Livestock & Feed Trends

VOLUME - 23 • NUMBER - 1 • APRIL - JUNE 2025

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#1 FCR point represent third/last decimal point of 1000

*Majority of field trials were conducted at same farm with multiple sheds in integrations across various geographical locations and at different time of the year. Some of the integrators were generous in sharing complete production indices while others communicated the summary of the trial results. In the field trials, Improval™ MS was compared with antibiotic/probiotic/antibiotic + probiotic/probiotic + prebiotic control. Detailed reports availble on request.

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From the Chairman's Desk.....

Dear Friends,

Warm greetings!

We are delighted to share that the first quarter of this Financial Year has been a truly remarkable one for **CLFMA OF INDIA.** Through impactful initiatives, high-level interactions, and active engagement with stakeholders across the livestock value chain, we have taken significant strides in strengthening our presence and advancing the collective goals of livestock sector.

It is with great pleasure that we announce the **58th Annual General Meeting (AGM)** and the **66th National Symposium** of CLFMA OF INDIA, scheduled to be held on **22nd and 23rd August, 2025, at Hotel Taj Deccan, Road No.1, Banjara Hills, Hyderabad – 500034.** We warmly invite your esteemed presence to this prestigious gathering, which promises to be a platform for collaboration, knowledge-sharing, and vision-building for the future of the livestock sector.

I am proud to share several key developments from the last quarter, which are elaborated in detail in the ***"CLFMA Activity Updates"*** section of this magazine. Notable highlights include:

Celebration of World Health Day (7th April 2025) and World Veterinary Day (26th April 2025), reaffirming our commitment to One Health and animal well-being. Participation in the Government of India's Outreach Programme on 8th April 2025, focused on support to fish and shrimp farmers and addressing seafood export challenges. Formal invitations extended to key dignitaries including Hon'ble Ministers Shri. Rajiv Ranjan Singh, Prof. S.P. Singh Baghel, Shri. Shivraj Singh Chouhan, and Shri N. Chandrababu Naidu, requesting their presence at our upcoming Symposium. Strategic Poultry Seminar in Patna on 23rd April 2025, organized in collaboration with the U.S. Grains Council and Bihar Poultry Farmers Association. Submission of key policy letters to government officials on 29th April 2025, requesting one-time permission to import grain sorghum from the U.S. for poultry feeding trials and research. Dairy Seminar in Kolhapur on 2nd May 2025, jointly hosted with Gokul Milk, emphasizing innovation and sustainable dairy practices. Participation in the inaugural IPAAF Expo from 9th to 11th May 2025 in Kerala, showcasing CLFMA's role in uniting stakeholders in poultry, aquaculture, and feed sectors. Support to the 2nd National Symposium of Vets in Poultry (VIP) on 7th May 2025 in Chandigarh. CLFMA Delegation's visit to Krishi Bhawan on 13th May 2025, advocating for policy

support and launching the all-India Digital Maize Survey Project with industry partners. Kickoff meeting of the Maize Survey Working Committee on 22nd May 2025 at Hotel Taj, Bangalore, aligning timelines and deliverables with key stakeholders. Celebration of CLFMA's 58th Foundation Day on 8th June 2025. Co-organization of the Poultry Conference in Coimbatore on 10th June 2025 with USSEC, USSOY, SOPA, and USDA, focusing on soybean's role in poultry nutrition. Visit of CLFMA ED Col. Vinay Kumar to Sri Lanka on 19–20 June 2025 to coordinate international collaboration with SLVA & WPSA for the upcoming joint event in July.

These milestones are a testament to our ongoing efforts to engage, innovate, and advocate for the advancement of the livestock industry. Your unwavering support, participation, and feedback continue to inspire and propel our initiatives forward.

As we look ahead, I wholeheartedly welcome your valuable suggestions to help us grow stronger and more resilient as a collective voice of the livestock sector. Together, let us build a sustainable and thriving future for our industry and for the nation.

With warm regards,

For **CLFMA OF INDIA,**

Divya Kumar Gulati
Chairman

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CLFMA
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ASSOCIATION OF LIVESTOCK INDUSTRY
U.S. GRAINS
COUNCIL
Date: April 23, 2025
Taj City Centre,
Patna
cordially invite you for
POULTRY
SEMINAR
"Poultry in India: Current Challenges & the Way Forward"
10.30 AM Registration
11:00 AM Welcome Address Mr. Divya Kumar Gulati - Chairman, CLFMA OF INDIA
11.10 AM Poultry in India and the Potential Mr. Pawan Kumar- President, BPFA
11.40 AM Feed Stocks: India's Current Situation & Global Perspective Mr. Amit Sachdev- Regional Consultant, U.S. Grains Council
12:00 Noon Alternate Grain – U.S. Sorghum: A Potential Solution Mr. Reece H Cannady- Director, U.S. Grains Council
12:20 PM Recent Advances in use of DDGS in Livestock and Poultry Feed Dr. Pankaj Kumar Singh - Professor and Head of Animal Nutrition Department and Deputy Director Research, Bihar Animal Sciences University, Patna
12:40 PM Break – Tea and Networking
01:30 PM Panel Discussion – Navigating the Indian Poultry Sector's New Normal
Moderator: Mr. Amit Saraogi- MD, Anmol Feeds
Panellists: Mr. Pawan Kumar- President, BPFA
Mr. Divya Kumar Gulati- Chairman, CLFMA OF INDIA
Mr. B. M. Sahni- MD, Patliputra Feeds
Mr. Amit Sachdev- Regional Consultant, U.S.Grains Council
02:00 PM Vote of Thanks
02:05 PM Adjourn for Lunch

CLFMA Hosts Strategic Session on "Poultry in India: Current Challenges & the Way Forward" in Collaboration with the U.S. Grains Council and Bihar Poultry Farmers Association (BPFA)

Patna, April 23, 2025 — The Compound Livestock Feed Manufacturers Association (CLFMA) of India, in Collaboration with the U.S. Grains Council and with support from the Bihar Poultry Farmers Association (BPFA) successfully hosted a seminar at Patna. The seminar, themed "Poultry in India: Current Challenges & the Way Forward," brought together more than 60 participants, including feed manufacturers, poultry farmers, nutritionists, grain suppliers, and researchers from across the region.

The seminar opened with a welcome address by Ms. Nayantara A Pande, Marketing Specialist, U.S. Grains Council, followed by a keynote on "Poultry in India and The Potential" by Mr. Divya Kumar Gulati, Chairman, CLFMA of India. He highlighted the urgent need for collective action to address rising feed costs and market volatility, stressing that strategic collaborations will be pivotal in driving sectoral resilience.

Mr. Divya Kumar Gulati, Chairman, CLFMA of India, shared, "The Indian poultry industry is at a critical crossroads, where timely interventions and strategic collaborations are essential to overcoming the challenges posed by rising feed costs, supply chain disruptions, and market volatility. According to a recent Crisil Ratings report, the industry's profitability is expected to dip by 50 basis points in the 2025-26 fiscal year, largely due to the rising prices of key feed ingredients like maize and soybean, which account for 90% of total feed costs. However, revenue growth is still projected to rise by 8-10%, driven by strong demand and consumption. Events like these provide an invaluable platform for exchanging insights, fostering collaboration, and exploring sustainable solutions that will not only benefit our sector but also contribute to the nation's economic resilience."

