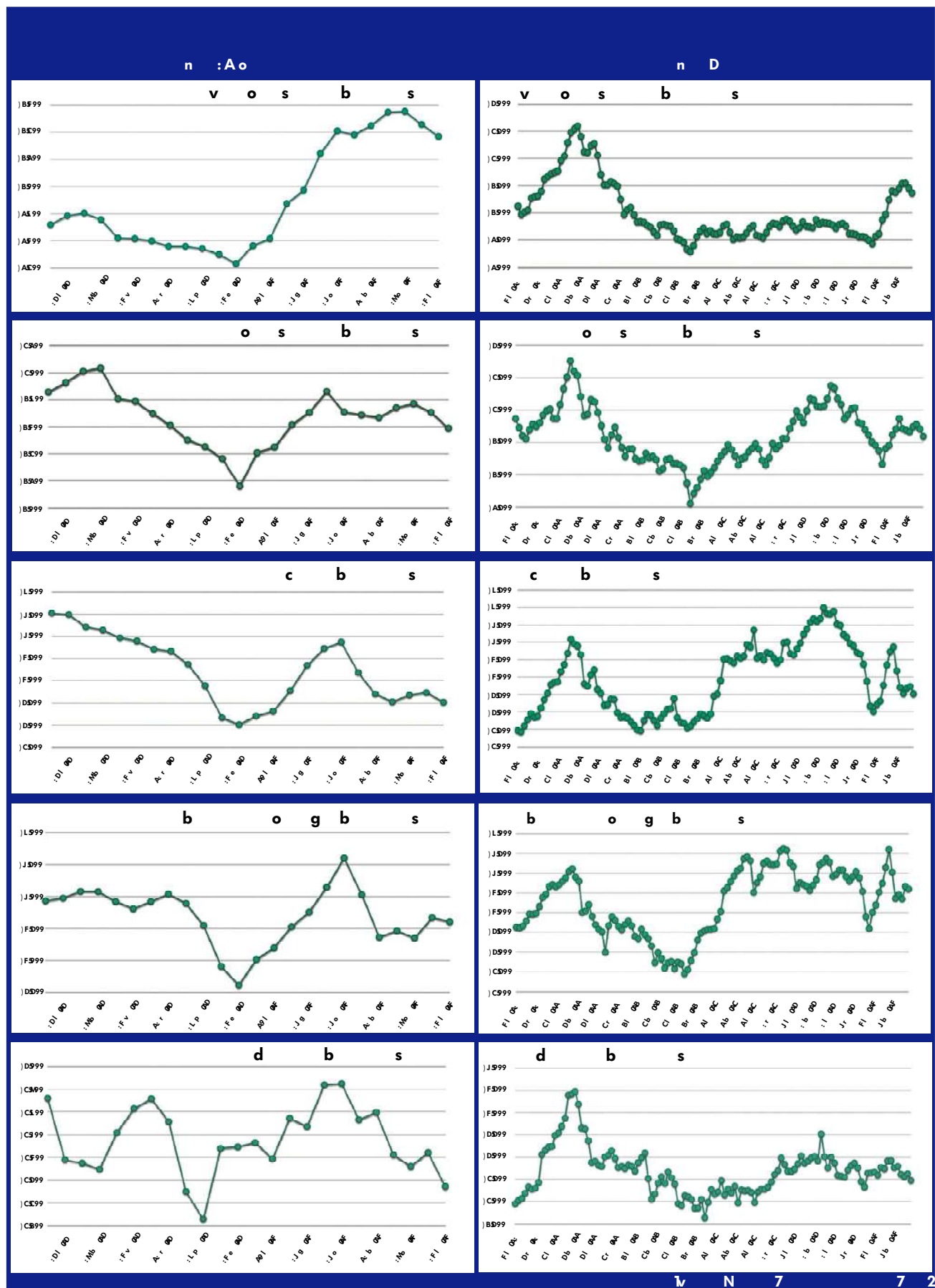
Source



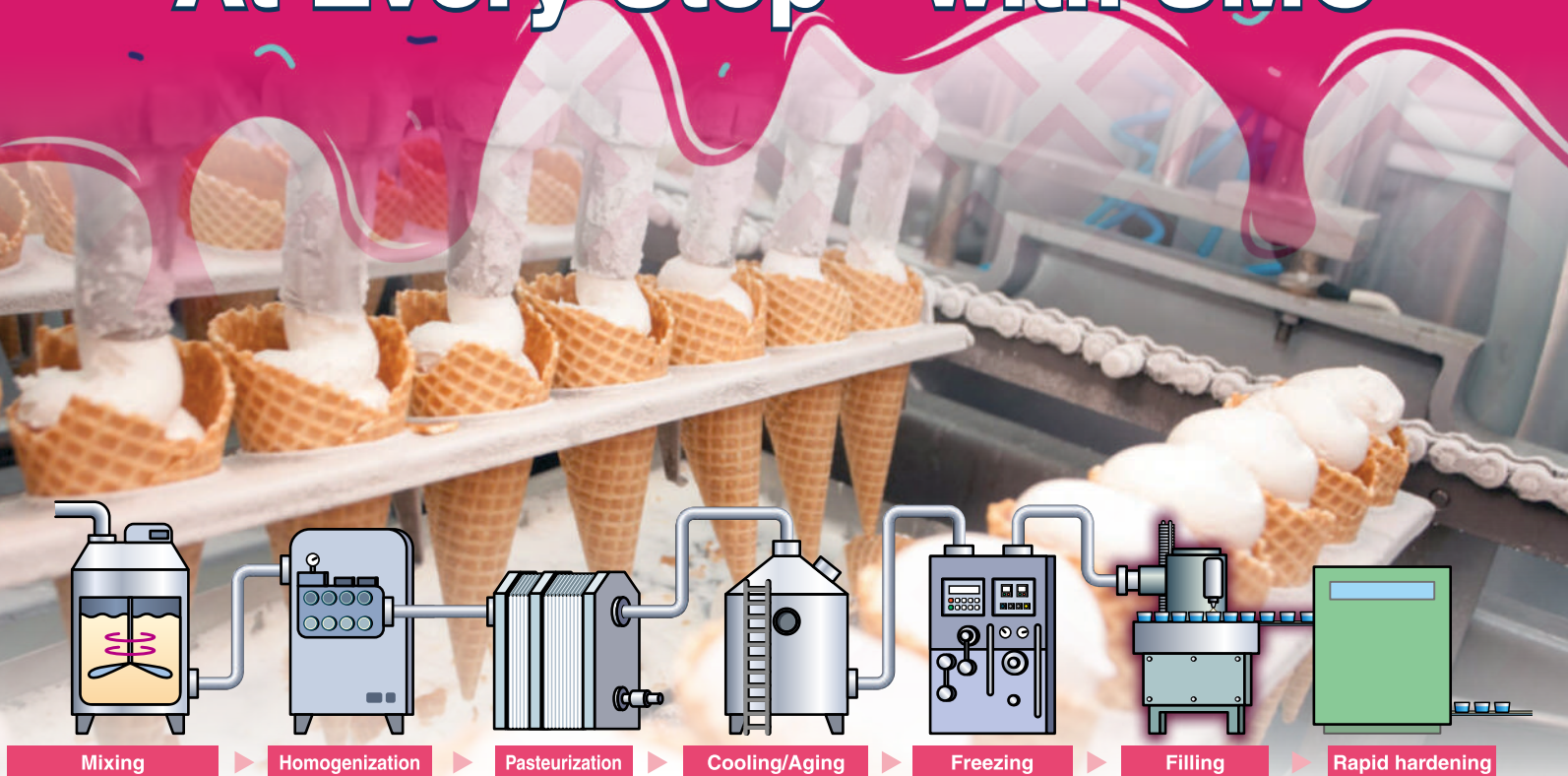
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MARKET WATCH



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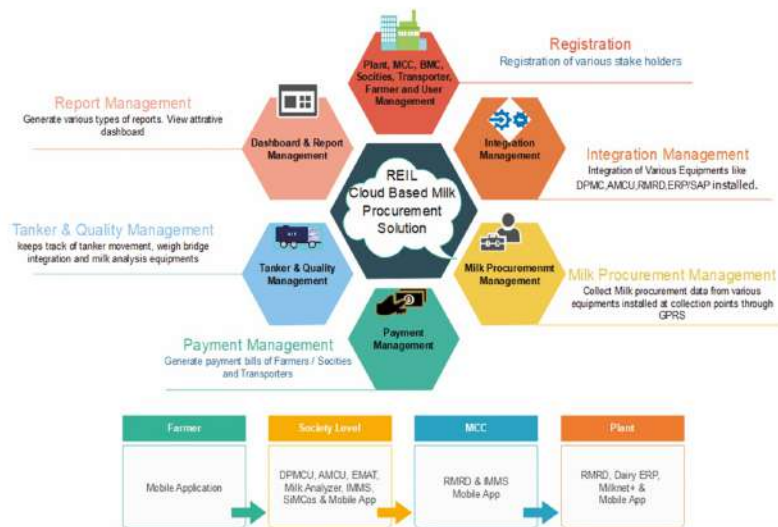
AmulFed Dairy, Gandhinagar is a unit of GCMMF Ltd. GCMMF Ltd. is a national level apex cooperative marketing organization engaged in marketing of milk and milk products under the brand name of AMUL. AmulFed Dairy is also having the poly film manufacturing unit at Gandhinagar. We wishes to empanel/register reputed vendors for Gandhinagar plant and also for PFP unit.

Interested suppliers engaged in manufacturing/processing of various raw materials e.g. polyethylene granules, master batch, metallocene, printing inks for roto-gravure and CI flexo, toluene free inks, printing cylinders, paper cores, Poly tube, plastic scrap converters, chemicals, food grade ingredients & food grade colours, spice powders, stabilizers & emulsifier, lactose, sucralose, coconut oil, jelly's, grocery and crockery items and vegetables, fruit crush and compounds, fruit pulps, dryfruits, fabrication items, hardware items, electrical items, engineering spares, lubricants, stationery items, suppliers engaged in AMC of different equipments/machineries, Dry/cold warehouse owners who can provide suitable space for food products storage, C & F agents may apply for registration (on our website <http://afdpurchase.amul.in/>) with all details with necessary supporting on the website. Transporters who can supply open, closed, container, insulated, refrigerated vehicles for transportation of material within and outside Gujarat can also apply for registration on our above website.

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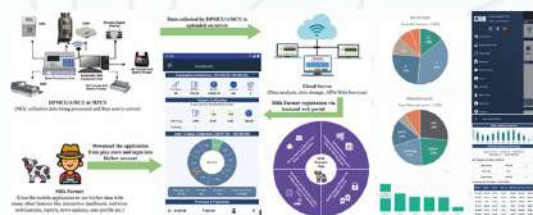
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IDA Celebrates World Milk Day at Head Office

World Milk Day 2026 was celebrated at the Indian Dairy Association (IDA) Head Office by IDA (North Zone) on June 1, 2026. IDA Zones and Chapters across the country also celebrated the occasion with great enthusiasm.

Dr. Rahul Saxena, Chairman, IDA North Zone, welcomed the distinguished Guests of Honour: Shri Raman Wadhwa from the Ministry of Rural Development (NRLM); Dr. Raghu Mallegowda, Executive Director, NDDDB Dairy Services; and Dr. Ashok Kumar Tripathi, Chairman, IDA Western UP Chapter. He also welcomed Dr. M.L. Madan, former Deputy Director General (Animal Science), ICAR; Shri Sudhir Kumar Singh, President, IDA; Dr. S.S. Mann, Vice President, IDA; Shri Ajay Kumar Khosla, Patron and former Vice President, IDA; and Dr. G.S. Rajorhia, former President, IDA.

He spoke about the tradition of celebrating World Milk Day, which was initiated in 2001 by FAO, and invited the dignitaries to participate in the ceremonial lamp lighting. The President, Vice President, and other senior members of the Association felicitated the Guests of Honour with bouquets and shawls.

The programme began with Shri Hariom Gulati, Secretary General, IDA requested the participants to introduce themselves briefly.

Dr. G.S. Rajorhia welcomed Dr. M.L. Madan and highlighted his distinguished achievements, including being conferred the Padma Shri, serving as Deputy Director General (Animal Sciences) at ICAR, and holding the position of Vice-Chancellor at two universities. He expressed his appreciation for Dr. Madan's presence and his longstanding association with and affection for the IDA.

Dr. M.L. Madan, in his brief remarks, thanked the organizers for the invitation and spoke about his close association with the IDA.

Shri Sudhir Kumar Singh, President, IDA, welcomed the distinguished guests and thanked them for participating

in the World Milk Day celebration. In his Keynote address, he recalled his early memories of powdered milk imported from the USA and noted that India was once a milk-deficient country, with per capita milk availability of only 132 grams per day. However, through the collective efforts of farmers, cooperatives, and the private sector, the situation has improved dramatically over the years.

He highlighted that India has been the world's largest milk-producing country since 1998. According to the latest data, the country produced 247.8 million metric tonnes of milk in 2024-25, with per capita availability reaching 485 grams per day. He emphasized that ongoing efforts by various stakeholders are focused on improving animal breeds and productivity, with the goal of increasing average milk yield from the current 2,080 kg per animal per year to 5,200 kg by 2047. Achieving this target could substantially boost milk production and further strengthen India's contribution to the global milk supply.

Shri Singh credited the visionary leadership of Dr. Verghese Kurien and the continued efforts of organizations such as NDDDB in developing the infrastructure required to handle millions of metric tonnes of milk. He also acknowledged the dedication of dairy farmers in producing quality milk. Concluding his address, he expressed confidence that India would continue to break milk production records and further consolidate its position as a global leader in milk production.

Dr. S.S. Mann, Vice President-IDA shared his thoughts on World Milk Day, emphasizing the importance of institutionalized policies and celebrating the significance of milk.

Shri Ajay Kumar Khosla, Patron and former Vice President of IDA, addressed the gathering, acknowledging notable attendees including former President and senior members. He highlighted the importance of celebrating World Milk Day, as it reflects





India's proud achievements and contributions to the dairy industry over several decades.

The discussion focused on India's position as the world's largest milk producer since 1998. He noted the dual challenge of being both the largest producer and consumer of milk, while exports account for less than 1% of total production. He highlighted a growth trend indicating that milk production has historically tripled approximately every 25 years and projected a significant increase by 2047, in alignment with India's *Amrit Kaal* vision.

Projections for 2047 estimate that milk production will reach around 660 million tonnes, while domestic consumption is expected to be about 550 million tonnes, leaving a surplus available for export. The share of exports is projected to increase to 10%. He stressed the need for the dairy industry to focus on quality, traceability, efficiency, cost reduction, and value addition to enhance international competitiveness and ensure the economic viability of dairy farming.

The importance of value addition was emphasized as a key factor in improving farmers' livelihoods, distinguishing India's dairy sector from those of many other countries. Major dairy initiatives, such as Operation Flood and the National Dairy Plan by NDDB, have driven phenomenal growth in the sector. Shri Khosla called for benchmarking quality standards and expanding India's presence in international markets. He praised brands such as Amul for their remarkable progress and extended his best wishes to all brands in the organized dairy sector and to all attendees on the occasion of World Milk Day.

Dr. M.L. Madan expressed gratitude for the invitation and reflects on their lifelong dedication to advancing India's dairy industry. Recalling a conversation with

Dr. Kurien at a World Dairy Conference in Canada, he highlighted the importance of India's dairy industry gaining global recognition and influence. Dr. Madan stressed on the need to create a distinctive brand for Indian dairy, specifically promoting buffalo milk, which is the majority milk produced in India but lacks branding and global recognition.

He emphasised more on branding buffalo milk to resonate worldwide due to its unique qualities. Dr. Madan shared insights from Dr. Kurien on caring for the people who work with dairy animals, emphasizing the importance of improving living standards of milk producers. He raised concerns about low milk consumption, persistent poverty, and child malnutrition in India despite abundant milk production, questioning where the benefits of dairy production are actually reaching.