The seminar was anchored by engaging sessions led by leading voices from the Indian poultry and feed sectors.

Key Discussions & Insights:

- **Mr. Amit Sachdev, Regional Consultant, U.S. Grains Council,** shared an overview of India's feedstock situation and its global implications.
- **Mr. Reece H Cannady, Director, U.S. Grains Council,** presented on "U.S. Sorghum: A Potential Solution" to current grain supply challenges.
- **Dr. Pankaj Kumar Singh, Professor and Head of Animal Nutrition Department and Deputy Director Research, Bihar Animal Sciences University,** elaborated on "Recent Advances in the Use of DDGS in Livestock and Poultry Feed," advocating for research-led adoption of DDGS to offset feed costs and improve efficiency.

A panel discussion on "Navigating the Indian Poultry Sector's New Normal" was moderated by Mr. Amit Saraogi (MD, Anmol Feeds), and featured an esteemed panel including Mr. Divya Kumar Gulati, Mr. Pawan Kumar, Mr. B. M. Sahni (MD, Patliputra Feeds), Mr. Pawan Kumar (President, BPFA) and Mr. Amit Sachdev. The discussion focused on the urgent need for sustainable feed alternatives, policy clarity, and building long-term supply chain resilience.

The seminar successfully highlighted critical issues facing India's poultry industry, from volatile feed grain markets to the need for strategic partnerships. It reinforced CLFMA's position as a vital advocate for industry advancement, enabling dialogue between farmers, academia, and global stakeholders to build a more sustainable and robust poultry ecosystem.

CLFMA EVENT












CLFMA OF INDIA

ASSOCIATION OF LIVESTOCK INDUSTRY

with

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cordially invite you for

Dairy Seminar

Date: 2nd May 2025

Regal Hall, Residency Club, Tarabai Park, Kolhapur

"Sustainable Dairy Farming and Innovations"

10.00 am	Registration	
10.30 am	Master of Ceremony	**Dr. Saikat Saha,** President, West Zone, CLFMA OF INDIA
	Convenor	**Mr. S. V. Bhave,** Past Chairman, CLFMA OF INDIA
	Opening Ceremony	**Mr. Divya Kumar Gulati,** Chairman, CLFMA OF INDIA
		Mr. Arun Ganpatrao Dongale, Chairman, Gokul
		Mr. Yogesh Godbole, Managing Director, Gokul
		Mr. S. V. Bhave, Past Chairman, CLFMA OF INDIA
	Lighting of Lamp	
	Opening Remarks	**Mr. S. V. Bhave,** Past Chairman, CLFMA OF INDIA
	Welcome Address By	**Mr. Divya Kumar Gulati,** Chairman, CLFMA OF INDIA
	Address by Guest of Honour	**Mr. Yogesh Godbole,** Managing Director, Gokul
	Address by Chief Guest	**Mr. Arun Ganpatrao Dongale,** Chairman, Gokul
11.30-12.00 pm	EVP - Etho Veterinarian Practices	**Dr. Vijay Magre,** Gokul
12.00-12.30 pm	Stress Management and Farm Practices and TMR	**Dr. Pritpal Singh,** National Manager Technical, Progressive Dairy Solution
12.30-12.50 pm	Progressive Dairy Farming - Punjab Story	**Mr. Munish Sharma,** General Manager, Progressive Dairy Solution
12.50-01.30 pm	Buffalo	**Dr. Niteen Manmohan Markandeya,** Retd. Dean Veterinary College, Prarbhani
01.30-02.30 pm	Lunch	
02.30-03.00 pm	Cattle Nutrition	**Dr. Prashant Shinde,** Commercial Director, Cargill India Pvt. Ltd.
03.00-03.30 pm	Silage For Small Dairy Farmers	**Dr. Chandrashekhar B. Pande,** Director, Lallemand India Pvt. Ltd.
03.30-04.30 pm	Panel Discussion	**Dr. Pradeep P. Mahajan,** Consulting Animal Nutritionist, Viziva Services
		Dr. V. D. Patil, Incharge & Nutritionist, Gokul Cattle Feed Plant
		Dr. Sriharsha K V S, CATAL-OO Animal Feed Consulting
		Dr. Prakash Jyoti Salunke, Manager, A.H, Gokul Milk Union
04.30-04.45 pm	Mementos to Sponsors	
04.45 pm	Vote of Thanks by	**Dr. Saikat Saha,** President, West Zone, CLFMA OF INDIA

CLFMA of India and Gokul Milk Host Seminar on Sustainable Dairy Farming and Innovations in Kolhapur

Kolhapur, Maharashtra – May 02, 2025: The Compound Livestock Feed Manufacturers Association (CLFMA) of India, in collaboration with Gokul Milk, successfully hosted an impactful seminar on "Sustainable Dairy Farming and Innovations" at Regal Hall, Residency Club, Tarabai Park, Kolhapur. The event brought together top leaders, veterinary experts, and researchers from the dairy and livestock sectors to highlight the advancements and prerequisites in India's dairy ecosystem through science, innovation, and sustainable practices. Sustainable dairy farming prioritizes environmental, social, and economic health, ensuring the well-being of the dairy farm, the animals, and the broader community.

The seminar was convened and ably guided by Mr. S. V. Bhave, Past Chairman, CLFMA of India. In his welcome address, Mr. Bhave extended warm greetings to the participants and introduced the distinguished dignitaries present from Gokul Dairy, including Mr. Navid Mushrif, Director, Gokul, Mr. Ajit Narake, Director, Gokul, Mr. Yogesh Godbole, Managing Director, Gokul.

He also acknowledged the presence of other prominent members of the **Board of Directors** of Gokul:

- **Mr. Yuvraj Patil**
- **Mr. Nandkumar Dhenge**
- **Mr. Prakash Patil**
- **Mr. S. R. Patil**
- **Mr. Bayaji Shelake**

Following the introductions, **Mr. Divya Kumar Gulati, Chairman, CLFMA of India, addressed the gathering and provided a comprehensive overview of CLFMA's vision, key initiatives, and its pivotal role in strengthening the livestock sector in India.**

Mr. Divya Kumar Gulati, Chairman, CLFMA of India, shared, "This seminar in collaboration with Gokul is a testament to CLFMA's unwavering commitment toward strengthening India's sustainable dairy farming and innovation through science-backed revolution, knowledge sharing, and stakeholder collaboration. In this seminar, we emphasised how a progressive dairy farming approach can be a stress-relief for farmers and also contribute significantly to public health through better-quality milk and livestock management. From promoting Total Mixed Ration (TMR) and effective veterinary practices to encouraging nutrition-focused feeding strategies, our aim is to empower farmers and professionals with tools that ensure both animal welfare and economic viability Through our consistent efforts and awareness-driven initiatives like this, we aim to nurture a more informed, robust, and forward-thinking approach toward India's livestock and cattle feed industry."

The Seminar was further anchored by engaging sessions led by leading voices from the Indian sustainable dairy farming and innovations.

- Dr. Vijay Magre of Gokul presented on Etho Veterinarian Practices, shedding light on animal welfare and ethical livestock management.
- Dr. Pritpal Singh, National Manager – Progressive Dairy Solution, addressed modern approaches to stress management and Total Mixed Ration (TMR) in dairy farming.
- Mr. Munish Sharma shared insights from the Punjab dairy sector, highlighting scalable innovations.
- Dr. Niteen Manmohan Markande, Retd. Dean, Veterinary College, Parbhani, emphasized the untapped potential of buffalo-based dairy.
- Dr. Prashant Shinde of Cargill and Dr. Chandrashekhar Pandey of Lallemand India elaborated on cattle nutrition and silage solutions for small-scale dairy farmers.
- An engaging panel featuring Dr. Pradeep P. Mahajan (Viziva Services), Dr. V. D. Patil (Gokul), Dr. Niteen Manmohan Markande (Retd. Dean, Veterinary College, Parbhani) and Dr. Prakash Jyoti Salunke (Gokul Milk Union) addressed future-ready practices in dairy nutrition and feed management moderated by Mr. S. V. Bhave (Past Chairman, CLFMA of India).

The Seminar concluded with a memento presentation to sponsors, speakers and address by **Mr. Arun Ganpatrao Dongale, Chairman, Gokul.**

Vote of thanks by Dr. Saikat Saha was extended to all the dignitaries who attended the event and shared their extensive knowledge and experience on sustainable dairy practices. More than 350 participants attended the seminar.



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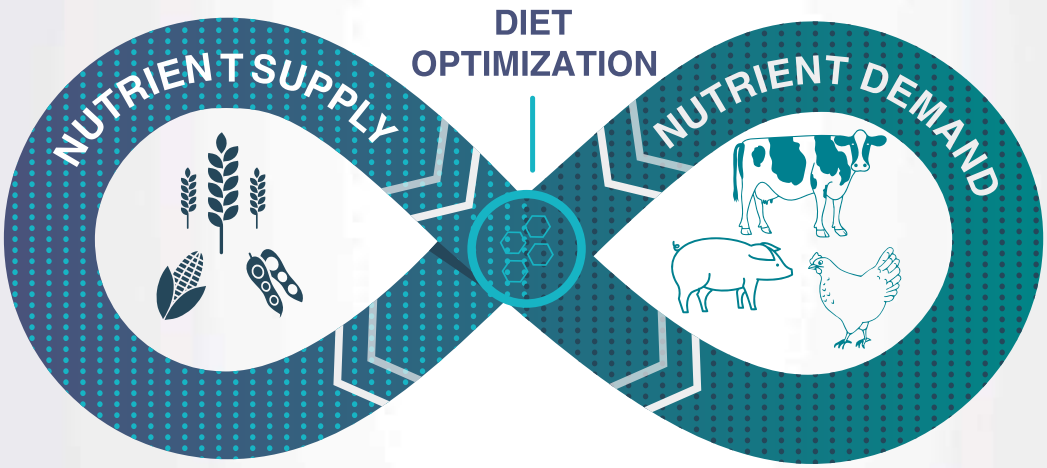

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CLFMA ACTIVITY UPDATES

CLFMA OF INDIA celebrated World Health Day on 7th April, 2025 and World Veterinary Day on 26th April, 2025.

CLFMA OF INDIA Participates in Government of India's Outreach Programme with Fish and Shrimp Farmers and Seafood Exporters on 8th April 2025:

CLFMA OF INDIA took part in the Government of India's Outreach Programme on April 8, 2025, held via video conference and co-chaired by Shri. Sagar Mehra, Joint Secretary (Inland Fisheries) and Ms. Neetu Prasad, Joint Secretary (Marine Fisheries) from the Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying. The session addressed the impact of U.S. reciprocal tariffs on Indian seafood exports and explored relief measures under schemes like PMMKSSY and FIDF.

Key discussions focused on supporting fish and shrimp farmers through input cost subsidies, farm level support, credit access, and price negotiation and farmer protection; boosting domestic demand via GST exemptions and inclusion in government dietary plans; and trade diversification through market access negotiations and addressing EU trade barriers.

CLFMA OF INDIA was represented by Mr. Nissar F. Mohammed, Col. Vinay Kumar, and Ms. Shilpa Utekar. CLFMA OF INDIA reaffirmed the organization's commitment to sustainable aquaculture growth and robust policy advocacy. The outreach programme attended by approximately 300 participants from across the seafood value chain. A comprehensive presentation delivered by Shri. Sagar Mehra, Joint Secretary (Inland Fisheries), Government of India during the session.

On April 16, 2025, CLFMA OF INDIA extended a formal invitation to Shri. Rajiv Ranjan Singh, Hon'ble Minister of Fisheries, Animal Husbandry and Dairying, Government of India, requesting his esteemed presence as the **Chief Guest at the 66th National Symposium of CLFMA OF INDIA**, scheduled to be held on **22nd and 23rd August, 2025 at Hotel Taj Deccan, Hyderabad.**

On April 16, 2025, CLFMA OF INDIA also extended a formal invitation to **Prof. S. P. Singh Baghel**, Hon'ble Minister of State for Fisheries, Animal Husbandry and Dairying, and Minister of State in the Ministry of Panchayati Raj, Government of India, to grace the occasion as a **Guest of Honour.**

Additionally, On April 16, 2025, a letter was addressed to **Shri. Shivraj Singh Chouhan**, Hon'ble Union Minister of Agriculture and Farmers Welfare, Government of India, inviting him to join the Symposium as a **Guest of Honour.**

CLFMA Hosts Strategic Poultry Seminar in Patna with U.S. Grains Council & BPFA on 23rd April, 2025:

CLFMA of India, in collaboration with the **U.S. Grains Council (USGC)** and support from the **Bihar Poultry Farmers Association (BPFA)**, organized a seminar on **"Poultry in India: Current Challenges & the Way Forward"** on 23rd April, 2025 in Patna. The event gathered over 60 stakeholders, including poultry farmers, feed manufacturers, and researchers.

Mr. Divya Kumar Gulati, Chairman of CLFMA, emphasized the need for collaborative action to counter rising feed costs and supply chain challenges, citing Crisil's report projecting a 50 basis points dip in industry margins despite 8–10% revenue growth.

Key sessions included insights from Mr. Amit Sachdev on overview of India's feedstock situation and its global implications and Mr. Reece Cannady on US Sorghum: A potential Solution" to current grain supply challenges, in short sorghum as a viable alternative, while Dr. Pankaj Kumar Singh advocated the use of DDGS in poultry feed. A panel discussion, moderated by Mr. Amit Saraogi, explored solutions for sustainability and policy clarity in the sector, Mr. Divya Kumar Gulati, CLFMA Chairman, Mr. B. M. Sahni (MD Patliputra Feeds), Mr. Pawan Kumar (President BPFA), Mr. Amit Sachdev, Regional Consultant, USGC actively participated in the panel discussions. The discussion focused on the urgent need for sustainable feed alternatives,

policy clarity and building long terms supply chain resilience.