Dr. Madan further highlighted the necessity of delivering dairy technologies through the farmer to effectively benefit the animals, suggesting a shift in approach to technology dissemination. The goal is to increase milk production averages per cow, with dairy professionals playing a crucial role in this delivery process. He underlined the importance of an efficient animal



WORLD MILK DAY

functioning system supported by current advanced technologies.

Focusing on cutting-edge reproductive technologies like IVF and embryo transfer, Dr. Madan noted the Indian government's significant investment towards multiplying high-producing animals through the Gopala program. He cautioned against using inferior animals in such programs to avoid past mistakes made during early artificial insemination efforts. The success of these initiatives depends on rigorous technical standards, skilled manpower, and strong government commitment to advancing dairy productivity.

Dr. G.S. Rajorhia, former President, IDA, highlighted the significance of World Milk Day, first celebrated in 2001, and noted that India contributes nearly 25% of global milk production. He explained that the Food and Agriculture Organization (FAO) designated 1st June as World Milk Day to recognize milk's role in nutrition, livelihoods, and sustainability. India uniquely observes both World Milk Day and National Milk Day on 26th November, commemorating Dr. Verghese Kurien. Across the country, cooperatives, private dairies, dairy organizations, and agricultural universities mark the occasion through awareness programmes, health camps, and milk distribution activities.

He stated that World Milk Day symbolizes support for the nearly one billion livelihoods linked to the global dairy sector and the billions who consume dairy products daily. Despite challenges such as climate change, poverty, food and water insecurity, and public health concerns, the dairy sector remains vital for food security and zero hunger. He noted that livestock contributes 30.23% to the Gross Value Added (GVA) of agriculture and allied sectors and about 5.5% to the national economy, while dairy contributes around 5% to India's GDP and plays a key role in rural livelihoods, employment, and nutrition.

Dr. Rajorhia outlined major challenges facing the dairy sector, including low productivity, the need for genetic improvement of dairy animals, rising feed and fodder costs, and contamination from aflatoxins, antibiotic residues, and pesticides. He stressed that milk quality and safety are essential for consumer health and export growth, while adulteration continues to hinder progress.

He further emphasized the need to expand organized milk procurement and processing, improve digitization, hygiene, and supply chain efficiency, and address the short shelf life of dairy products. Highlighting that women perform nearly 80% of dairy-related work, he called for women-centric development programmes, skill enhancement, entrepreneurship, and stronger farmer education to ensure the long-term growth and competitiveness of the Indian dairy sector.



The Guest of Honour **Shri Raman Wadhwa**, Director, DAY-NRLM, Ministry of Rural Development, emphasized the crucial role of women in dairy farming and the importance of an organized dairy sector for their economic empowerment. Acknowledging the contributions of Dr. Verghese Kurien to India's dairy development, he highlighted dairying as a major livelihood activity for rural women under the National Rural Livelihoods Mission (NRLM).

Drawing on his experience in rural livelihoods and women-led enterprises, Shri Wadhwa outlined NRLM's efforts to promote women's participation in dairy through exposure visits, capacity building, and apprenticeship-based learning. He noted that millions of women associated with NRLM are engaged in dairy activities, making it an important source of income. However, he stressed the need to strengthen linkages between quality milk production and organized marketing systems.

Sharing experiences from Madhya Pradesh, he described the establishment of women-led dairy producer companies with support from NDDB and NRLM, emphasizing that effective implementation is the key to success. He informed



that 12 dairy producer companies have been formed, benefiting nearly 10 lakh people. He also highlighted the importance of improving milk quality, productivity, and market access while adopting scientific approaches inspired by successful dairy models in countries such as the Netherlands, Brazil, and China.

Shri Wadhwa identified low productivity, poor animal nutrition, and limited adoption of modern feeding practices as major challenges. He emphasized the role of trained community livestock workers (*Pashu Sakhis*), greater private-sector participation, and improved financing, insurance, and CSR support for producer companies.

Concluding, he called for enhanced milk quality testing, farmer training, value addition, and the adoption of emerging technologies such as AI and machine learning. He envisioned a greener, science-driven, and inclusive "White Revolution 2.0" that would improve productivity, quality, processing, and incomes for rural women through collaborative efforts.

The Guest of Honour **Dr. Raghu Mallegowda**, Executive Director, NDDB Dairy Services (NDS), presented the concept of farmer-owned institutions and producer-owned dairy enterprises, emphasizing sustainable livelihoods, efficient dairy value chains, and the transition from women participating in dairying to women leading it. NDS, a subsidiary of NDDB, supports dairy development through large semen stations, a vast network of AI technicians, and advanced technologies such as embryo transfer and sexed indigenous semen.

He explained that producer companies were created as an alternative to traditional cooperatives, combining cooperative principles with the flexibility of company law. These organizations follow voluntary membership, one member-one vote, limited returns on shares, and patronage-based surplus distribution. NDS has established 22 milk producer organizations, with three more upcoming, across 16 states and nearly 42,000 villages. Together, they have a turnover of about Rs. 12,500 crore and are fully owned by farmer members.

Of the 14.85 lakh members, 11.53 lakh are women, and 16 producer companies are exclusively women-owned. These organizations procure around 70 lakh litres of milk daily, while farmers have contributed Rs. 324 crore as share capital. Since inception, the companies have paid over Rs. 60,000 crore directly to farmers through bank transfers on a 10-day cycle. Women receive nearly 78% of these payments, amounting to about Rs. 50,000 crore. Around 85-88% of revenues are returned to farmers, with the remaining 13% covering operational expenses. The companies maintain transparency through automated milk collection

systems, real-time testing, digital receipts, and advanced IT-enabled management.

Dr. Mallegowda highlighted the success of women-owned milk producer organizations, particularly Shreeja, the world's largest women-owned dairy producer company. With 1.3 lakh women members, Shreeja has a turnover of Rs. 1,233 crore, procures 8.33 lakh litres of milk daily, and has paid Rs. 5,845 crore to women producers. It received international recognition, including the IDF Award in 2024.

He also discussed the expansion of women-led producer companies across Rajasthan, Uttar Pradesh, Maharashtra, Madhya Pradesh, Bihar, Bundelkhand, Assam, West Bengal, and Chhattisgarh. Today, 19 of 25 milk producer organizations are women-owned, with women serving as chairpersons and directors. Survey findings showed that 77% of women invest dairy income in livestock, health, education, nutrition, clothing, and household welfare. Regular payments have improved savings, credit access, and economic resilience, making



women-led dairying a powerful model for rural development and empowerment.

The Guest of Honour **Dr. Ashok Kumar Tripathi**, Advisor, SMC Foods Ltd. and Chairman, Western UP Chapter of IDA, highlighted dairy farming as a powerful means of women's empowerment and livestock development through Self-Help Groups (SHGs). He noted that dairying provides rural women with a dependable



source of income, improves livelihoods, promotes financial independence, and enhances their social status. Suitable for small and marginal farmers, dairy farming generates regular household income while encouraging women's participation in decision-making.

Dr. Tripathi emphasized the important role of SHGs in sustainable rural development through savings, credit access, entrepreneurship, and self-reliance. Dairy farming is particularly suited to SHGs as it requires limited land, can be managed at the household level, and provides daily income through milk sales. This financial security improves living standards, education, healthcare, and leadership opportunities for women.

Sharing the success story of SMC Foods Ltd. in Uttar Pradesh, he explained how the company partnered with women SHGs to strengthen milk marketing and income generation. Starting with 150 villages lacking milk collection facilities, the initiative focused on creating market linkages, increasing milk production, generating employment, and improving access to credit. Collaboration with government agencies and HDFC Bank enabled around 1,200 women farmers to access affordable loans, reducing dependence on informal lenders.

The programme later expanded to over 800 villages, with women SHG members becoming major milk suppliers. Direct bank payments ensured transparency and financial inclusion, while nearly 38,000 litres of milk were procured through the initiative this year. Through the Mahila Utthan Trust, SHG members also receive a subsidy of Rs.2 per litre of milk supplied, helping improve cattle management and productivity.

Dr. Tripathi concluded that dairying is not only an income-generating activity but also a pathway to entrepreneurship, financial inclusion, nutrition security, and women's empowerment, contributing significantly to rural economic development.

The session concluded with tokens of appreciation being presented to the speakers, including Dr. M.L. Madan, Shri Raman Wadhwa, Dr. Raghu Mallegowda, and Dr. Ashok Kumar Tripathi, in recognition of their valuable contributions to the programme and their efforts towards rural development.

Delivering the Vote of thanks on behalf of IDA North Zone, Dr. Rahul Saxena expressed his gratitude to the speakers, Guests of Honour, and other dignitaries for their contributions to the World Milk Day celebration, which focused on women's empowerment through dairying. He recalled a pilot project undertaken in the 1990s that revealed that when women control income from dairy enterprises, they tend to prioritize their children's education, healthcare, and savings. This finding led to the development of a women's dairy

programme in Rajasthan, where women-only dairy cooperative societies were established to promote female empowerment in the dairy sector.

Dr. Saxena thanked all participants and dignitaries, including the President, Vice President, and Guests of Honour, for making the event a success. The programme concluded with lunch for all attendees.

ICAR-NIANP and IDA (SZ) Celebrate World Milk Day



The ICAR-National Institute of Animal Nutrition and Physiology (ICAR-NIANP), Bengaluru, in association with the Indian Dairy Association (South Zone), successfully celebrated World Milk Day 2026 by organizing a National Seminar on "**Ayurveda-driven Innovation in Dairy Foods**" at the institute's auditorium with great grandeur on 17th June 2026. The event brought together eminent scientists, academicians, dairy professionals, industry leaders, policymakers, cooperative sector representatives, students, and other stakeholders from across the country to deliberate on the emerging opportunities at the interface of Ayurveda and dairy science.

The programme commenced with an invocation and welcome address by **Dr. Kajal Sankar Roy**, Organizing Secretary, who welcomed the distinguished guests and delegates and emphasized the relevance of integrating traditional Indian knowledge systems with modern dairy science for the sustainable growth of the dairy sector. The ceremonial lighting of the lamp marked the formal inauguration of the seminar.

Delivering the inaugural address via live stream, the Chief Guest, **Dr. Meenesh Shah**, Chairman, National Dairy Development Board (NDDB), Anand, highlighted the remarkable achievements of the Indian dairy sector and underscored the need for innovation, value addition, and consumer-oriented product development. He emphasized that India's leadership in global milk production must be strengthened through science-driven



approaches, technological advancements, and diversified dairy products catering to emerging consumer preferences.

Dr. Satish Kulkarni, Chairman, Indian Dairy Association (South Zone), in his address, stressed the importance of developing novel dairy products rooted in India's rich traditional knowledge and highlighted the role of professional bodies such as IDA in fostering collaboration among researchers, industry, and policymakers.

The Guest of Honour, **Padma Shri Prof. (Dr.) N. Punniyamurthy**, a distinguished veterinarian and proponent of indigenous knowledge systems, elaborated on the immense potential of Ayurveda-based dietary interventions in promoting health and wellness. He emphasized the need for scientific validation and wider dissemination of traditional practices that can contribute to human, animal, and environmental health.

A policy paper entitled "**Reimagining Dairying in Southern India: Integrating Sustainability, Technology & Entrepreneurship**", authored by Dr. Kajal Sankar Roy, Dr. Artabandhu Sahoo, and Dr. Satish Kulkarni, was released during the inaugural session and symbolized the collective efforts of the dairy fraternity towards innovation and knowledge dissemination.

Presiding over the Inaugural session, **Dr. Artabandhu Sahoo**, Director, ICAR-NIANP, Bangalore, highlighted the institute's commitment to advancing research in animal nutrition, physiology, sustainable livestock production, and functional foods. He noted that integrating Ayurveda with dairy science could open new avenues for value addition, entrepreneurship, and nutritional security.



The highlight of the programme was the prestigious Dr. K.K. Iya Memorial Oration, delivered by Padma Shri Prof. (Dr.) N. Punniyamurthy on the topic "**Sustaining India's Dairy Leadership: Integrating an Ecosystem-based Approach for One Health Resilience**." The oration emphasized the interconnectedness of animal health, human health, and environmental sustainability and called for holistic approaches to ensure the long-term resilience of India's dairy sector.

The seminar's second technical session focused on emerging opportunities and regulatory dimensions of Ayurveda-based dairy products. **Dr. Ravishankar** delivered an insightful lecture on "**Ayurveda Aahar - Emerging Prospects for Dairy Products**," highlighting the growing consumer demand for functional foods and the potential of incorporating Ayurvedic principles into dairy product development. Subsequently, **Shri Sachin Achintalwar** addressed the gathering on "**Emerging Regulatory Challenges for Ayurveda Aahara Dairy Products**," providing valuable perspectives on regulatory frameworks, quality standards, product claims, and market acceptance.

The technical sessions witnessed active participation and stimulating discussions among researchers, industry representatives, students, and policymakers. Delegates deliberated on scientific validation of traditional formulations, opportunities for commercialization, regulatory compliance, and future research priorities.

The programme concluded with a vote of thanks delivered by **Dr. N.K. S. Gowda**, Vice-Chairman, IDA (South Zone), who expressed gratitude to all dignitaries, speakers, participants, sponsors, and organizers for making the event a grand success.

The seminar emphasized the vast potential of Ayurveda-driven innovations in dairy foods. It reinforced the need for interdisciplinary collaboration among scientists, industry stakeholders, regulatory agencies, and

policymakers to develop scientifically validated, consumer-centric, and globally competitive dairy products. The event also reaffirmed the commitment of ICAR-NIANP and IDA (South Zone) towards promoting sustainable growth and innovation in the Indian dairy sector.

IDA (West Zone) World Milk Day Celebrations

The Indian Dairy Association (West Zone) organized the World Milk Day celebrations at Juhu Beach, Mumbai, on 1st June 2026, starting from 7 am to 9 am. The program aimed to reach out to the general public to educate them on the nutritional goodness of milk and highlight the crucial role of the dairy sector in health, nutrition, and the rural economy.

The event saw an enthusiastic turnout of approximately 250 fitness enthusiasts who joined the session during their morning exercise and walks. The program was anchored by **Shri Madhav Patgonkar**, Secretary, IDA (WZ). The dignitaries who attended the event included Shri Arun Patil, Vice President, IDA; Dr. J.B. Prajapati, Chairman, IDA (WZ); Dr. J.V. Parekh, Vice Chairman, IDA (WZ); Shri Shyju Sidharthan, Vice Chairman, IDA (WZ); Shri Anil Hatekar, Treasurer, IDA (WZ); and Shri Rajesh Lele, Member, CEC.



Technical interactive sessions were organized on the event, addressing common consumer queries and clarifying myths:

- **Nutritional Value:** **Shri Arun Patil** emphasized that milk is a "complete food" and explained the economic distribution of consumer purchases to the farmers.
- **Health and Quality:** **Shri Anil Hatekar** compared the wholesomeness of cow/buffalo milk against plant-based alternatives and provided practical advice for

consumers on purchasing quality paneer, recommending that consumers compare prices with milk and opt for branded products. He also acknowledged the vital contribution of women farmers in the dairy sector.

- **Nutrition and Health:** **Shri Rajesh Lele** highlighted that a single glass of milk provides essential nutrition for optimal organ function, describing it as one of the safest and fastest sources of nutrition for individuals.

Consumer Engagement and Collaboration

A key focus of this year's celebration was the ongoing collaboration with the Mumbai Grahak Panchayat to educate citizens on milk adulteration. The association highlighted their initiative of providing two testing



machines to support transparency and quality assurance for consumers. Representatives from the Mumbai Grahak Panchayat also addressed the gathering, reaffirming their commitment to representing and protecting consumer interests.

The association extends its sincere gratitude to Mahananda, Warana, and Gokul dairies for their active support. These organizations provided flavoured milk and chhaas to all the fitness enthusiasts in attendance, which greatly enhanced the outreach and engagement of the event.



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IDA Karnataka State Chapter

The World Milk Day celebrations were held on 2nd June 2026 at the Verghese Kurien Memorial Hall of the Dakshina Kannada Co-operative Milk Producers' Union (DKMUL), Mangaluru. The event was jointly organized by DKMUL and the IDA Karnataka State Chapter (KSC). About 200 dairy farmers, predominantly women, along with milk society staff and artificial insemination (A.I.) workers, participated in the programme.