The Seminar reinforced the importance of innovation, partnerships, and resilience in shaping the future of India's poultry industry.

CLFMA OF INDIA has extended a formal invitation to Sri Nara Chandrababu Naidu, Hon'ble Chief Minister of Andhra Pradesh, through a letter dated 25th April 2025, requesting his esteemed presence as the Guest of Honour at the 66th National Symposium of CLFMA OF INDIA, scheduled to be held on 22nd and 23rd August 2025 at Hotel Taj Deccan, Hyderabad. In continuation of the same, a request has been made for an appointment with the Hon'ble Chief Minister on either 12th, 13th, or 14th May 2025, at a time convenient to his schedule.

CLFMA OF INDIA Sent request letter to GOI officials for one time permission to import grain sorghum from the US for Poultry Feeding Trials and Research on 29th April 2025:

1. Letter sent to Dr. Pramod Kumar Meherda, Additional Secretary, Plant Protection Division, Ministry of Agriculture and Farmers Welfare (MoA & FW), Department of Agriculture, Cooperation and Farmers Welfare, Room No 224, Krishi Bhavan, New Delhi – 110001, Government of India on the subject - Request Letter for one time permission to import grain sorghum from the United States for poultry feeding trials and research on 29th April, 2025.
2. Letter sent to Shri. Sunil Barthwal, Commerce Secretary, Ministry of Commerce, Vanijya Bhawan, New Delhi – 110001, Government of India on the subject - Request Letter for one time permission to import grain sorghum from the United States for poultry feeding trials and research on 29th April, 2025.
3. Letter sent to Shri. Rajesh Agrawal, Special Secretary, Ministry of Commerce, Vanijya Bhawan, New Delhi - 110001 Government of India, on the subject - Request Letter for one time permission to import grain sorghum from the United States for poultry feeding trials and research on 29th April, 2025.

CLFMA of India and Gokul Milk Host Seminar on Sustainable Dairy Farming and Innovations in Kolhapur on 2nd May, 2025:

The Compound Livestock Feed Manufacturers Association (CLFMA) of India, in collaboration with Gokul Milk, successfully hosted an impactful seminar on "Sustainable Dairy Farming and Innovations" at Regal Hall, Residency Club, Tarabai Park, Kolhapur on 2nd May, 2025. The event brought together top leaders, veterinary experts, and researchers from the dairy and livestock sectors to highlight the advancements and prerequisites in India's dairy ecosystem through science, innovation, and sustainable practices. Sustainable dairy farming prioritizes environmental, social, and

economic health, ensuring the well-being of the dairy farm, the animals, and the broader community.

The Seminar was guided by Mr. S. V. Bhave, Past Chairman, CLFMA of India, and commenced with a welcome address by Mr. Divya Kumar Gulati, Chairman, CLFMA of India and other prominent dignitaries as Mr. Navid Mushrif, Director, Gokul, Mr Ajit Narake, Director, Gokul, Mr. Yogesh Godbole, Managing Director, Gokul. Other prominent Directors from Gokul also included Mr. Yuvraj Patil, Mr. Nandkumar Dhenge, Mr. Prakash Patil, Mr. S. R. Patil, Mr. Bayaji Shelake.

CLFMA of India Chairman Mr. Divya Kumar Gulati shared that this Seminar in collaboration with Gokul is a testament to CLFMA's unwavering commitment toward strengthening India's sustainable dairy farming and innovation through science-backed revolution, knowledge sharing, and stakeholder collaboration. In this seminar, we emphasized how a progressive dairy farming approach can be a stress-relief for farmers and also contribute significantly to public health through better-quality milk and livestock management. From promoting Total Mixed Ration (TMR) and effective veterinary practices to encouraging nutrition-focused feeding strategies, our aim is to empower farmers and professionals with tools that ensure both animal welfare and economic viability through our consistent efforts and awareness-driven initiatives like this, we aim to nurture a more informed, robust, and forward-thinking approach toward India's livestock and cattle feed industry."

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The Seminar concluded with a memento presentation to sponsors, speakers and address by Mr. Arun Ganpatrao Dongale, Chairman, Gokul.

Vote of thanks by Dr. Saikat Saha was extended to all the dignitaries who attended the event and shared their extensive knowledge and experience on sustainable dairy practices. More than 300 participants attended the seminar.

CLFMA OF INDIA at the 1st edition of IPAAF-International Poultry, Aquaculture and Animal Feed Expo scheduled from 09-11th May, 2025 at Adlux International Convention Centre, Angamaly, Ernakulam:

CLFMA OF INDIA participated in the inaugural function of the **International Poultry, Aquaculture and Animal Feed Expo (IPAAF)**, held from **09th to 11th May 2025** at the Adlux International Convention Centre, Angamaly, Ernakulam. **The grand inaugural ceremony on 9th May 2025** witnessed the presence of several eminent dignitaries, including Prof. (Dr.) Anil K.S. – Vice Chancellor – Kerala Veterinary & Animal Sciences University (KVASU), Mr. Divya Kumar Gulati – Chairman – CLFMA OF INDIA, Association of Livestock Industry, Mr. R. Ramkutty – Treasurer - CLFMA OF INDIA, Association of Livestock Industry, Mr. Davis – Managing Director – Thomson Group, Mr. Pramod – Managing Director – Farm India Chicken, Mr. Martin P. Chacko IEDS - Assistant Director, MSME – Development & Facilitation office ministry of MSME, Government of India, Mr. C. Saravanan – JMD, Swathi Hatcheries, Member of Broiler Coordination Committee & Poultry Farmers Regulatory Committee, South Zone President – CLFMA of India, Association of Livestock Industry, Mr. Jaison John – CLFMA Management Committee Member, Mr. Vivekanandhan. D – Director – Midaas Touch Events and Trade Fairs LLP.

The expo featured over 120 exhibition stalls, bringing together stakeholders from across the poultry, aquaculture, and animal feed sectors. CLFMA OF INDIA showcased its presence at Stall No. 15, which was visited by some of the CLFMA members and over 50 industry professionals and stakeholders. Representing CLFMA OF INDIA at the expo were Col. Vinay Kumar, Executive Director, Ms. Shraddha Kadam, Admin Officer, Ms. Poonam Mestry, Accounts Manager.

The organizers of IPAAF expressed their appreciation for CLFMA OF INDIA's valuable presence and continued support, acknowledging its vital role in enhancing the event's impact and relevance for the livestock industry.

CLFMA of India Extends Support to Vets In Poultry's 2nd National Symposium 2025:

CLFMA of India proudly supported the 2nd National Symposium organized by Vets In Poultry (VIP), held on 7th May 2025 at Hyatt Regency, Chandigarh. A special message from the Chairman of CLFMA was shared for inclusion in VIP's National Symposium Souvenir, underscoring the Association's continued commitment to collaborative growth and knowledge exchange in the poultry sector.

CLFMA Delegation's Visit to Krishi Bhawan – 13th May 2025:

A delegation of CLFMA of India, comprising Mr. Divya Kumar Gulati, Chairman; Mr. Naveen Pasuparthy, Deputy Chairman; Col. Vinay Kumar, Executive Director; and Mr. Prakhar Rathi from Satsure Analytics India Pvt. Ltd., visited Krishi Bhawan, New Delhi, on 13th May 2025.

The delegation had the privilege of meeting Ms. Alka Upadhyaya, Secretary, Department of Animal Husbandry & Dairying (AHD), Government of India. CLFMA along with 12 other leading industry associations came together to represent the Poultry Sector with a collective voice. A detailed presentation was made, highlighting the critical issues related to the demand-supply dynamics of maize, which continues to be the key raw material for the poultry sector. The joint delegation also submitted a proposal for a Knowledge Partnership to conduct a Digital Survey of Maize Production, a collaborative initiative intended to be jointly funded and executed by the participating associations. Furthermore, the associations sought the Ministry's support as a Knowledge Partner for the Maize Survey Project and requested permission to feature the Department's logo in the final survey report.

The delegation also took this opportunity to extend a formal invitation to Ms. Alka Upadhyaya to grace the upcoming CLFMA National Symposium 2025 as the Guest of Honour.

In addition, the CLFMA delegation met Dr. Lipi Sairiwal, Deputy Commissioner (AHIDF) and Mr. Sujit K. Dutta, Joint Commissioner (NLM) in the Department of Animal Husbandry & Dairying, Government of India. Both dignitaries were also cordially invited to attend CLFMA's National Symposium 2025 as Special Guests.

This visit marks a pivotal step in fostering collaboration between industry and government for the sustainable growth of the livestock sector in India.

Follow up Working Committee Meeting - Maize Survey Report - 22nd May 2025 Kick off Meeting in Hotel Taj, Bangalore: Mr. Divya Kumar Gulati, Chairman and Mr. Naveen Pasuparthy, Dy. Chairman along with Maize working committee with Satsure had all India Maize Digital Survey Project Kick Off Meeting, USGC Team, etc. actively involved in the same. The team discussed time lines, deliverables, dashboard formats, etc. regarding the Maize Survey Report.

CLFMA OF INDIA celebrated its 58th Foundation Day on 8th June, 2025.

USSEC, USSOY, SOPA, USDA in collaboration with **CLFMA OF INDIA** successfully organized a Poultry Conference on 10th June 2025 at Hotel Residency Towers, Coimbatore.

The conference began with welcome remarks by Mr. Franklin Manual, Country Team Lead – India, USSEC, followed by insights from Mr. D. N. Pathak of SOPA. Mr. Matthew Clark, Director, Feedguys Resources Pte. Ltd., presented on the Global Soybean Meal Composition and broiler feed economics, highlighting the superior nutritional profile of soybean meal.

Key presentations included:

- Poultry and Soybean Outlook of India by Mr. Jaison John, USSEC
- Comparative Advantages of Soybean Meal by Mr. Susil Silva, USSEC
- Modernizing Poultry through Technical Audits by Mr. Atula Mahagamage, USSEC
- Human Capital Development via

Soy Excellence Center (SEC) by Mr. Vijay Anand, USSEC

- Soybean Superiority in Poultry Breeding by Dr. Chandrasekaran Duraiswamy
- Importance of Soybean Meal in Poultry Nutrition by Dr. Bhukya Prakash, DPD, Govt. of India
- Differential Analysis of Soybean Quality by Mr. Matthew Clark

A dynamic panel discussion was moderated by Ms. Deeba Giannoulis, USSEC, with active participation from industry leaders and experts including CLFMA Treasurer Mr. R. Ramkutty.

Mr. R. Lakshmanan, Chairman, Shanti Feeds Pvt. Ltd. and CLFMA Managing Committee Member, offered an industry perspective on feed quality and sustainability. Mr. C. Sarvanan C, South Zone President and Member of PR and Digital Working Committee & Col. Vinay Kumar, CLFMA Executive Director attended the event on behalf of CLFMA OF INDIA, which was concluded with closing remarks by Mr. Susil Silva.

The conference saw active participation from around 50 delegates and proved to be an insightful platform for knowledge sharing and industry collaboration.

CLFMA ED Col. Vinay Kumar Visit to Sri Lanka on 19th – 20th June, 2025:

Col Vinay Kumar, ED CLFMA visited Colombo on 19-20 June 2025 to co-ordinate the Office Bearers meeting with SLVA & WPSA (Sri Lanka Branch) scheduled on 01-03 July, 2025.

A Meeting for the same was held with Mr. Krishnamurti, Dr. Mallawa Arachchi, Dr. Tushara and Dr. Sumdu.

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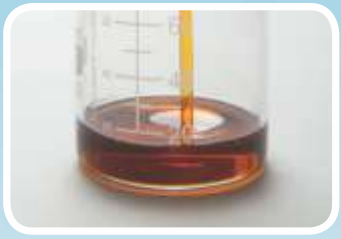
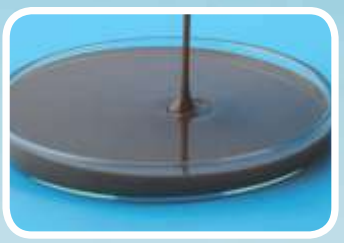

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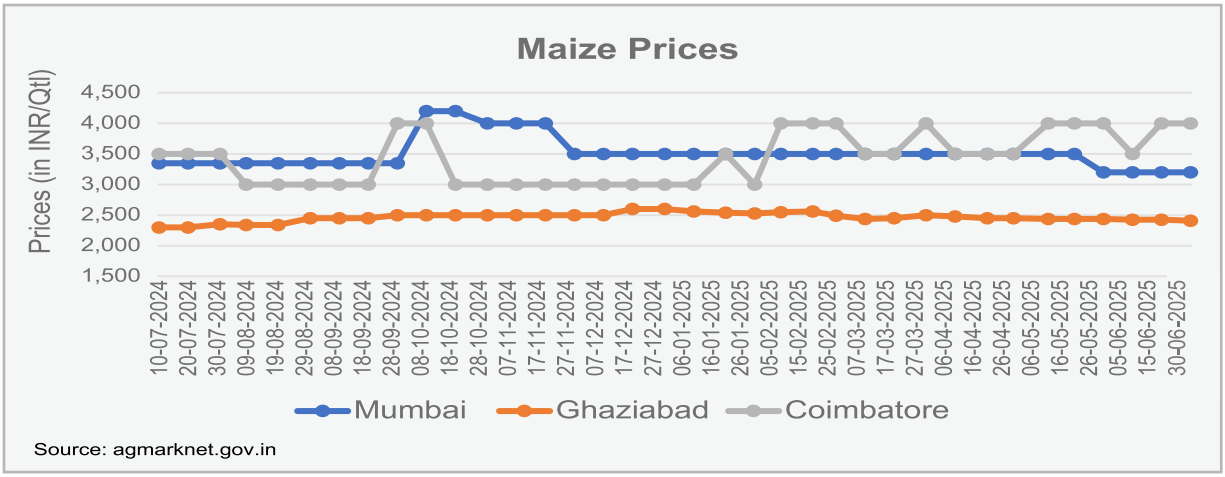
Commodity Updates