The event commenced with an invocation by Mrs. Shakuntala, followed by the traditional lighting of the lamp by the dignitaries on the dais. **Shri Uday S. Kotiyan**, Vice President, DKMUL, delivered the welcome address. The programme was presided over by **Shri Raviraj Hegde**, Chairman, DKMUL. **Dr. Satish Kulkarni**, Chairman, IDA South Zone was the Guest of Honour.

The dignitaries from IDA KSC present on the occasion included **Shri N.B. Marathe**, Chairman; **Shri B.N. Vijayakumar**, Vice Chairman; and **Shri Vijayendra Deshpande**, Secretary.

In his address, **Shri Raviraj Hegde** highlighted dairy farming as an important avenue for women's economic

empowerment. He noted that India ranks first globally in milk production, with rural communities contributing nearly 80% of the country's milk supply. He also informed that DKMUL's milk procurement increased from 3.30 lakh litres per day last year to 4.70 lakh litres per day this year.

Shri J. Jaikumar, Managing Director, DKMUL, spoke on the global significance of World Milk Day and highlighted the cooperative's operational growth, market expansion, and organizational achievements.

Dr. Satish Kulkarni, Chairman, IDA South Zone, urged the government to provide interest-free or low-interest loans and enhanced subsidies for the dairy sector, similar to those available to agriculture.

The technical session was moderated by **Dr. N.V. Belavadi**, former Executive Director, NDDB, and **Dr. Hosamani S.V.** The presentations focused on recent

advancements in dairy farming:

- **Profitable Dairy Farming:** **Dr. Raghavendra K.** outlined the financial benchmarks essential for sustaining long-term profitability.
- **Feeding Management and Forage Preservation:** **Dr. Shivakumar R.** emphasized optimal nutrition and advanced forage preservation techniques, particularly silage making, to maintain milk quality during lean seasons.
- **Women Dairy Farmers Driving Milk Production, Family Welfare and Economic Growth:** **Dr. B.P. Suresh** highlighted how empowering women through dairy

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cooperatives contributes to improved family welfare and broader economic development.

The **IDA KSC awarded cash prizes** to DKMUL's top-performing dairy farmers for 2025: Mrs. Jameela (Piligoodu MPCS - 457 litres/day), Mrs. Limala Lynette Gonsalves (Padumarnadu - 360 litres/day), and Mrs. Suma K. (Udupi Hiriyadka - 352 litres/day).

The dignitaries from the DKMUL Board of Directors present during the event included Shri Belapu Deviprasad Shetty (KMF Board Representative), Mrs. Sucharitha Shetty, Shri Sudhakar Shetty, Mrs. Savitha Shetty, Shri Nandaram Rai, Mrs Mamatha R Shetty and Mr Shivamurthy Upadya.

The event was coordinated by Dr. Madhusudan Kamat (Administration) and Shri Sachin (Marketing), both from DKMUL. Mrs. Janet Rosario compered the programme, while the vote of thanks was proposed by Dr. Raviraj Udupa and Shri B.N. Vijayakumar. The programme concluded with a grand community lunch hosted by DKMUL.

IDA Tamil Nadu Chapter Commemorates World Milk Day with a Special Webinar

The Indian Dairy Association (IDA), Tamil Nadu Chapter, commemorated World Milk Day 2026 on June 4 by organizing a Special Webinar on the theme "**Dairying for Cleaner Food and a Healthier World: Role of Women.**" The event brought together dairy professionals, academicians, students, farmers, and industry stakeholders to recognize and celebrate the vital contributions of women to sustainable dairy development.

The webinar commenced with a welcome address by **Shri K.S. Kanna**, Chairman, IDA Tamil Nadu State Chapter, who highlighted the significance of World Milk Day in promoting the nutritional, economic, and environmental importance of milk and dairy farming. He emphasized the indispensable role of women across the dairy value chain, from animal husbandry and milk production to household nutrition and rural livelihood enhancement.

Delivering the World Milk Day message, **Shri C.P. Charles**, Central Executive Committee Member, IDA, New Delhi, underscored the need to empower women dairy farmers through improved access to technology, training, finance, and market opportunities. He noted that women continue to be the backbone of India's dairy

sector and play a crucial role in ensuring food security and sustainable agricultural growth.

The Keynote address was delivered by **Dr. Punniamurthy Natesan**, Padma Shri Awardee (2026), on the theme of the Webinar. He highlighted the significant contributions of women-led dairy enterprises in enhancing animal welfare, improving milk quality, promoting environmental sustainability, and strengthening family nutrition. He emphasized that empowering women in dairy farming not only increases productivity but also contributes to resilient rural economies and sustainable food systems.

Dr. Punniamurthy Natesan further discussed the growing importance of climate-smart dairy practices, effective animal health management, and capacity building among women dairy entrepreneurs. He encouraged all stakeholders to create an enabling ecosystem that recognizes, supports, and rewards the contributions of women in the dairy sector.

The webinar witnessed the participation of around 100 delegates, including Shri Arun Patil, Vice President, IDA, and Dr. J.V. Parekh, Vice Chairman, IDA (West Zone). The programme also featured an interactive question-and-answer session, during which participants engaged in meaningful discussions on sustainable dairying, women's leadership, animal health, and emerging opportunities in the dairy industry.

The programme concluded with a Vote of thanks delivered by **Dr. T.R. Pugazhenth**, Secretary, IDA Tamil Nadu State Chapter, who expressed his gratitude to the keynote speaker, distinguished guests, participants, and organizers for making the event a grand success.

The webinar reinforced the message that women are key drivers of sustainable dairy development and play a pivotal role in building cleaner food systems, healthier communities, and a greener future.





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IDA Telangana State Chapter Organizes an Awareness Rally Across Kamareddy town



The Indian Dairy Association (IDA) - Telangana Chapter marked World Milk Day 2026 with great enthusiasm at the College of Dairy Technology, PVNRT Veterinary University, Kamareddy, Telangana.

The celebration aimed to highlight the nutritional value, health benefits, and economic significance of milk in daily life, in line with this year's global theme of promoting milk as a wholesome and sustainable food.

As part of the celebration, students and faculty of the College of Dairy Technology organized an awareness rally across Kamareddy town, carrying placards and raising slogans to promote the benefits of milk, balanced nutrition, and the importance of consuming safe and hygienic dairy products. The outreach programme also included the distribution of buttermilk to the general public, emphasizing milk's role in hydration and health, particularly during the summer season, while encouraging the consumption of traditional dairy-based beverages. In addition, a quiz programme

on dairy science, milk nutrition, and the dairy sector was conducted for students. The interactive session witnessed enthusiastic participation, and the winners were felicitated with prizes to encourage young talent in the dairy field.

The event witnessed active participation from senior dignitaries of the university. Dr. Suresh Rathod, Associate Dean, College of Dairy Technology, led the programme and addressed the gathering on the importance of strengthening the dairy value chain from farm to consumer. Senior Professors Dr. Umapathi and Dr. Swarnalatha also participated and shared insights on quality milk production, food safety, and career opportunities in the dairy industry.



The programme concluded with a pledge by students and faculty members to continue promoting awareness about the nutritional richness of milk and to support dairy farmers in Telangana.

The IDA Telangana Chapter expressed its gratitude to PVNRT Veterinary University, Kamareddy, for hosting the event and reaffirmed its commitment to celebrating World Milk Day as a platform for education, outreach, and industry collaboration.

IDA Kerala Chapter Celebrates World Milk Day at VKIDFT, Mannuthy

The Indian Dairy Association (IDA), Kerala Chapter, in association with the Students' Union of Verghese Kurien Institute of Dairy and Food Technology (VKIDFT), Mannuthy, celebrated World Milk Day 2026 from June 1 to June 5 with a series of engaging and informative

programmes under the theme "Celebrating Women Farmers."

The celebrations commenced on June 1 with the release of a poster highlighting the World Milk Day theme by Dr. A.K. Beena, Dean, VKIDFT. A special video paying tribute to the dedication and hard work of women dairy farmers was also released on the occasion.

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WORLD MILK DAY

From **June 2 to June 4**, a variety of competitions and outreach activities were organized for students.

On **June 2**, the "Snapshot - Pic with Your Favourite Dessert" competition was conducted. Participants submitted photographs of their favourite desserts along with suitable captions. The entries were evaluated by a panel of judges based on creativity, originality, and photographic quality.

On **June 3**, the "Adverse - Advertisement Photo Recreation" competition was organized. Participants were provided with



dairy products and challenged to recreate popular advertisement photographs. The event proved to be both engaging and educational, enabling students to explore product features and marketing concepts in a creative manner.

On **June 4**, students visited a nearby special school as part of the outreach programme. They interacted with the children through various fun-filled activities, fostering joy and meaningful connections. Sweets were distributed to the students.

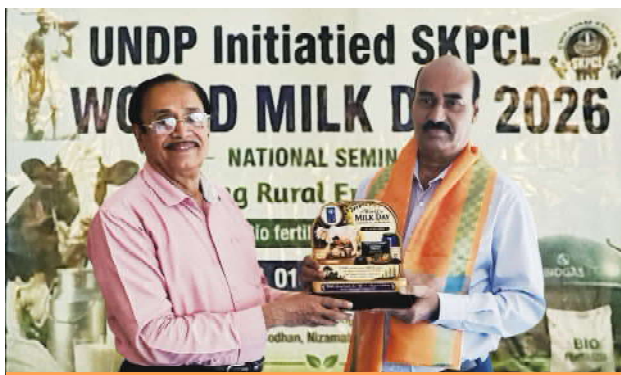
On **June 5**, participants took part in an Open Quiz on Dairy Products and a unique programme titled "Dairy Decides - Dairy Products Election." In this innovative and entertaining event, five dairy products were assigned to students, who campaigned by impersonating the products and highlighting their benefits. Following the campaign presentations and a question-and-answer session, teachers cast their votes to elect the winning product. The programme combined fun, creativity, and dairy education, making it a memorable experience for

all participants.

The valedictory function was graced by Ms. Anu Joseph, Founder of Casaro Creamery, as the Chief Guest. She shared her inspiring entrepreneurial journey and the experiences that led to her success. Dr. P. Sudheerbabu, Associate Patron, delivered the World Milk Day message. The function was presided over by Dr. A. K. Beena, Dean, VKIDFT.

The celebration concluded with the distribution of attractive prizes to the winners of the various competitions. The five-day programme promoted awareness about the dairy sector while recognizing the invaluable contributions of women dairy farmers and fostering student participation through innovative and enjoyable activities.

UNDP-initiated Project SKPCL Organizes a National Seminar on Sustainable Rural Development



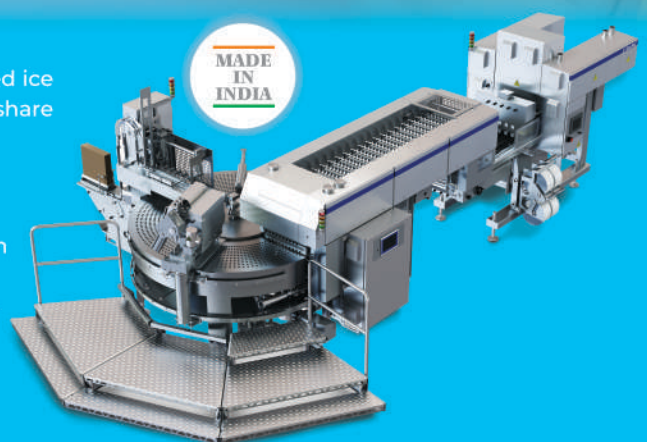
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The UNDP-initiated Project SKPCL organized a National Seminar on "**Bioenergy, Biofertilizers and Sustainable Rural Development**" on the eve of World Milk Day 2026, bringing together policymakers, scientists, dairy professionals, and farmers to discuss sustainable solutions for rural development.

Addressing the gathering, **Dr. Raja Rathinam**, Managing Director of Project SKPCL, highlighted the challenges of energy insecurity, rising fertilizer costs, climate change, and environmental degradation. He emphasized the immense potential of cattle dung and biodegradable waste in generating clean energy, improving soil health, reducing dependence on imported LPG, and strengthening rural livelihoods.

In his special message, **Shri P. Sudarshan Reddy Garu**, Advisor to the Government of Telangana with Cabinet Minister rank, urged the people of Waddepally to transform their village into a "Bio Village" and set an example for rural India. Representing Shri Vakalapudi Krishna Rao, Shri Ramulu encouraged farmers to adopt measurable targets for replacing LPG with biogas and chemical fertilizers with biofertilizers.

Shri Madhusudan Rao, General Manager, Telangana State Dairy Development Cooperative Federation, highlighted the vision of Milk Federation Chairman Shri Gutha Amit Reddy. Prof. (Dr.) K. Hanumantha Rao and Shri C.H. Ashok emphasized the benefits of sustainable farming practices and the effective use of backyard manure.

Representing the National Dairy Research Institute, Dr. Laxman Naik conveyed the message of Mrs. Varsha Joshi, Additional Secretary (CDD/Trade/CE&P), DAHD, Government of India, stressing the importance of the seminar's theme.

In his address, **Shri G. Mohan**, representing the Community Development Centre and a former banker and Air Force officer, underscored the importance of translating visionary ideas into time-bound actions.

During the interactive session, **Shri Papa Rao**, a progressive organic farmer, along with several farmers, appealed to the Government to provide subsidy and incentive support for village-level entrepreneurs engaged in the production of biogas

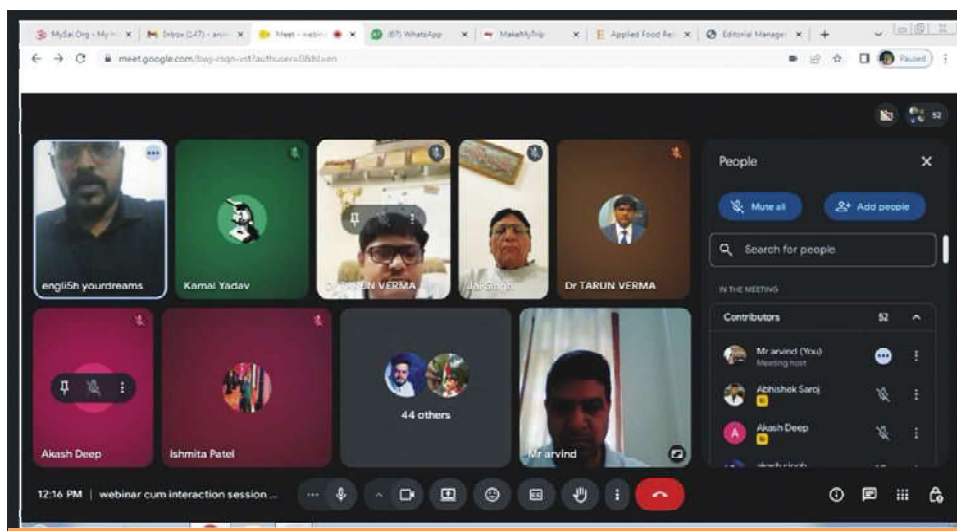
and biofertilizers. Representing the District Administration, Nizamabad, Shri Siddhi Rameshwar assured all possible support for the successful implementation of the seminar's recommendations.

A highlight of the event was the commitment announced by Shri Kommatti Satyam, Sarpanch of Waddepally, towards the Bio Village initiative. The Board of Directors of Project SKPCL also honoured Shri B.V.K. Reddy, Central Executive Committee Member of the Indian Dairy Association, for promoting the effective use of backyard manure. The seminar concluded with a vote of thanks by Shri C.H. Naveen, an ex-Army serviceman.

IDA Eastern UP Chapter Marks World Milk Day with Awareness Programmes on Safe Milk, Nutrition and Food Safety

The Indian Dairy Association (IDA), Eastern UP Chapter, in collaboration with the Department of Dairy Science and Food Technology, Institute of Agricultural Sciences, Banaras Hindu University (BHU), celebrated World Milk Day 2026 through a series of academic and public awareness programmes aimed at promoting safe milk, nutrition, food safety and consumer awareness. The events attracted enthusiastic participation from students, research scholars, faculty members and members of the public.