1. Domestic Prices

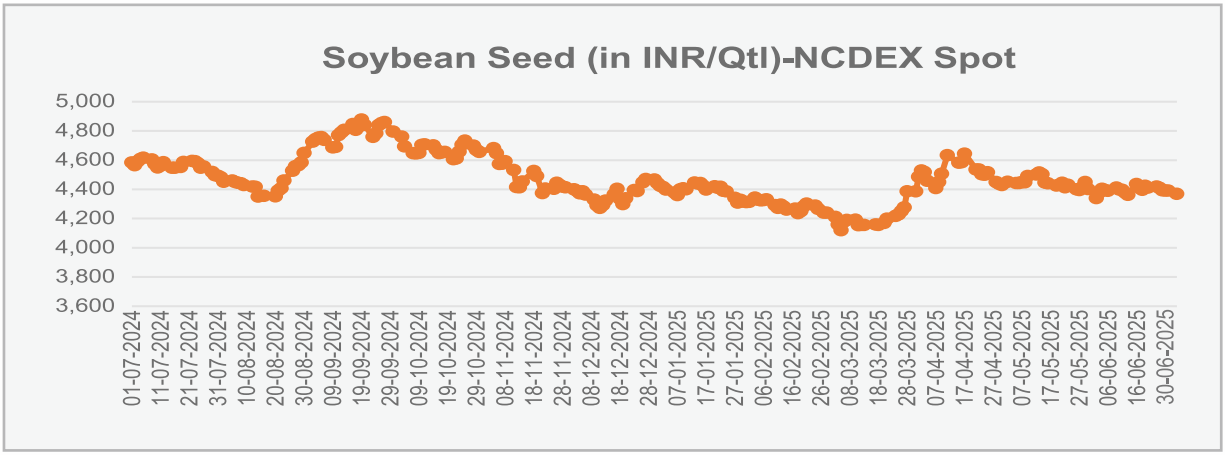
I. Maize



Source: agmarknet.gov.in

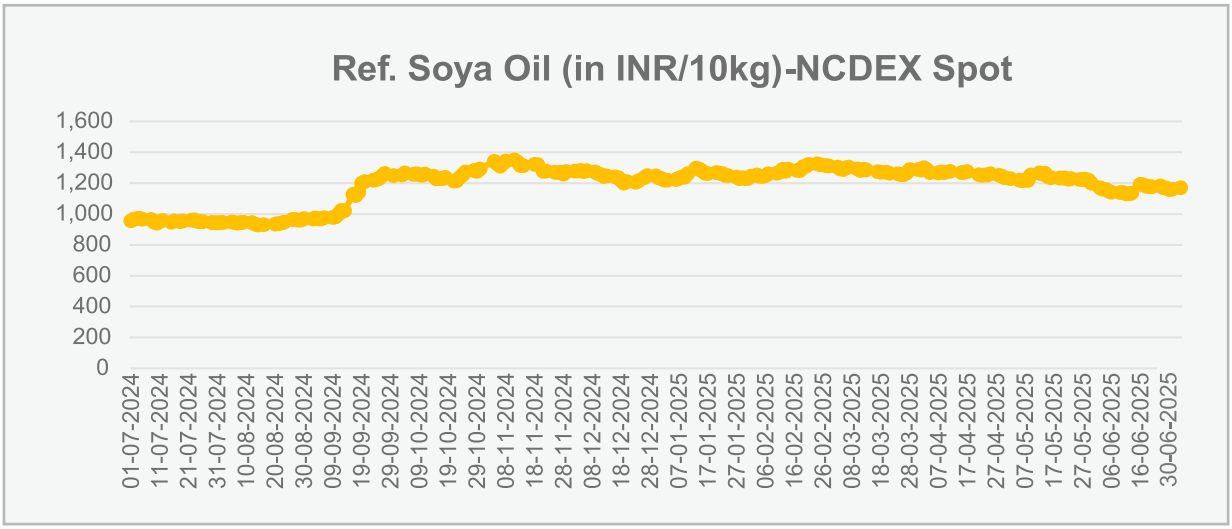
Maize Prices (INR/Quintal)		
City	30/06/2025	31/05/2025
Mumbai	3,200	3,200
Ghaziabad	2,410	2,440
Coimbatore	4,000	4,000

II. Soybean

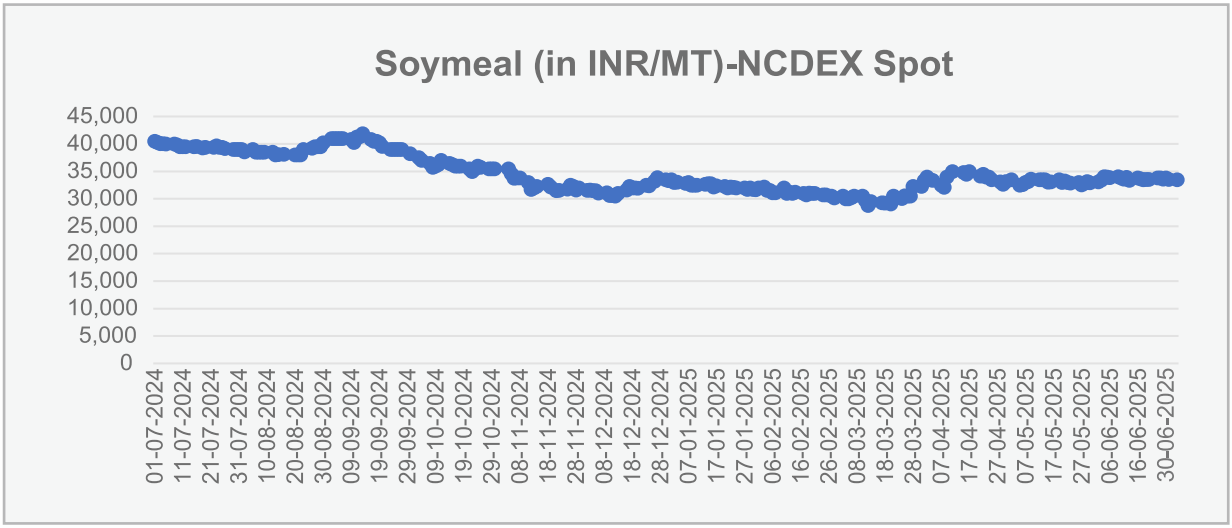


Soybean Complex Prices-NCDEX Spot		
Commodity (Unit)	**30/06/2025**	**31/05/2025**
Soybean Seed (in INR/Qtl)	4,369	4,402
Ref. Soya Oil (in INR/10kg)	1,170	1,200
Soymeal (in INR/MT)	33,500	32,950

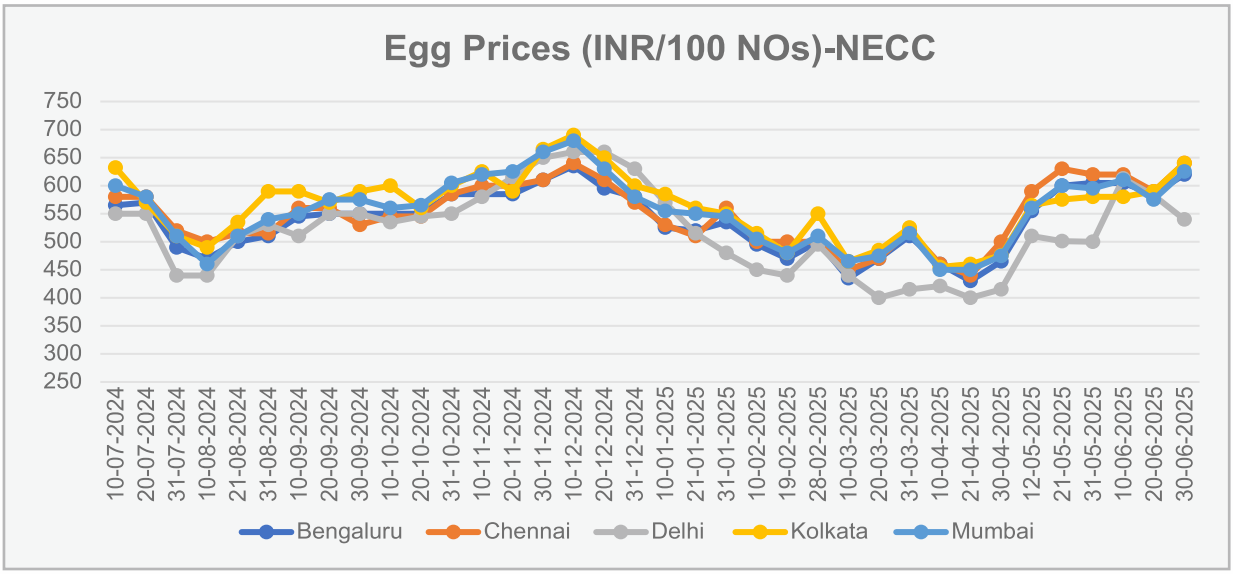
Ref Soya Oil



Soymeal



III. Egg Rates



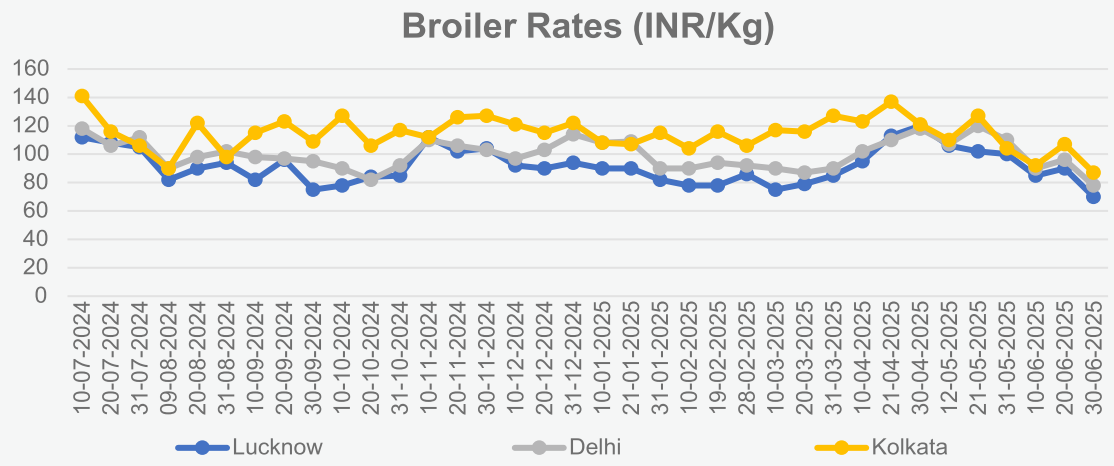
EGG PRICES (INR/100 NOs)		
Name of Zone	**30/06/2025**	**31/05/2025**
NECC Prices		
Ahmedabad	590	535
Ajmer	550	455
Barwala	521	450
Bengaluru (CC)	620	605
Brahmapur (OD)	585	527
Chennai (CC)	640	620
Chittoor	633	613
Delhi (CC)	540	500
E.Godavari	570	510
Hospet	570	555
Hyderabad	565	525
Jabalpur	590	520
Kolkata (WB)	640	580
Ludhiana	521	460
Mumbai (CC)	625	595
Mysuru	625	610
Namakkal	575	560
Pune	625	595
Raipur	576	520
Surat	605	550
Vijayawada	590	525
Vizag	585	535
W.Godavari	570	510
Warangal	567	527

III. Egg Rates

EGG PRICES (INR/100 NOs)		
Name of Zone	**30/06/2025**	**31/05/2025**
Prevailing Prices		
Allahabad (CC)	595	519
Bhopal	580	510
Indore (CC)	580	485
Kanpur (CC)	567	495
Lucknow (CC)	595	524
Muzaffurpur (CC)	585	515
Nagpur	595	555
Patna	585	515
Ranchi (CC)	590	538
Varanasi (CC)	567	513

Source: NECC

IV. Broiler Rates



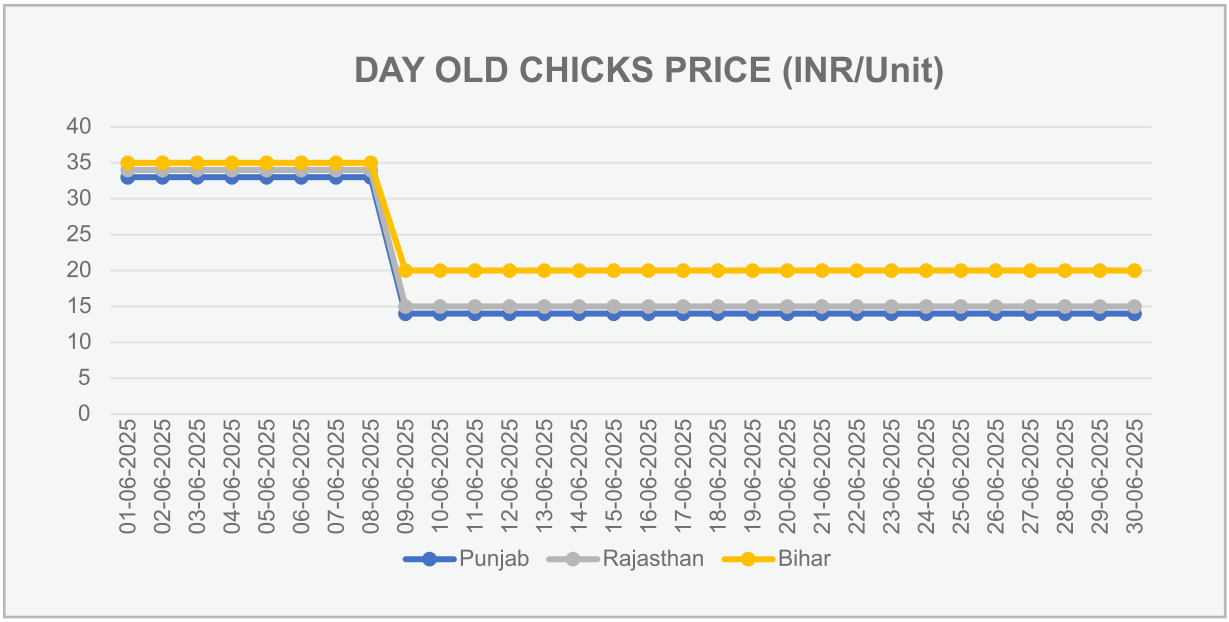
BROILER RATES (INR/Kg)		
Location	**30/06/2025**	**31/05/2025**
Delhi	78	110
Punjab	76	104
Raipur	75	100
Pune	92	115
Bengaluru	89	110
Hyderabad	90	110
Guwahati	90	129
Kolkata	87	104
Bihar	80	125
Madhya Pradesh	90	109
Lucknow	70	100