The celebrations commenced with a webinar on the theme, "**Safe Milk, Healthy Future: Ensuring Nutrition in a Changing World.**" Addressing the participants, Shri Nitish Sathyan highlighted emerging career opportunities in the food industry and emphasized the growing importance of quality assurance, food safety



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and certification. He encouraged students to acquire industry-relevant skills and certifications to enhance their global employability.

Delivering the second Keynote address, **Dr. Chandan Pandey**, Assistant Commissioner, Food Safety and Drug Administration, Government of Uttar Pradesh, spoke on innovation and entrepreneurship opportunities in the dairy sector. He noted that India's position as the world's largest milk producer offers immense scope for value addition, start-ups and dairy-based enterprises, while stressing the importance of adherence to food safety standards.

The second phase of the celebrations featured the "**Food Safety on Wheels**" outreach programme at the Vishwanath Temple area of BHU. The mobile food testing laboratory emerged as a major attraction, drawing hundreds of students, university staff, research scholars and local residents. **Shri Koushlendra Sharma**, Assistant Commissioner-II, Food Safety and Drug Administration, Varanasi, emphasized that food safety is a shared societal responsibility and urged consumers to remain vigilant about food quality, hygiene and labelling. **Shri Amit**, Chief Food Safety Officer, highlighted the role of public awareness initiatives in promoting safe food practices.

Experts conducted live demonstrations on detecting adulteration in milk and other food products, providing participants with practical insights into food quality testing methods.

Prof. R.K. Duary, Head of the Department, underscored the importance of World Milk Day as a platform for promoting nutrition security, food quality and public health. The programmes were organized under the guidance of **Dr. Arvind**, Chairman, IDA Eastern UP



Chapter, and **Dr. Tarun Verma**, Secretary, who emphasized the need for continued collaboration among academia, industry and government to strengthen food safety awareness and nutrition security across society.

IDA Bihar Chapter Organises World Milk Day Seminar in Patna

The Bihar State Chapter of the Indian Dairy Association (IDA) organised a workshop-cum-seminar to mark World Milk Day at the conference hall of Naturals Dairy Pvt. Ltd., Patliputra Industrial Area, Patna. The event brought together dairy professionals, industry representatives, academicians and students to discuss the role of the dairy sector in nutrition, rural development and economic growth.



The programme was held under the leadership of **Shri Dharmendra Kumar Srivastava**, Chairman, IDA Bihar State Chapter, a veteran dairy professional with over 35 years of experience in the cooperative dairy sector. The seminar was jointly inaugurated by **Shri Srivastava**; **Shri Hemant Das**, Managing Director, Naturals Dairy Pvt. Ltd.(NDPL); and **Shri Chanapya**, Director, NDPL Patna.

In his address, **Shri Hemant Das** highlighted the importance of innovation, quality assurance, consumer satisfaction and sustainable business practices in driving the growth of the dairy industry. **Shri Srivastava** emphasised the significance of World Milk Day in recognising the contributions

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of milk producers, cooperatives, private dairies and other stakeholders. He also underlined the sector's role in

milk consumption and supporting the sustainable development of the dairy sector.

nutrition security, farmer prosperity and value-added dairy processing.

The seminar featured discussions on emerging industry trends, technological innovations and sustainability challenges. Participants reaffirmed their commitment to promoting dairy entrepreneurship, increasing

IDA News

SmartDairy 360° Seminar Showcases Emerging Dairy Testing Technologies

Everest Instruments, in association with the Indian Dairy Association (West Zone), organized SmartDairy 360°, a one-day seminar on emerging technologies for dairy and milk testing, at Four Points by Sheraton, Pune. The event brought together dairy industry leaders, technical experts, consultants, and decision-makers to discuss innovations driving the future of dairy quality assurance, automation, and analytical excellence.

The seminar commenced with a traditional lamp-lighting ceremony in the presence of Shri Ajit Patel, CMD, Everest

Instruments Pvt. Ltd.; Shri Parimal Patel, JMD, Everest Instruments; Dr. J.B. Prajapati, the then Chairman, IDA (West Zone); Shri Rajesh Lele, CEC Member, IDA; Shri Rahul Kumar, COO, Parag Milk Foods; Dr. J.V. Parekh, the then Vice Chairman, IDA (WZ); Shri Madhav Patgaonkar, Secretary, IDA (WZ); and Ms. Payal Agarwal, Managing Director - India & South Asia Region, PerkinElmer. Speakers emphasized the growing importance of precision, transparency, and integrated analytical systems in the evolving dairy sector.

Technical sessions covered analytical challenges in the Indian dairy industry, NIR and FT-NIR technologies, integrated technology solutions, and rapid diagnostic and microbial testing systems. Expert presentations were delivered by Shri Rahul Kumar, Shri Shailesh Singh, Shri Sanket Joshi, Dr. K.D. Aparnathi, Shri Hans Yamseen, Board Member of ICAR Germany, and Dr. Wim from the Netherlands, who leads Everest's farm management projects.



A key highlight of the seminar was the launch of Everest Instruments' next-generation FT-IR-based dairy analytical systems by Ms. Payal Agarwal. The newly introduced **Lactoscope 300** and **Lactoscope 500 analyzers** demonstrated advanced capabilities in milk analysis, adulteration detection, and real-time quality assessment.

The panel discussion on "The ROI of Automation in the Dairy Industry," moderated by Ms. Richie Agarwal, featured Shri Sanket Joshi, Shri Rajesh Lele, Shri Rajiv Mitra, Shri Manoj Parihar, Shri Job Prakash, and Dr. K.D. Aparnathi.



The discussion explored automation, digital transformation, procurement efficiency, quality management, and the future of intelligent dairy operations.

The seminar concluded with a vote of thanks by Shri Parimal Patel, followed by networking interactions and live technology demonstrations. SmartDairy 360° provided a valuable platform for knowledge exchange, innovation, and collaboration aimed at building a smarter and more sustainable dairy industry.

IDA Karnataka State Chapter Organizes World Environment Day

The IDA Karnataka State Chapter (KSC), in collaboration with Dairy Science College, Mahagaon Cross, Kalaburagi, celebrated World Environment Day on 5 June 2026.

The programme was graced by noted environmentalist Shri Ramesh Mahidarkar, who delivered an inspiring talk on the importance of protecting the environment, reducing pollution, and adopting sustainable practices for a greener future.

Shri N.B. Marathe, Chairman, IDA KSC, highlighted the significant role of women dairy farmers in the growth and sustainability of the dairy sector. He emphasized that their contributions have been instrumental in strengthening rural livelihoods and enhancing dairy productivity.

Dr. Manjunatha H., Dean, Dairy Science College, Mahagaon Cross, Kalaburagi, delivered the Presidential address. He spoke about the rapid growth of the dairy

industry in Karnataka and appreciated the vital contribution of women farmers to the sector's development.

Dr. Devaraju R., Associate Professor and Treasurer, IDA Karnataka State Chapter, welcomed the gathering and highlighted the role of dairying in reducing the carbon footprint through environmentally sustainable practices.

Among those present were faculty members Dr. Shashikumar, Dr. Adarsh M. Kalla, Dr. Priyatham Reddy, Shri Akshaykumar, Shri Madhusudan, and Dr. Rajkumar.

As part of the celebrations, Ms. Basavabharati conducted an engaging quiz competition for school students. The winners were felicitated with prizes, which were distributed by the dignitaries present on the occasion.

Dr. S.T. Suresh Assumes Charge as KMF Managing Director

A delegation from the Indian Dairy Association (IDA) called on Dr. S.T. Suresh and felicitated him recently on his appointment as the Managing Director of the Karnataka Milk Federation (KMF).

During the meeting, the delegation extended a formal invitation to Dr. Suresh to attend the forthcoming World Milk Day Programme and Technical Seminar as the Guest



of Honour. The event is being jointly organized by IDA (South Zone) and the National Institute of Animal Nutrition and Physiology (NIANP), Bengaluru, and is scheduled to be held on 17 June 2026 at Aduvodi, Bengaluru.

The IDA delegation comprised Dr. Satish Kulkarni, Chairman, IDA (South Zone); Shri Vijayakumar B.N., Vice Chairman, IDA Karnataka State Chapter; and Shri Kodyalmath N.S., State Executive Committee Member, IDA Karnataka State Chapter.

IDA Kerala Chapter Felicitates New MRCMPU Managing Director

The Indian Dairy Association (IDA), Kerala Chapter, felicitated Shri N.K. Premlal on his appointment as the Managing Director of the Malabar Regional Co-operative Milk Producers' Union (MRCMPU).

The felicitation function was organized to recognize Shri Premlal's elevation to the prestigious position and to convey the Association's best wishes for his new responsibilities. Speaking on the occasion, Dr. S. N. Rajakumar, Chairman of IDA Kerala Chapter, congratulated Shri Premlal and expressed confidence in his leadership. He wished him a successful tenure and continued progress for the dairy cooperative sector under his stewardship.

Shri C.P. Charles, Member of the Central Executive Committee of IDA, along with other members of the Association, also extended their felicitations and conveyed their best wishes for Shri Premlal's future endeavors.

The event reflected the cordial relationship between IDA and the dairy cooperative

sector and reaffirmed their shared commitment to strengthening dairy development and serving the interests of milk producers and consumers.

New State Executive Committee (SEC) of IDA Gujarat Chapter Assume the Office

The election for the IDA Gujarat State Chapter was declared on May 16, 2026. The election was conducted under the supervision of the nominated Returning Officer, Shri Naveenkumara A.C. The other members of the Election Committee were Shri Nitin Thakare and Shri Kuldip Gajjar.

Subsequent to the election of the State Executive Committee (SEC) of the IDA Gujarat State Chapter, the newly elected SEC assumed office on May 30, 2026, during a Joint State Executive Committee Meeting held at the IDA Gujarat State Chapter Office, SMC College of Dairy Science, Anand. The new State Executive Committee has been elected for the term 2026-2029.



As per the election results, the composition of the new SEC of the IDA Gujarat State Chapter is: **Chairman:** Shri Srinivas Sajja; **Vice Chairman:** Dr. Satishkumar Chaturbhai Parmar; **Secretary:** Dr. Samit Dutta; **Treasurer:** Shri Dipakkumar Ratilal Shah; **Member (RE):** Dr. Aditya Kumar Premchand Jain; **Member (PP):** Shri Nitesh Mathur; **Member (DI):** M/s IDMC Ltd.; **Member (MP):** Shri Shabhesinh Mangabhai Parmar.

The ZEC appreciated the efficient conduct of the election process and conveyed its gratitude to the members of the Election Committee.



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IDA (West Zone) Elects New Zonal Executive Committee for 2026-2029

The election schedule was announced to the IDA (WZ) members on 23 May 2026, setting in motion a transparent and well-organised process. The election was conducted through an online voting system under the supervision of the nominated Returning Officer, Shri Dattatray V. Ghanekar. The other members of the Election Committee were Shri Mahesh Padhye and Shri Pankaj Kulkarni.

The election process was completed on 8 June 2026, and the new Zonal Executive Committee (ZEC) for the term 2026-2029 was elected unanimously. The newly elected ZEC brings together a diverse and accomplished group of professionals.

Chairman: Shri Kalathupurath Shyju Sidharthan (Director, Micron Industries Pvt. Ltd.); **Vice Chairmen:** Shri Anil Shiram Hatekar (Managing Director, Mahanand) and Shri Yogesh Kumar Godbole (Managing Director, Kolhapur Milk Union); **Secretary:** Shri Madhav Vasudeo Patgaonkar (Dairy Business Consultant); **Treasurer:** Ms. Swati Srivastava (NDDDB, Mumbai); **Member (RE):** Dr. Sudhir Uprit (Dean, Dairy Technology College, Raipur); and Dr. Dhiraj H. Kankhare (College of Agriculture, Pune); **Member (MP):** Valsad District Cooperative Milk Producers' Union Ltd.; and Govind Milk & Milk Products Pvt. Ltd.; **Member (PP):** Ms. Richie Agarwal (RA Consulting, Pune); and Shri Shreenandan Sharma (Dairy Business Consultant, Indore); **Member (DI):** Shri Ketul Kamleshkumar Sheth (IDMC Limited, Anand); and Shri Shridhar Pravinchandra Mehta (Prompt Equipments Pvt. Ltd., Ahmedabad). **Former Chairman:** Dr. J.B. Prajapati.

The newly elected IDA (West Zone) Executive Committee (ZEC) formally assumed charge during the 13th ZEC Meeting held on 18th June 2026. The transition

ceremony was marked by gratitude, reflection, and a shared commitment to the continued growth of the dairy sector.

ZEC thanked the Election committee members for conducting the election very smoothly and felicitated them with flowers and a Memento.

Outgoing Chairman **Dr. J.B. Prajapati** expressed appreciation for the support extended to him during his three-year tenure. He highlighted key achievements of the Zone, including the successful organization of seminars and workshops across five states, the landmark 49th Dairy Industry Conference (DIC), and consumer awareness programmes conducted in collaboration with Mumbai Grahak Panchayat, BAIF, and industry partners. He conveyed his best wishes to the incoming committee and assured them of his continued support.

Secretary **Shri Madhav Patgaonkar** and CEC Vice President **Shri Arun Patil** lauded Dr. Prajapati's leadership, dedication, and contributions to strengthening the Zone. Members also fondly recalled his efforts and expressed their gratitude.

Taking charge as the new Chairman, **Shri K. Shyju** paid tribute to the outgoing Chairman's accomplishments and pledged to build upon the strong foundation laid by the previous committee. He introduced the newly elected team and emphasized collaboration, innovation, and collective growth as key priorities for the new term.

Several newly elected members, including Shri Anil Hatekar, Shri Shreenandan Sharma, Shri Godbole, Shri Kapadia, Ms. Richie Agarwal, and Dr. Kankhare, also addressed the gathering, assuring their wholehearted cooperation and commitment to the Zone's future initiatives. The ceremony concluded with floral felicitations to the outgoing and incoming members, followed by a vote of thanks by Secretary Shri Madhav Patgaonkar.



With a strong leadership team and renewed enthusiasm, the West Zone looks forward to advancing the dairy industry while strengthening engagement with consumers and stakeholders.

New Executive Committee of IDA Karnataka State Chapter Assume the Office

The Karnataka State Chapter of IDA election completed on June 1, 2026. The election was held under the nominated Returning Officer Dr. C.S. Prasad. The other election committee members were: Dr. S. Subash and Dr. B.V. Venkateshaiah. The election was held through on-line voting system. The newly elected member for the term 2026-2029.



The State Executive Committee unanimously got elected and took charge on June 16, 2026 in a ceremony organized at the IDA South Zone Office, located within the NDRI Campus in Adugodi, Bengaluru. The ceremony was held in the esteemed presence of Dr. Satish Kulkarni, Chairman, (IDA South Zone). SEC thanked the Election committee members for conducting the election very smoothly and felicitated them with bouquet.

The newly elected members are: **Chairman:** Shri N.B. Marathe; **Vice Chairman:** Shri B.N. Vijayakumar; **Secretary:** Shri Vijayeendra Deshpande; **Treasurer:** Dr. Devaraju R.; **Member (RE):** Prof. Manjunatha Hanumanthappa; **Member (MP):** Karnataka Co-op. Milk Producers' Federation Ltd.; **Member (PP):** Shri Kodiyalmath Nagalingayya; **Member (DI):** Shri Raghunandan Manje Gowda.

IDA Haryana State Chapter Result Announced

The Haryana State Chapter of IDA election completed on June 9, 2026. The election was held under the nominated Returning Officer Shri B.B. Garg. The other election committee members were: Dr. Hari Ram Gupta

and Dr. Surendra Gupta. The election was held through on-line voting system. The State Executive Committee unanimously got elected for the term 2026-2029.

The newly elected members are: **Chairman:** Dr. Mahendra Singh; **Vice Chairman:** Shri P.K. Jain; **Secretary:** Dr. Vivek Sharma; **Treasurer:** Vacant; **Member (RE):** Dr. S.V. Singh; **Member (MP):** Vacant; **Member (PP):** Vacant; **Member (DI):** Vacant.

NATIONAL News

Amul Reports Strong Ice Cream Growth, Holds Milk Prices Steady Amid Market Stability

Amul has reported a strong surge in summer demand, with Managing Director Shri Jayen Mehta stating that ice cream sales jumped by 55% in May 2026 as extreme temperatures boosted consumption across India. Shri Mehta said that Amul does not foresee any immediate increase in milk prices despite rising demand, providing relief to consumers and food manufacturers.



Amul will continue with the international expansion strategy, strengthening its presence in the United States while growing distribution across European markets. The cooperative is focusing on expanding exports of dairy products and leveraging increasing global demand for Indian dairy brands. The strong performance in value-added categories such as ice cream reflects changing consumer preferences and reinforces the importance of product diversification for dairy companies.

Amul's ability to maintain stable milk prices while expanding globally underscores the strength of its cooperative procurement model and growing international ambitions. The continued expansion of the ice cream segment demonstrates the evolving nature of India's dairy market, where consumer demand for premium and convenience-oriented products is creating new opportunities for dairy cooperatives and private processors alike.

Digitalisation Takes Centre Stage at WOA General Session in Paris

The 93rd General Session of the World Organisation for Animal Health, held in Paris from May 18-22, 2026, highlighted the increasing role of digital technologies in

Mother Dairy Leads Sustainable Packaging Revolution

In a significant step towards sustainable packaging and environmental stewardship, Mother Dairy, a wholly owned subsidiary of the National Dairy Development Board (NDDB), has launched India's First naturally degradable milk pouch in soil – a pioneering packaging innovation designed to redefine sustainability in the dairy sector. The innovation was unveiled by Dr. Meenesh Shah, Chairman, NDDB and Mother Dairy, along with Shri J.T. Chary, MD, Mother Dairy, in New Delhi on the occasion of World Environment Day.

The newly developed milk pouch, introduced initially for Mother Dairy's Cow Milk variant across Delhi-NCR, represents a first-of-its-kind degradable packaging innovation that enables the material to transform into bioavailable wax, which is naturally broken down by microbes present in the soil to turn it into natural elements.

Speaking on the occasion, **Dr. Meenesh Shah** stated that India's dairy sector, as the largest milk producer in the world, exemplifies scale, inclusivity, and responsibility, with sustainability deeply embedded across the value chain. He emphasized that milk pouch packaging remains critical for ensuring affordable and convenient access to milk for millions of consumers and noted that the innovation was developed after more than four years of dedicated research.



Dr. Shah highlighted that the new packaging requires no change in consumer usage behaviour and will not lead to any increase in milk prices. He further noted that Mother Dairy has been among the early adopters of Extended Producer Responsibility (EPR) and has established itself as a Plastic Waste Neutral organization, reaffirming its commitment to responsible

innovation and long-term sustainability.

Addressing the gathering, **Shri J.T. Chary** said that Mother Dairy has remained at the forefront of innovation in the dairy sector for over five decades. He remarked that the newly developed pouch leaves no trace of plastic in the environment while maintaining the quality, shelf-life, and safety of milk. According to him, the innovation reflects Mother Dairy's continued efforts to combine consumer convenience with environmental responsibility.

Alongside the packaging innovation, Mother Dairy also unveiled a refreshed design identity for its milk portfolio, beginning with the Cow Milk variant. The new packaging features cleaner typography, brighter visual elements, and the "Note of Care" brand device, reinforcing the company's promise of trust, care, and quality.

The launch marks a major milestone in sustainable dairy packaging and demonstrates the Indian dairy sector's growing commitment to environmental conservation and circular economy principles.



strengthening animal health systems and reducing investment risks in livestock farming.

At the Animal Health Forum 2026, a panel discussion

on innovation and digitalisation of animal health services explored how digital tools can improve animal health, traceability, preventive care, and livestock resilience.

Among the panellists was Shri Manish Jain, Founder of Nitara, an AI-driven agri-tech platform developed by GormalOne LLP and a Sustaining Member of the Indian Dairy Association. Nitara's participation underscored the growing global recognition of Indian dairy technology solutions. The platform was also honoured with the IDF Dairy Innovation Award 2025.

The discussion emphasised that data-driven farm management can enable early disease detection, improve productivity and animal welfare, and enhance the long-term sustainability of the dairy sector, particularly in India.

NCDFI and Assam Rifles Sign MoA to Strengthen Supply of Milk and Milk Products through Dairy Cooperatives

National Cooperative Dairy Federation of India Ltd. (NCDFI) and Assam Rifles signed a Memorandum of Agreement (MoA) in New Delhi to further strengthen cooperation for the supply of milk and milk products through the dairy cooperative network.

The MoA was exchanged by Brig Sachinder Tiwari, SM, Brig (Adm), Directorate General Assam Rifles and Shri Srinivas Sajja, MD, NCDFI, in the august presence of Lt Gen Vikas Lakhera, AVSM, SM, Director General, Assam Rifles, and Dr. Meenesh Shah, Chairman, NCDFI & NDDDB. The occasion marked an important milestone in expanding the role of dairy cooperatives in meeting the requirements of Assam Rifles.

During the previous year, NCDFI facilitated contracts with Assam Rifles for the supply of UHT milk by Amul (Gujarat) and Nandini (Karnataka), Whole Milk Powder by Warana Milk Union (Maharashtra), and fresh milk by Manipur, Mizoram and Tripura Milk Unions. Based on the satisfactory performance and reliable supplies by dairy cooperatives, Assam Rifles has expanded the range of milk and milk products being procured from the cooperative sector.

Accordingly, in addition to the previous year's contracts, Malt Based Food and Cheese are now being supplied by Amul, while fresh milk and butter are being supplied by WAMUL (Assam), Dimapur (Nagaland), Bhagirathi (West Bengal) and Alwar (Rajasthan) Milk Unions. The supplies under the arrangement are presently catering primarily to Assam Rifles units and establishments in the North Eastern States, along with their offices in Kolkata and New Delhi.

The MoA reflects the shared commitment of NCDFI and Assam Rifles towards ensuring a dependable supply of quality milk and milk products to Assam Rifles units, while also creating meaningful market opportunities for dairy

cooperatives and their farmer members, with particular emphasis on strengthening dairy development and farmer empowerment in the North Eastern region.

Speaking on the occasion, **Lt Gen Vikas Lakhera**, AVSM, SM, appreciated the consistent efforts of NCDFI and the participating dairy cooperatives in meeting the requirements of Assam Rifles. He further noted that Assam Rifles, being a force deeply associated with the North East and widely regarded as the "Friends of the North Eastern People", has taken this initiative not only

to ensure reliable supplies for its personnel but also to support the larger cause of empowering dairy farmers through cooperative institutions of the region.

Dr. Meenesh Shah said that the association with Assam Rifles is a matter of pride for the dairy cooperative sector. He stated that NCDFI has had the privilege of facilitating supplies of milk and milk products to the Indian Army and ITBP for the last four decades, and the partnership with Assam Rifles further strengthens this trusted association with national institutions. He added that such initiatives reflect the capability of dairy cooperatives to efficiently serve the requirements of Defence and paramilitary forces, while also creating assured market opportunities for cooperative dairies and their farmer members, particularly in the North Eastern states.

Dr. Meenesh Shah also presented Certificates of Gratitude to the officials of Assam Rifles in recognition of their support and trust in the dairy cooperative network. Certificates of Appreciation were also

presented to the participating dairy cooperatives in recognition of their role in undertaking supplies of milk and milk products to Assam Rifles, and for their commitment towards ensuring timely, reliable and satisfactory service.

The partnership is expected to further encourage the participation of dairy cooperatives from different regions of the country in meeting the requirements of Assam Rifles, particularly across the North Eastern region and related establishments, while strengthening the cooperative dairy sector's contribution towards national service, self-reliance and farmer welfare.



INTERNATIONAL News

International Dairy Market: Overview

As per the latest USDA data during June 08-19, 2026, international market overview are as follows:

EUROPEAN

Western European

The number of dairy farms in the United Kingdom has fallen below 7,000 for the first time, reflecting a long-term trend of industry consolidation and structural change. Rising costs, labor challenges, and ongoing investment requirements continue to pressure smaller operations, while larger and more efficient farms account for an increasing share of milk production. Despite the decline in farm numbers, overall milk output has remained comparatively resilient, as productivity gains continue to offset the shrinking producer base.

European dairy markets have shown signs of stabilizing in recent weeks after an extended period of price weakness, with values for several key commodities finding firmer footing. While milk supplies remain ample across much of the region, improved demand and a slowdown in price declines have helped support market sentiment. Despite the more balanced tone, participants continue to monitor production levels and export demand as factors that could influence price direction in the months ahead.

Eastern European

Eastern Europe continues to strengthen its role in EU dairy production, with Poland remaining a key driver of regional milk output growth. Productivity gains and ongoing farm consolidation have supported production despite declining cow numbers, while a growing share of milk is being directed toward cheese manufacturing. Although lower milk prices may slow expansion, the region remains better positioned for growth compared to many Western European producers.

Latvia has expanded its dairy processing capacity with the opening of a new cheese facility designed to handle significant volumes of milk and support growing export demand. The investment highlights continued confidence in the Baltic dairy sector and is expected to strengthen regional cheese production, with a substantial share of output targeted for international markets across Europe and beyond.

OCEANIA DAIRY MARKET

New Zealand

Following Global Dairy Trade (GDT) Event 406, a group

in New Zealand that forecasts milk prices decreased its 2026/27 season milk price forecast to NZ\$9.38 per kilogram of milk solids (kgMS). The spot value of milk declined to NZ\$9.76/kgMS from NZ\$10.27/kgMS. Prices were lower for milk powders and milk fats offered at GDT Event 406.

The group's 2025/26 season milk price forecast remains at NZ\$9.74/kgMS. This projection is based on an exchange rate assumption of US\$0.5877 per NZ dollar and a forecast range of NZ\$9.08/kgMS to NZ\$9.98/kgMS. The September 2026/27 Milk Price Futures contract last settled at NZ\$9.78/kgMS.

The Ministry for Primary Industries (MPI) released its latest Situation and Outlook for Primary Industries (SOPI) report. For the year ending June 30, 2026, New Zealand's food and fibre sector is projected to generate NZ\$64.3 billion in revenue, representing 82 percent of the country's total exports. Dairy revenue is forecast to rise 5 percent to a record NZ\$28.6 billion, following last year's record performance.

Whole milk powder accounted for 32 percent of dairy export revenue, followed by milk fats at 21 percent, cheese at 12 percent, and casein and other protein products at 11 percent. China remained the largest export market at 36 percent, while Australia, the United States, and Indonesia each accounted for 5 percent. Production is expected to reach 2.02 billion kgMS, a 4 percent increase, supported by favourable weather and strong on-farm financial incentives. MPI currently estimates the 2025/26 season milk price at a final payout of NZ\$9.85/kgMS.

Australia

Dairy Australia recently published new data on packaged milk sales. In April 2026, total packaged milk sales reached 191.0 million litres, an increase of 1.7 million litres year-over-year (YoY). Sales increased YoY in New South Wales (1.4 percent), Victoria (1.7 percent), and Queensland (1.1 percent). Meanwhile, sales declined in South Australia (0.1 percent), Western Australia (1.5 percent), and Tasmania (0.9 percent).

Packaged milk sales year-to-date (YTD) for Australia's 2025/26 season totalled 1,968.6 million litres, up 23.3 million litres (1.2 percent) compared to the previous season. Relative to the 2024/25 season, YTD sales in 2025/26 increased in Victoria (2.7 percent), Queensland (1.2 percent), South Australia (1.7 percent), and Western Australia (1.0 percent), while declining in New South Wales (0.2 percent) and Tasmania (1.1 percent).

Dairy Australia also released updated export data showing that milk export volumes from July 2025

through April 2026 totalled 139,822 metric tonnes, a 15.2 percent increase compared with the same period a year earlier.

The May 2026 Production Inputs Monitor Report from Dairy Australia showed that rainfall increased across most of eastern Australia in May, ending the month above average after a dry April. Northern New South Wales and southern Queensland recorded particularly strong rainfall, providing relief from prolonged dry conditions.

Despite improved rainfall, feed prices increased across all major categories. Early-month dryness in northern dairying regions kept feed demand high, while elevated freight costs and strong global wheat demand added upward pressure. Improved feedstock availability in southern regions helped moderate price increases. Temporary water prices remained elevated, exceeding May 2025 levels by more than double in several regions and remaining well above five-year averages, although slightly below March peaks. Urea prices stayed exceptionally high but eased marginally as buyers shifted to alternative fertilisers. Diammonium phosphate prices rose amid limited supply, while fuel prices declined more significantly, supported by a temporary excise reduction and increased national stockpiles. Fuel Supply Roundtable, while peak farming bodies advocate for government recognition of potential impacts on food production and regional communities.

SOUTH AMERICA DAIRY MARKET

Milk production in South America is entering a seasonally

lower output period as dairy herds move beyond peak production. Although year-over-year milk production remains higher, growth rates are beginning to slow. In Argentina, industry stakeholders attribute part of the slowdown in milk output growth to heavy rainfall. An El Niño weather pattern is anticipated in 2026, which could bring above-average precipitation to key dairy-producing regions.

Argentine stakeholders also report delays in harvesting activities due to persistent rainfall. Operating costs, particularly for fuel and labour, have increased, while feed prices have remained relatively stable.

The broadly scoped EU-MERCOSUR agreement, which aims to reduce import duties between member countries of the European Union and the Southern Common Market (MERCOSUR)—comprising Argentina, Brazil, Paraguay, and Uruguay—has entered provisional status through an interim trade arrangement, although the full agreement has yet to be ratified.

Production of dairy products such as skim milk powder (SMP), whole milk powder (WMP), and cheese has moderated in line with seasonal changes in milk supply. Stakeholders report no significant changes in demand for either SMP or WMP.

According to the latest data from CLAL.it, Brazil's imports of both skim milk powder and whole milk powder have increased. Argentina's exports of both products have also risen, while Uruguay has recorded growth in whole milk powder exports.

Global Dairy Prices Decline at GDT Event 406

Global dairy commodity prices moved lower at Global Dairy Trade (GDT) Event 406, held on June 16, 2026, reflected a market correction after several months of strong gains. The overall GDT Price Index fell by 2.8%, with the average winning price reaching US\$3,979 per metric tonne.

The decline was seen across most major dairy products. Whole Milk Powder (WMP), a key indicator of global dairy market trends, dropped by 3.1% to US\$3,589/MT, while Skim Milk Powder (SMP) declined by 3.6% to US\$3,368/MT. Butter prices fell by 2.4% to US\$5,516/MT and Anhydrous Milk Fat (AMF) eased by 1.0% to US\$6,601/MT. Cheese prices also weakened, with Cheddar and Mozzarella recording declines. Lactose was the only major commodity to post a gain.

Industry analysts attribute the correction to improved milk production in major exporting regions and a more cautious purchasing approach by importers. Earlier in the year, concerns over limited milk supplies and strong

demand had pushed prices higher. However, improving production and better product availability have reduced supply pressures, encouraging buyers to take a more measured approach to procurement.

The latest auction suggests that global dairy markets are moving toward a more balanced demand-supply situation. While prices have softened, they remain at levels that indicate continued underlying demand for dairy products.

Looking ahead, market participants will closely monitor milk production trends in key exporting countries, buying activity from China, and demand developments in emerging markets. These factors are expected to influence price movements during the coming months.

For India, the impact of lower global dairy prices is expected to be limited. Strong domestic demand, active competition for milk procurement, and relatively tight milk supplies continue to support the domestic dairy market.

(Source: www.globaldairytrade.info)



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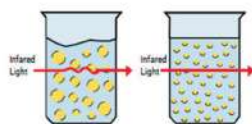
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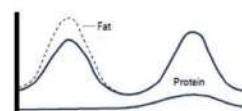
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Full spectrum analysis on the LactoScope™ 500 also provides built-in redundancy, enabling the model to rely on multiple correlated regions of the spectrum, and supports future method development by allowing stored spectra to be reprocessed as analytical needs evolve. This approach ensures consistent performance across a wide range of dairy applications, including milk intake, standardization, finished products, and by-products such as whey.

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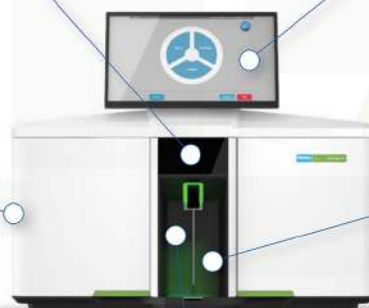
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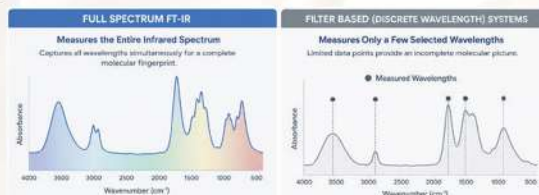
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Feeding for a Greener Future: How Diet Changes Can Curb Methane

Vikash Kumar, Supriti Chatterjee, Paritosh Kumar and Rakesh Chaudhary

This article explores dietary strategies for methane mitigation, including feed additives such as 3-nitrooxypropanol (3-NOP), red seaweed, tannin-rich plants, and improved ration balancing. These interventions can substantially reduce methane emissions while enhancing feed efficiency, milk yield, and animal health. Wider adoption requires farmer awareness, affordable access, supportive policies, and effective extension services.

Introduction

India, home to over 303 million bovines, sustains the world's largest dairy sector but also generates a significant amount of methane emissions through enteric fermentation and manure management. These together are estimated to produce 12-13 Tg (CH₄) annually (Aneja *et al*, 2023; FAO, 2022). These emissions account for more than 60% of India's agricultural methane emissions, ruminants are a major topic of discussion when it comes to climate change (E-Scientific Publishers, 2020; FAO, 2022). Since methane is more than 80 times more powerful than CO₂ over a 20-year period, these emissions exacerbate global warming while simultaneously supporting essential livelihoods. Dietary interventions using feed additives such as 3-Nitrooxypropanol (3-NOP), red seaweed (*Asparagopsis spp.*), tannin-rich plants, and improved silage practices have shown methane reductions of 10-80% (Roque *et al*, 2021; Yu *et al*, 2021; Verma *et al*, 2024; Van Gastelen *et al*, 2020). These strategies also improve rumen efficiency, milk yield, and feed conversion. Wider adoption requires cost-effective access, farmer training, and regulatory support to promote climate-smart dairying in India.

Why Methane from Cows Matters

Methane (CH₄) is a byproduct of enteric fermentation, which breaks down fibrous plant material in the stomachs of cows and buffaloes as they digest roughage. The animals primarily expel this by belching (FAO, 2022). Despite being invisible, methane is a potent greenhouse gas that traps heat more than 80 times as effectively as carbon dioxide over a 20-year period (IPCC, 2021). India produces more than 230 million tonnes of milk a year, making it the world's largest milk producer with over 303 million bovines (Government of India, 20th Livestock Census, 2019) (NDDB, 2024). Smallholder farmers who raise two to five animals and use mixed feeding systems that incorporate grazing, crop residues, and household byproducts provide the majority of this milk (NDDB & FAO, 2023). Rural livelihoods are supported by these decentralised systems, but they also make it more difficult to apply consistent methane-reduction approaches. Around 40% of methane emissions caused by humans worldwide come from agriculture, with livestock being the primary contributor (FAO, 2022). The Global Methane Pledge and the Sustainable Development Goals (SDG 13: Climate Action, SDG 2: Zero Hunger) place a strong emphasis on reducing methane because it is one of the quickest ways to slow down short-term warming (United Nations, 2015). Addressing livestock methane presents India with a chance to improve animal productivity and take the lead on climate change, in addition to being an environmental necessity.

The Science Behind Feed Additives

Researchers from all over the world are discovering that small dietary changes can significantly reduce methane production in cattle without compromising milk production. 3-Nitrooxypropanol (3-NOP), a synthetic compound that blocks a crucial enzyme in the rumen microbes that produce methane, is one of the most exciting discoveries. When 3-NOP is added to feed, studies conducted in several countries have shown average decreases in enteric methane emissions of 20-40% (Hristov *et al*, 2022; FAO, 2022). Red seaweed (*Asparagopsis spp.*) is a promising feed supplement that has been shown to reduce enteric methane emissions by around 50% when included at approximately 0.5% of the diet's dry matter, with some studies reporting reductions of up to 80% under controlled experimental conditions (Roque *et al*, 2021). However, such high levels of methane reduction may alter the rumen microbial ecosystem and fermentation pathways, potentially influencing nutrient utilization and animal performance. Therefore, further long-term in vivo studies are required to comprehensively evaluate these effects.

Moreover, large-scale seaweed production and ensuring a consistent supply remain major challenges, particularly for a dairy industry as extensive as ours. Tannin-rich feeds (ICAR-NIANP's herbal anti-methanogenic supplement Harit Dhara) and fat supplements (like coconut oil and bypass fats) are more approachable tactics. These can increase feed efficiency while lowering methane by 10% to 20% (ICAR-NIANP, 2021). According to field tests conducted in India, these herbal

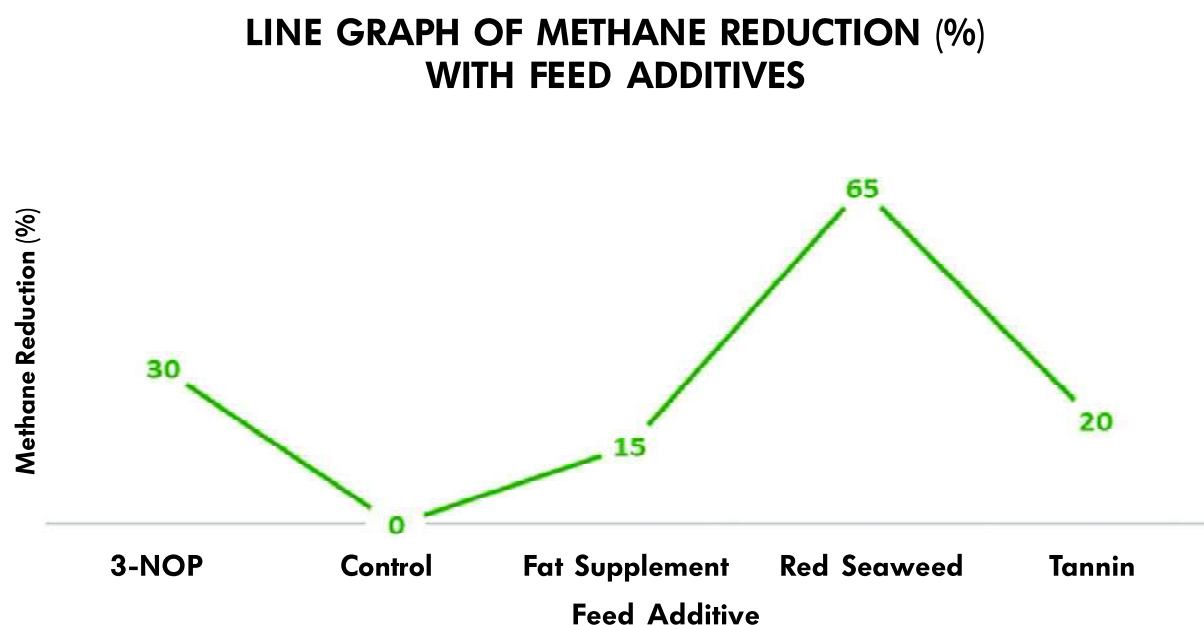
additives may increase milk yield and body weight gain in addition to reducing emissions, making them viable choices for smallholder farmers (ICAR-NIANP, 2021). Ration balancing is another practical approach that can reduce enteric methane emissions while improving animal productivity.

Co-benefits Beyond Methane Reduction

In addition to being beneficial for the environment, lowering methane emissions from dairy cattle can also directly benefit farmers and the sector. Research indicates that by increasing rumen efficiency and nutrient absorption, feed additives such as 3-NOP, red seaweed, and locally accessible tannin-rich plants can enhance milk yield and overall animal health (Hristov *et al*, 2022; ICAR-NIANP, 2021). More milk can be produced from the same amount of fodder by better-fed cows, which could eventually lower feed costs because they convert feed more effectively. Such efficiency improvements can greatly increase income and sustainability in smallholder systems, which are prevalent throughout India and where fodder availability may be limited (NDDDB & FAO, 2023). These actions have the potential to improve dairy production.

Customers are becoming more conscious of the environmental impact of food, particularly in urban and export markets. Adoption of climate-smart dairy practices is further encouraged by the opportunities they present for branding, premium pricing, and involvement in carbon credit programs (FAO, 2022; United Nations, 2015). Simple methane mitigation techniques benefit

Fig. 1: Reduction of Enteric Methane (%) in Cattle using Different Feed Additives
(Averaged from global and Indian studies)



farmers, consumers, and the environment by balancing economic, environmental, and social advantages.

Challenges and Practical Considerations

Although feed additives significantly reduce methane, there are still practical obstacles to overcome. Millions of smallholder farmers in India may find it costly and challenging to source expensive additives like red seaweed or 3-NOP on a large scale (Hristov *et al*, 2022; Roque *et al*, 2021). Maintaining efficacy also necessitates a steady supply chain, which requires substantial investment in production, distribution, and storage infrastructure. Training and awareness among farmers are essential. To implement these interventions safely and successfully, smallholders require guidance on appropriate dosage, feed mixing, and animal health monitoring (NDDDB & FAO, 2023). In this context, the Ration Balancing Programme (RBP) initiated by the National Dairy Development Board (NDDDB) offers a more practical and cost-effective approach. The RBP focuses on optimizing the nutrient composition of locally available feed resources to meet the animal's maintenance and production requirements, thereby improving feed efficiency and reducing methane emissions indirectly.

By promoting better utilization of existing feed resources rather than relying on imported additives, it aligns well with the economic realities of Indian dairy farmers. Demonstration farms and strengthened extension services can further support awareness and adoption of both ration balancing and feed efficiency practices. Consumer and regulatory factors are also crucial. To ensure safety and compliance, additives must be approved by bodies such as the FSSAI and ICAR. Furthermore, even if "additive-fed" milk is climate-friendly, consumers may still be hesitant, particularly in branded or export-oriented markets (FAO, 2022).

Building trust through certification, transparency, and awareness campaigns will be vital. Policymakers, researchers, dairy cooperatives, and farmers must collaborate to address these challenges, but the potential economic, social, and environmental benefits make the effort worthwhile.

Initiatives from the Industry and Policy

In an effort to reduce methane emissions, the Indian government and dairy industry are pushing climate-smart dairy practices more and more. The objectives of NDDDB-led programs are to increase feed efficiency, promote locally sourced feed additives, and provide smallholder farmers with technical assistance and training (NDDDB & FAO, 2023). Likewise, the FAO has collaborated with Indian cooperatives and research institutions to carry out pilot projects on sustainable feeding practices and methane reduction (FAO, 2022). In terms of adoption, dairy cooperatives play an essential role. Amul, for

instance, has tested the use of herbal feeds high in tannins and other dietary interventions at a few milk collection facilities, tracking the effects on milk productivity and methane emissions (NDDDB, 2024). These programs assist in proving viability to farmers and generating data for national intervention and scaling. Interest in carbon credit markets is also rising. Sustainable, verifiable, and quantifiable methane mitigation techniques can produce carbon credits, providing farmers and cooperatives with financial incentives (UNFCCC, 2021). Incorporating these incentives into dairy operations boosts farmer incomes and industry competitiveness while also advancing climate goals.

Call to Action and Future Outlook

It takes cooperation between researchers, farmers, industry, and policymakers to reduce methane emissions from India's dairy sector. While extension services assist farmers in successfully implementing these practices, researchers can continue to create and validate novel feed additives (ICAR-NIANP, 2021; NDDDB & FAO, 2023). To encourage adoption, policymakers can back carbon credit programs, regulatory approvals, and subsidies. At the centre of this change are farmers, especially smallholders. They can increase productivity, cut expenses, and potentially receive carbon incentives by adopting climate-smart feeding practices and taking part in cooperatives or pilot programs (NDDDB, 2024). Demand for greener dairy can be fuelled by consumers' awareness of the environmental impact of milk, their support of cooperatives that use sustainable practices, and their choice of climate-conscious dairy products (FAO, 2022; United Nations, 2015). A productive and ecologically conscious future can be ensured by India's dairy industry if all stakeholders work together to lower methane emissions, improve sustainability, and provide leadership in climate-smart agriculture.

Conclusion

In addition to being environmentally necessary, reducing methane emissions from India's dairy industry offers a chance to improve rural livelihoods. Small dietary adjustments can result in significant reductions in greenhouse gas emissions without sacrificing productivity, as shown by feed-based interventions like 3-NOP, red seaweed, and supplements high in tannin. In addition to helping the environment, these methods provide farmers with access to new markets, lower feed costs, higher milk yields, and carbon credit opportunities. However, widespread adoption will necessitate concerted efforts, including consumer awareness, regulatory approvals, farmer training, and affordable access to feed additives. This requires close collaboration between researchers, policymakers, cooperatives, and smallholders. By embracing sustainable feeding strategies, the sector can safeguard farmer incomes,

enhance food security, and position India as a global leader in environmentally responsible dairying.

References

The authors may be contacted for references through email.

Authors

Vikash Kumar

M.Sc. Research Scholar
Dairy Extension
ICAR-NDRI, Karnal
rking9855@gmail.com



Supriti Chatterjee

Ph.D. Scholar
Division of Agricultural Extension
Education, ICAR- Indian Agricultural
Research Institute, New Delhi
supritichatterjee30@gmail.com



Paritosh Kumar

M.Sc. Research Scholar
Dairy Extension
ICAR-NDRI, Karnal
pritoshkumar21@outlook.com



Rakesh Chaudhary

M.Sc. Research Scholar
Dairy Extension
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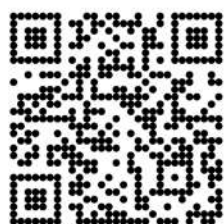
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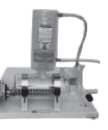
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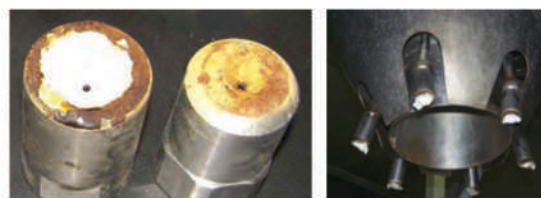


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Camel Milk: A Health-packed Beverage with Natural Medicinal Value

Nistha Yadav, D. Sreekumar, Mona Sharma, Urmila Pannu and Ved Prakash

Camel milk serves as a widely consumed staple food, particularly in arid and semi-arid regions. It is rich in essential nutrients, including lactoferrin, zinc, bioactive peptides, and mono- and polyunsaturated fatty acids, all of which contribute to overall health and well-being. These components have the potential to help manage various human health conditions, including tuberculosis, asthma, gastrointestinal disorders, and jaundice. Rich in essential fatty acids, proteins, lactose, and minerals, camel milk has been reported to have beneficial effects in the management of diabetes, hepatitis C, and allergies. It has also been shown to enhance antioxidant enzyme levels in children with autism spectrum disorder and in patients with tuberculosis. This article explores the therapeutic properties of camel milk, its nutritional composition, and its potential applications in the management of specific diseases and the promotion of human health.

Introduction

Animal husbandry began with the domestication of animals for companionship. In the early stages, humans led a nomadic lifestyle and engaged in the hunting of wild animals. Over time, humans transitioned to settled living, surrounding themselves with various animal species. The adaptation of these species to their habitats is attributed to a range of physiological traits. India boasts rich biodiversity, characterized by diverse geo-climatic conditions and extensive animal genetic resources (AnGR). Different animal species have adapted to their respective environments, including fish that thrive in aquatic ecosystems, yaks and mithuns that are suited to mountainous terrains, camels that are well adapted to arid desert climates, and polar bears that inhabit polar regions. Communities residing in the arid and semi-arid regions of Africa and Asia, as well as the Andean highlands, rely on camels for their livelihoods, cultural practices, and economic activities. Camels possess the ability to produce fiber and high-quality food even under severe climatic conditions and are therefore regarded as significant contributors to sustainable livelihoods in the 21st century. The United Nations designated the year 2024 as the "International Year of the Camel" (IYC 2024) to raise awareness about the adaptive traits and importance of camels in arid, semi-arid, and mountainous regions. The Raika (Rebari) community of the desert districts of Rajasthan and Gujarat has safeguarded this valuable national heritage by breeding and conserving camels for centuries (**Fig. 1**).

Worldwide, approximately 16.9% of the milk intended for human consumption is obtained from non-bovine species, including buffaloes, sheep, goats, equines, yaks, and camels. Camels (*Camelus dromedarius*) contribute about 0.4% of this alternative milk production. The average milk yield of a female camel ranges from 4 to 30 liters per day. Camel milk typically contains protein (2.5–4.5%), fat (2.9–5.5%), solids-not-fat (8.9–14.3%), ash (0.35–0.95%), lactose (2.9–5.8%), and water (86.3–88.5%). It is valued for its slightly salty taste, high vitamin C content, and potential therapeutic properties.

Studies have indicated that camel milk may be beneficial in the management of conditions such as autism spectrum disorder, diabetes, hepatic cirrhosis, and allergic reactions. In particular, it has been reported to aid in glycemic control by helping to reduce blood glucose levels. The consumption of camel milk is increasing worldwide, and numerous industries are exploring opportunities to enhance its production and processing. Consequently, this article highlights the nutritional and therapeutic benefits of camel milk and examines its potential contribution to global food security.

Taxonomic Significance and Origin of Camels

Camel species originated in North America, and people in southern Arabia began its domestication, for transportation and milk production, around 4000-3000 BC. Linnaeus classified them as *Camelus dromedarius* and *Camelus bactrianus* in 1758. Camel comes from the Greek word kamelos, and Dromas means "to run". The word Bactrian comes from the Bactriana region of the ancient Persian Empire. Przewalski discovered the wild Bactrian camel (*Camelus ferus*) in 1878.

Camels are also classified as Arabian or single-humped (dromedary) and double-humped (Bactrian) camels. Currently, seven camel species belong to the Camelidae family, which are classified as Old-World camels and New World camels based on their origin. The wild Bactrian camel (*Camelus ferus*), Bactrian camel (*Camelus bactrianus*), and dromedary camel (*Camelus dromedarius*) are the three Old World camel species. The llama (*Lama glama*), alpaca (*Vicugna pacos*), guanaco (*Lama guanicoe*), and vicuña (*Vicugna vicugna*) are the four New World camel species.

General Overview of Camels

Camels possess remarkable ability to utilize low-quality forage and can store food for as long as 70 hours. Their digestion and metabolism of fibrous forages are superior as compared to other ruminants. They can recycle surplus urea to generate microbial protein necessary for gut enzymes. Their body temperature varies significantly (34 to 41°C; -20 to 40°C for Bactrian camels) with daily fluctuations, which enhances their

adaptation to the severe desert conditions of arid and semi-arid regions (5-45°C). Camel's padded, cloven-hoofed feet offer improved traction on sand and prevent them from sinking in desert terrain.

Their innate features, such as the ability to close their nostrils to shield against sandstorms and long eyelashes to protect their eyes, exemplify their adaptations to extreme environments. The utilization of excess fat stored in their humps as an energy source is a crucial adaptation for enduring conditions of food and water scarcity during famines in desert areas. Camels can endure without food or water for up to 50 days in winter and between 5 to 7 days in summer. Their diet consists of grasses, thorny plants, shrubs, and herbs that are typically inedible to other animals. Additionally, camels exhibit physiological characteristics such as tolerance to extreme heat, resistance to solar radiation, and the ability to thrive in regions with limited food and water resources.

The connection of camel-breeding communities across different nations underscores the cultural and economic significance of this animal. The Raika community, residing in the semi-arid areas of northwestern India, particularly in western Rajasthan, has played a vital role in the breeding and conservation of camels (**Fig. 2**). They believe that they were created by Lord Shiva to tend to dromedary camels. Ilse Kohler-Rollefson, a veterinarian, chronicled her experiences working with camels and the Raika community in Rajasthan in her book "Camel Karma (2014)." She expressed that "Raikas are eager to maintain their traditions and uphold their responsibilities towards camel husbandry, transmitting

Fig. 1: Camel tola (group of camel) Guided by Raika Herder for Pasture Grazing in Morning as a Routine Managemental Practice



Fig. 2: Arrangement of Sheds for She Camel and Calf (Dam-calf interaction)



these practices from one generation to the next." The decreasing population of camels is leading to challenges within the community, such as negative impacts on the custom of presenting camels during weddings and the demand for labour.

Registered Camel Breeds in India

The Breed Registration Committee of NBAGR (2025) has so far registered 9 camel breeds, as Bikaneri, Jaisalmeri, Kachchhi, Mewari, Kharai, Malvi, Marwari, Jalori, and Mewati (**Fig. 3**). Mewari breed is renowned for milk production (5-7 lt/d) and adaptability to Aravalli Hills of southern Rajasthan; Jaisalmeri breed for riding and racing abilities; Kachchhi breed for multipurpose utility; Jalori and Bikaneri breeds for excellent load-carrying capacity. Kharai is a distinctively rare breed, often referred to as 'swimming camel' and '*Dariyataru*', due to their remarkable ability to flourish in the salty marshes of Kutch. These camels swim in the shallow sea with a deliberate graceful motion effortlessly, covering a distance up to 3 km for grazing in mangroves region.

Fig. 3: Bikaneri Breed – More than Half of Camel Population in Rajasthan



Product and Service Aids from Camels

Camels are recognized globally as versatile animals, offering a range of products and services, including milk, meat, hair/wool fiber, dung manure (fertilizer), and transportation. Their remarkable adaptability to arid climate enables them to thrive in agricultural settings, contributing to production and load-carrying capabilities. The rise of camel-based tourism, camel dairy, camel leather, camel bone, and hair products is becoming increasingly popular, which will enhance livelihoods of camel farmers and associated communities.

Production Aspects of Camel Milk

Owing to its rich nutritional profile and health benefits, camel milk serves as a complete dietary option. The average milk yield from Indian camels is 3.24 lt. in the morning, 1.99 lt. in the evening, with a total of 5.23 lt./day. With effective management practices, it is possible to increase the milk production, achieving daily outputs of 13.560 lt. (8.157 lt. in morning and 5.401 lt. in evening). This demonstrates the significant milk production potential of Indian camels. The lactation period ranges from 9 to 18 months, with peak milk production occurring during 2nd to 3rd month post-calving. The milk feeding practice by a calf and hand-milking procedure are illustrated in **Fig. 4** and **5**, respectively.

Beneficial Biochemical Properties of Camel Milk

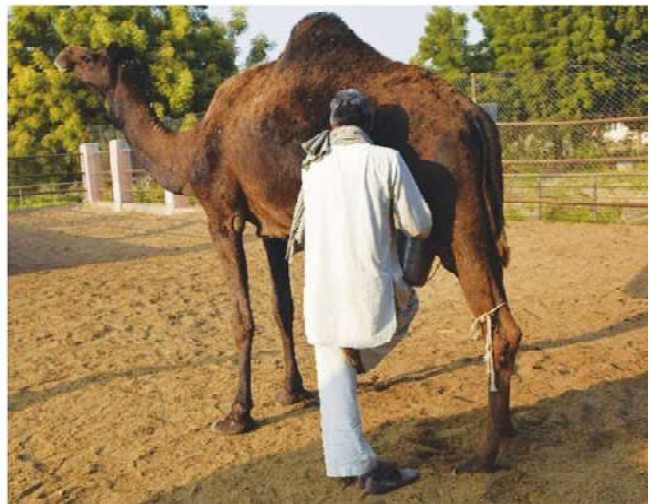
General chemical composition and characteristics of camel milk indicated its richness in valuable ingredients, including lactoferrin and zinc, lactoactive peptides, mono- and polyunsaturated fatty acids, which support optimal health (**Fig. 6**).

Factors such as nutrition, breed, age, lactation parity and stage primarily influence the composition of camel milk. Additionally, the composition of camel's milk shows considerable variation depending on the geographical area and the season. The whey proteins present exhibit

Fig. 4: Milk Sucking by Calf



Fig. 5: Hand Milking Method



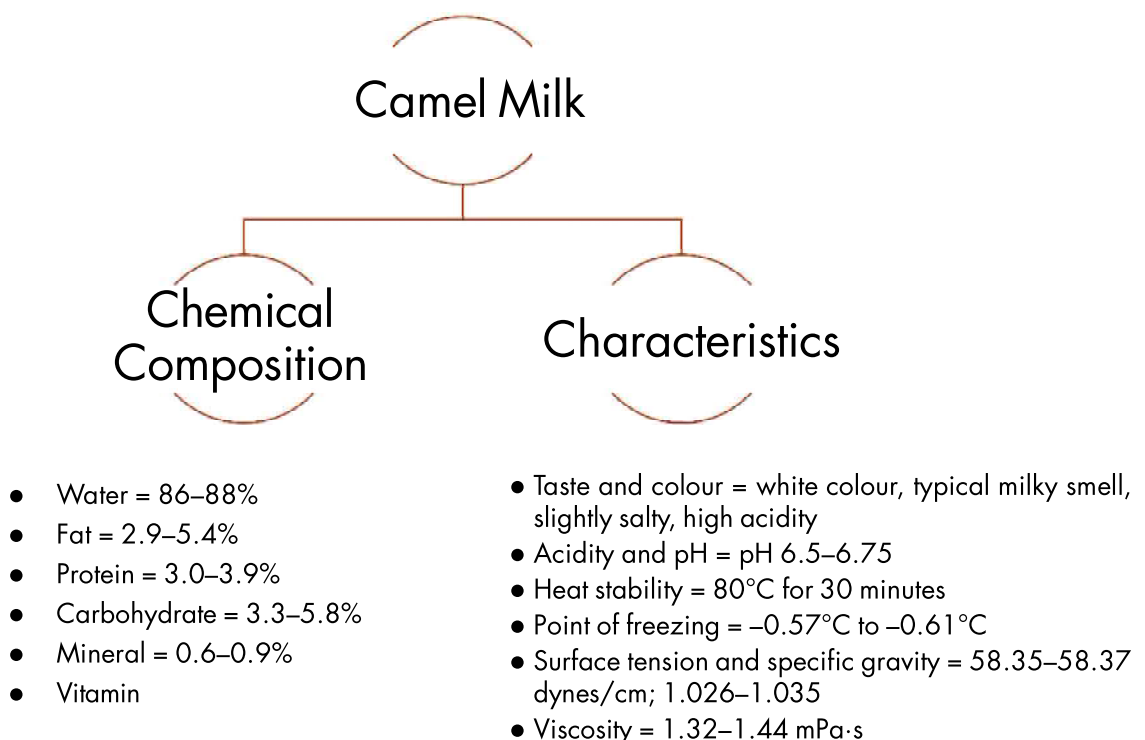
unique physical, chemical, physiological, functional, and technological properties that offer advantages in culinary applications and possess high nutritional value. Hydrolysis processes break down the milk proteins into bioactive peptides, which exert physiological effects on the body's major organ systems.

The white hue of camel milk is attributed to its low beta-carotene levels. The flavor profile of this milk varies from pungent and sweet to salty. This diversity in taste is influenced by the type of feed and water provided. The

low pH level results from its high vitamin C concentration. Because of its slow souring process, camel milk can be stored for extended periods without refrigeration, unlike cow's milk. Consuming camel milk daily can fulfill the body's requirements for minerals, electrolytes, and vitamins.

A quarter liter of camel milk provides approximately 10.5% of vitamins C, B1, and B6, along with 8.25% of vitamin B2, 15.5% of vitamin B12, and 5.25% of vitamin A. The low kappa casein protein content in camel milk

Fig. 6: Chemical Composition and Characteristic Features of Camel Milk



poses challenges for producing fermented products such as cheese and yogurt.

Key Elements of Camel Milk for Health Benefits

The distinctive characteristics of camel milk encompass its elevated iron levels, reduced fat content, and abundant vitamins, particularly vitamin C, along with essential minerals, rendering it appropriate for those with lactose intolerance. The attributes of camel milk, including its extended shelf life, substantial inulin protein content, high digestibility, significant nutritional value, absence of β -lactoglobulin, minimal allergic reactions, presence of bioactive peptides, and hypoglycemic properties, underscore its relevance in disease diagnosis and treatment.

Medicinal Applications of Camel Milk

Camel milk offers remarkable nutritional benefits and therapeutic effects for a range of health issues, exhibiting anti-inflammatory, hypoallergenic, hepatoprotective, anti-tumor, anti-carcinogenic, anti-hypertensive, anti-autistic, and immune-boosting properties. Consequently, the regular intake of camel milk aids in lowering insulin resistance and blood sugar levels, enhancing lipid profiles, managing diabetes, and fortifying the immune system. Additionally, camel milk proves advantageous for conditions such as hepatitis C, autism, and tuberculosis in children.

Commercial Products Derived from Camel Milk

The ICAR-National Research Centre on Camel (NRCC) located in Bikaner is diligently engaged in the development and promotion of various camel milk products. NRCC also produces a range of camel milk items including camel milk powder, flavored camel milk, cheese, nuggets, coffee, kulfi, and whey, among others. Kumbhalgarh Camel Dairy (Camel Karishma), Advik Foods, Amul, Sarhad Dairy, Bahula Naturals, and numerous other private enterprises manufacture camel milk and its derivatives. Kumbhalgarh Camel Dairy (Camel Karishma) offers pure camel milk, while Advik Foods markets a variety of camel milk-based products such as raw camel milk powder, chocolates, and soaps. A variety of camel milk-based products can be found in the market under the "Amul" brand, which is associated with the Sarhad Dairy Cooperative Society and produced by the Camel Milk Corporation. The offerings include camel milk (@ Rs. 25/ 200 ml bottle), milk powder (@ Rs.300/10 sachets of 25g each), and ice cream (@ Rs.240/pack of 180 ml x 8),. Additionally, Bahula Naturals specializes in pure and chemical-free camel milk products, including ghee, cookies, fresh cheese, and Cheshire cheese.

Conclusion

Camel milk and its derivatives have attracted considerable global interest due to their remarkable

nutritional profile and reported therapeutic advantages for various human health issues. Camels account for approximately 0.4% of non-livestock dairy production, providing fiber- and nutrient-rich food even in challenging climates. Camel milk has distinctive physicochemical properties and medicinal applications. In contrast to bovine milk, camel milk does not contain β -lactoglobulin, but elevated levels of iron and vitamin C. Additionally, the extended shelf life of camel milk, hypoglycemic properties and significant amounts of insulin-like proteins, have been associated with its therapeutic potential, especially in the management of diabetes. Its richness in bioactive peptides enhance its biological value towards improved digestibility, superior nutritional quality, and health-promoting effects. However, in the context of rapid economic growth in other areas, camel farmers are falling behind. With the rising demand for camel milk, it is essential to enhance its production and processing, which necessitates improved collaboration and coordination among all stakeholders. In summary, camel milk is distinguished as a functional food with promising potential in human health, warranting further research and development to fully exploit its benefits.

Authors

Nistha Yadav

Assistant Professor
Department of Animal Genetics & Breeding, Arawali Veterinary College
Sikar, Rajasthan
nisthayadav145@gmail.com



D. Sreekumar

Professor and Head
Department of LPM
Arawali Veterinary College
Sikar, Rajasthan
sknest1@gmail.com



Urmila Pannu

Professor and Head
Department of Animal Genetics and Breeding, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences
Bikaner, Rajasthan



Ved Prakash

Senior Scientist
Department of Animal Genetics and Breeding
ICAR-National Research Centre on Camel, Bikaner, Rajasthan
drvedagb@gmail.com





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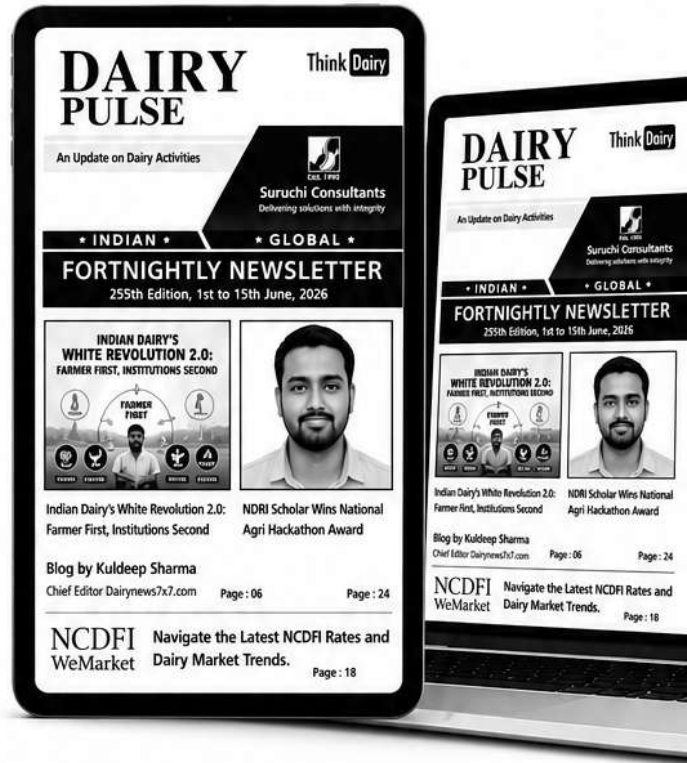
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Integrating Extension Approaches for Sustainable Paddy Straw Management in Northern India

Priya and Yashwant Singh

In Northern India, the burning of paddy stubbles remains a persistent challenge due to the short turnaround time between rice harvesting and wheat sowing. Although several *in-situ* and *ex-situ* crop residue management (CRM) technologies have been developed, their adoption is limited due to behavioural, infrastructural, and awareness-related constraints. This paper emphasizes the importance of integrated extension and advisory strategies to improve farmer awareness, build local capacity, and promote sustainable CRM practices. A multi-dimensional, stakeholder-driven approach is proposed as a pragmatic solution to reduce straw burning and its adverse environmental impacts.

Introduction

Paddy straw burning has emerged as a significant environmental concern in northern Indian states of Punjab, Haryana, and Uttar Pradesh, which together contribute over 80% of India's total paddy residue generation. Each year, farmers burn approximately 13–15 million tonnes of paddy residue between October and November as a cost-effective and rapid method of field clearance between rice harvest and wheat sowing (CPCB, 2021). This practice contributes to the release of over 19 million tonnes of CO₂, along with 0.12 million tonnes of CH₄ and 0.07 million tonnes of N₂O, significantly elevating particulate matter (PM_{2.5}) and ozone precursor levels across the Indo-Gangetic plains. The National Green Tribunal and the Commission for Air Quality Management (CAQM) have repeatedly identified crop residue burning as one of the leading man-made sources of episodic air pollution, particularly affecting Delhi-NCR and adjoining regions. In addition to atmospheric pollution, continuous burning results in the loss of nearly 60% nitrogen, 25% phosphorus, 50% sulphur, and 20% potassium contained in residues, degrading soil health and organic carbon levels.

Although a range of *in-situ* and *ex-situ* CRM technologies such as the Happy Seeder, Super Seeder, Mulcher, Baler, and Straw Chopper-cum-Spreader have been developed and demonstrated, their widespread adoption remained limited. Major barriers include small and fragmented landholdings, high machinery costs, lack of timely availability through custom hiring centres, and limited technical awareness among farmers. To address these challenges, a multi-pronged extension and advisory framework is required, integrating awareness creation, capacity building, and farmer-led innovation supported by enabling policy mechanisms and community-based models. Strengthening participatory extension approaches through Krishi Vigyan Kendras (KVKs), State Agricultural Universities (SAUs), and Farmer Producer Organizations (FPOs) can play a pivotal role in catalysing behavioural change, scaling technology adoption, and achieving sustainable residue management outcomes.

Awareness Creation and Measured Impact

Widespread awareness is the foundation for behavioural transformation. In Punjab and Haryana, Departments of Agriculture and State Agricultural Universities have launched extensive campaigns to educate farmers about CRM technologies.

A survey of 1,478 farmers across 11 districts of Punjab found that although awareness of CRM machinery was



Adoption of CRM machines by farmers

Source: Rural Voice. (2025). Punjab: Over 14,000 CRM machines to be given to farmers to curb stubble burning.

high, 58% of farmers used in-situ CRM machines, yet many still burned loose straw before usage; the report discusses how training and extension gaps may hamper full adoption. In the present initiative, a workshop and hands-on training session organized by KVK, GADVASU sensitized over 120 farmers on residue management options. Post-event feedback revealed improved understanding of the economic and environmental costs of stubble burning, with 68% of participants expressing willingness to adopt CRM technologies in the upcoming season.

Enhanced outreach can be achieved through the following strategies:

ICT-based Tools

- SMS alerts, mobile apps (e.g., PAU Kisan app), and WhatsApp advisories.
- Telecast and broadcast of CRM-related content via TV and radio.

On-Ground Initiatives

- On-farm demonstrations of CRM equipment usage
- Wall paintings, street plays (Nukkad Natak), and folk media campaigns.
- Mobile awareness vans and information kiosks in villages.
- Training camps and workshops at KVKs and SAUs
- CRM-focused literature such as handouts and brochures.

Community Engagement

- Collaboration with panchayats, gurdwaras, schools, and NGOs.
- Farmers-scientists' meets, field days, and Farmers' Day events.
- Identification and training of ambassador/ opinion leader farmers.

Institutional Campaigns

- Organization of Stakeholders' Meets on Residue Management.
- Community-based events to foster dialogue and feedback.

Farmer-Led Extension and Evidence of Behavioural Change

Field surveys and extension reports indicate that villages with visible peer-adopters and opinion-leader farmers show substantially higher CRM uptake than comparable villages without such champions. For example, adoption studies of Happy Seeder and other in-situ technologies document faster diffusion in areas with strong local champions and KVK demonstration activity.

Key initiatives include:

- Felicitation of no-burning farmers during public events.
- Organization of field visits to demonstration plots of progressive farmers.
- Inclusion of such farmers in training and awareness programs.



Workshop and Training Sessions organized by KVK, GADVASU to sensitize farmers on crop residue management practices

- Publication of their stories in print and digital media.
- Engagement of these farmers as trainers and mentors in farmer-to-farmer learning programs.

This approach fosters trust, reduces resistance to change, and enhances local credibility of CRM solutions.

Capacity Building

CRM machinery is often more sophisticated than conventional equipment, requiring technical knowledge for effective use and maintenance. Regular capacity-building efforts are essential to ensure optimal implementation.

Recommendations:

- Conduct hands-on training for farmers, machine operators, and custom hiring providers at KVKs, SAUs, and ICAR institutes.
- Develop standard operating procedures and manuals in local languages.
- Provide post-training support through helpdesks and helplines.
- Encourage behavioural change communication (BCC) and social interaction platforms to address resistance and improve perception.
- Establish village-level machinery banks and cooperatives to promote shared access and reduce individual costs.

According to ICAR-ATARI (Ludhiana), villages participating under the CRM project with operational custom hiring centres (CHC) showed lower incidence of residue burning in monitored extension zones, compared to non-CHC areas.

Future Perspectives

Transitioning from stubble burning to sustainable straw management demands a holistic approach that integrates economic incentives, behavioural change, technological innovation, and policy coherence. Economic measures such as linking CRM practices to carbon credit markets, green financing, or performance-based subsidies can motivate farmers while aligning local actions with

national climate commitments. Behavioural interventions driven by continuous farmers training, peer learning, and the active role of KVKs and FPOs can promote social acceptance and long-term adoption. Digital advisories, mobile apps, and success stories showcasing field-level outcomes can further strengthen awareness and reduce misconceptions about CRM technologies.

Sustained implementation requires collaboration among state agricultural universities, ICAR institutes, pollution control boards, and local governance bodies to validate and refine region-specific strategies. Developing viable value chains for paddy straw utilization in bioenergy, mushroom cultivation, packaging, and livestock feed can convert waste into economic opportunity. Institutionalizing monitoring and evaluation systems will ensure accountability, while adaptive policies can evolve with emerging data and farmer needs. Ultimately, embedding CRM within a broader climate-smart agriculture framework can transform Punjab and Haryana into models of low-emission, resource-efficient farming that protects both livelihoods and the environment.

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The authors may be contacted through email for references.

Authors

Priya

Assistant Professor
Department of LPM
College of Veterinary Science, GADVASU
Rampura Phul, Bathinda, Punjab
dhattarwalpriya@gmail.com



Yashwant Singh

Professor & Incharge
Department of Livestock Farm Complex,
College of Veterinary Science
Rampura Phul, GADVASU

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Indian Dairy's White Revolution 2.0: Farmer First



Kuldeep Sharma
Chief Editor, Dairynews7x7 and
Fellow, Indian Dairy Association

India's dairy sector stands as one of the most remarkable examples of rural economic transformation. The cooperative movement, pioneered by the vision of Dr. Verghese Kurien, enabled millions of small dairy farmers to become stakeholders in a value chain that had once been dominated by traders and intermediaries. The success of the Amul model proved that organized farmers could build world-class institutions while ensuring better incomes, transparency, and social progress.

Dr. Kurien's reservations about private sector participation were shaped by the realities of his era, when many private players were primarily engaged in milk trading with limited commitment to farmer development. However, the dairy landscape has evolved significantly over the past few decades. Several private dairy companies have invested extensively in village-level milk procurement, quality improvement programmes, veterinary care, animal nutrition services, digital payments, and farmer support systems, creating strong and sustainable linkages with producers.

In this changing environment, the debate should no longer focus on cooperatives versus private dairies. The real challenge is to create a farmer-centric dairy ecosystem where farmers remain the primary stakeholders and every institution—whether cooperative or private—competes to serve them better.

India's ambitions for higher milk production, improved farmer incomes, and a stronger dairy economy are both necessary and achievable. However, future growth will depend on more than expanding procurement networks. Climate change, heat stress, fodder shortages, and uncertain rainfall are emerging challenges that directly affect dairy productivity. Farmers will invest in better animals, feed, genetics, and technology only when they have reliable market access, remunerative milk prices,

and long-term productivity-enhancing services.

The future dairy model should therefore rest on two key principles. First, farmer organizations, including cooperatives and Farmer Producer Organizations (FPOs), should serve as the foundation of milk aggregation and collective bargaining. Second, these farmer institutions should have the freedom to choose buyers based on price, service quality, trust, and performance.

Farmer empowerment is not guaranteed by institutional ownership alone. Cooperative institutions succeed only when they remain genuinely farmer-owned, transparent, accountable, and responsive to members' needs. Likewise, private dairies should earn farmer loyalty through superior services and competitive returns. The most effective institutions should succeed through performance rather than preferential support.

The role of government should be to strengthen farmers through investments in animal health, breed improvement, climate-resilient dairy farming, fodder development, infrastructure, and capacity building, rather than favouring any particular buyer category.

The next phase of dairy development should focus on creating a competitive ecosystem where all processors remain accountable to farmers. A strong and dynamic dairy sector will emerge when farmers are not merely suppliers of milk but active owners and decision-makers within the milk economy.

A competitive dairy market does not mean weakening cooperatives. In fact, healthy competition can make every institution more accountable and farmer-focused. Many successful dairy economies have evolved through strong farmer institutions combined with market discipline. New Zealand's cooperative-led model shows the strength of farmer ownership, while countries like the United States and the United Kingdom have developed systems where organised farmer suppliers play a central role in determining market relationships. India does not need to copy any one model.

India needs a model where the farmer remains at the top of the dairy pyramid and all processors — cooperative or private — remain accountable to the farmer. The biggest transformation will happen when farmers do not merely supply milk to institutions but become the owners of the milk economy.

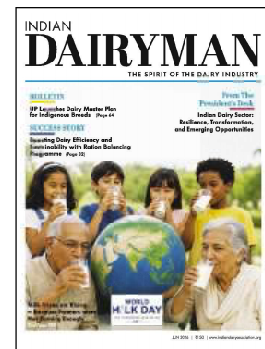
The first White Revolution liberated farmers from traders. White Revolution 2.0 must liberate them from dependence on any single institution. The future of Indian dairying lies not in expanding the power of one organization, but in expanding the power, choices, and prosperity of the farmers who sustain the sector.

(This article is based on a blog by Shri Kuldeep Sharma, published on June 14, 2026, at <https://dairynews7x7.com>)



INDIAN DAIRYMAN

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Author must draw a conclusion at the end of the paper.

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References cited in the text should not be older than last 10 years and be given at the end of the article.

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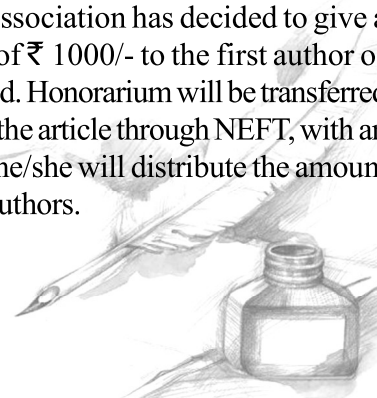
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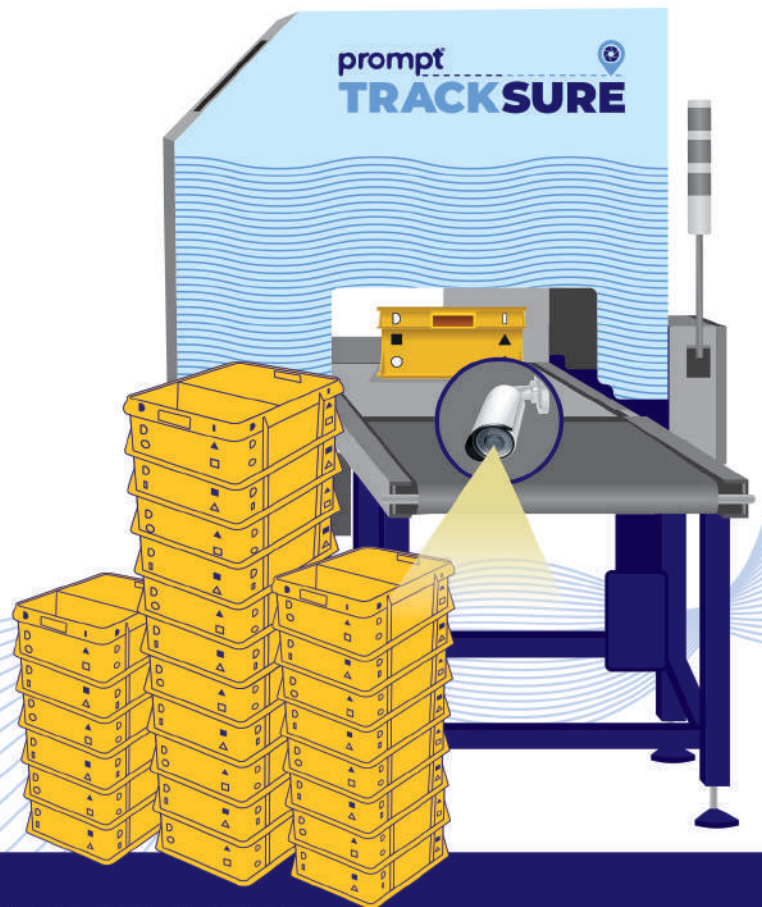


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REPRESENTATIVE IN INDIA FOR FRAUTECH AND MILKYLAB

SRISHTI Separation India LLP

New Delhi | India

Mob: +91-98103 01727, +91-7678400530

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