Source: SRP (Wholesale Rates)

V. Day old Chicks Price

DAY OLD CHICKS PRICE (INR/Unit)		
State	**30/06/2025**	**31/05/2025**
Punjab	14	33
Dehradun	16	34
Haryana	14	33
Himachal Pradesh	15	34
Rajasthan	15	34
Jammu	16	35
Andhra Pradesh	25	30
Uttar Pradesh	17	35
Madhya Pradesh	22	33
Telangana	22	30
Bihar	20	35
Jharkhand	20	35
Gujarat	20	29

Source: Poultry India TV/ SRP



VI. Fish Prices

Fish Prices Average Price (INR/Quintal)		
Fish Type	**30/06/2025**	**31/05/2025**
Bata Putti	8,000	7,000
Black Dom	10,000	15,000
Blue Dom	12,500	13,500
Chilwa	8,000	12,000
Halwa	20,000	22,000
Hilsa	40,000	45,000
Katla (Small)	8,000	10,000
Malli (Big)	12,500	19,000
Malli (Small)	8,000	11,500
Pangass	8,500	8,000
Katla (Big)	10,000	16,500
Singhra (Big)	25,000	36,000
Singhra (Small)	15,000	19,000
Surmali (Small)	25,000	30,000
Surmai (Big)	35,000	50,000
Sol	30,000	40,000
Soli	12,500	19,000
White Dom	12,500	13,000
Rahu (Andhra)	10,000	12,000
Zinga (Zambo-A)	45,000	50,000
Zinga (Zambo-B)	35,000	40,000
Zinga (Zambo-C)	23,500	25,000

Source: agmarknet.gov.in
The Prices are of Delhi (Gazipur Mandi)

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2. Global Commodity Prices

Commodity (Unit)	PRICE (30/06/2025)
Milk (USD/CWT)	18.73
Rapeseed (Euro/Ton)	470.37
Soybean Meal (USD/Ton)	270.10
Soybean Oil (USD/lb)	0.53
Live Cattle (USD/Lbs)	2.25
Poultry (USD/Kgs)*	1.34
Eggs US (USD/Dozen)	2.54

Source:tradingeconomics; markets.businessinsider

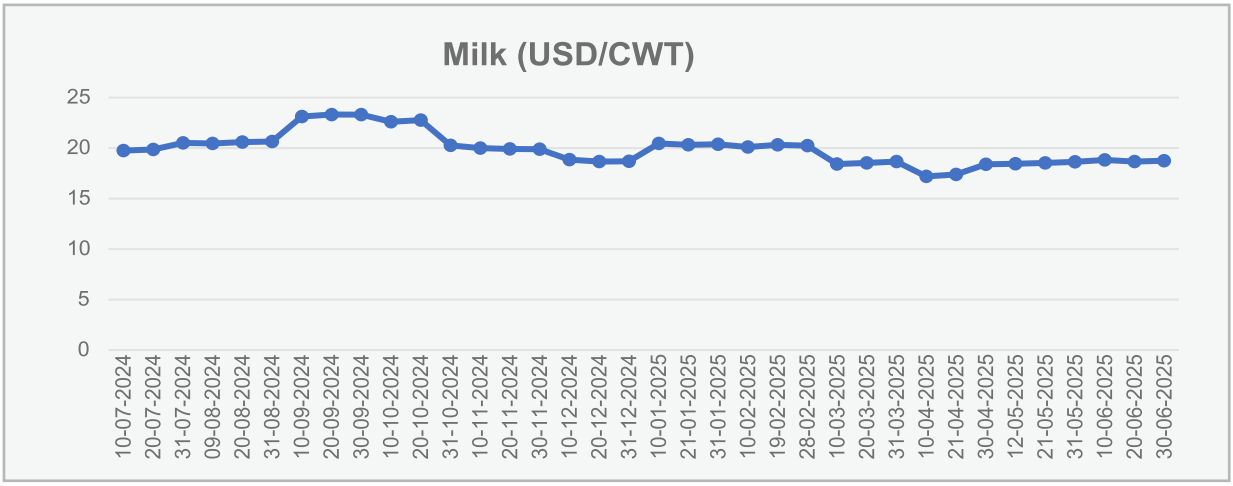
USD: United States Dollar

CWT: Short Hundredweight

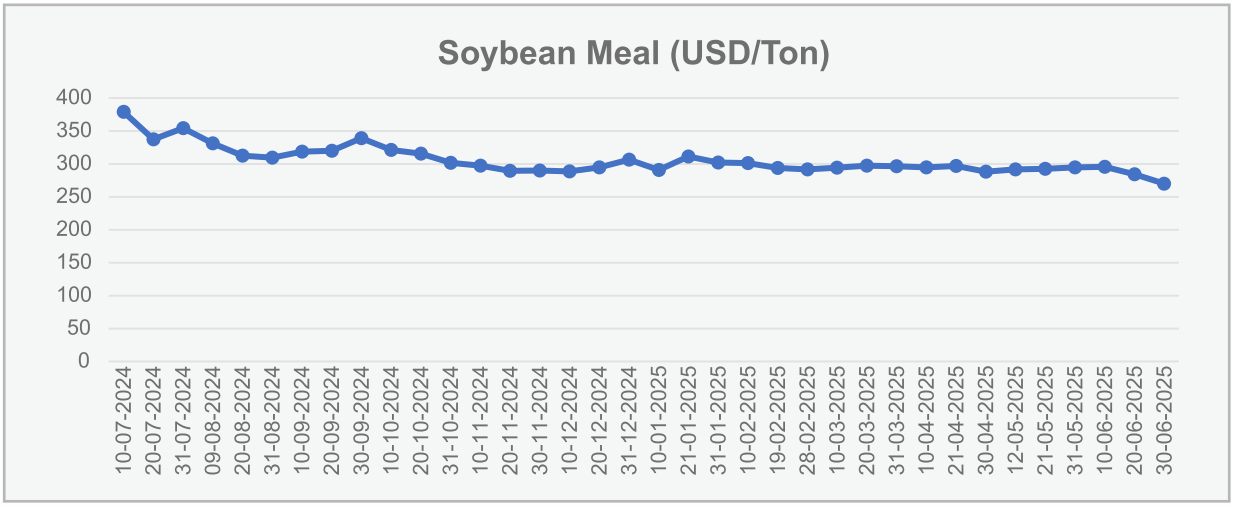
Lbs: Pounds

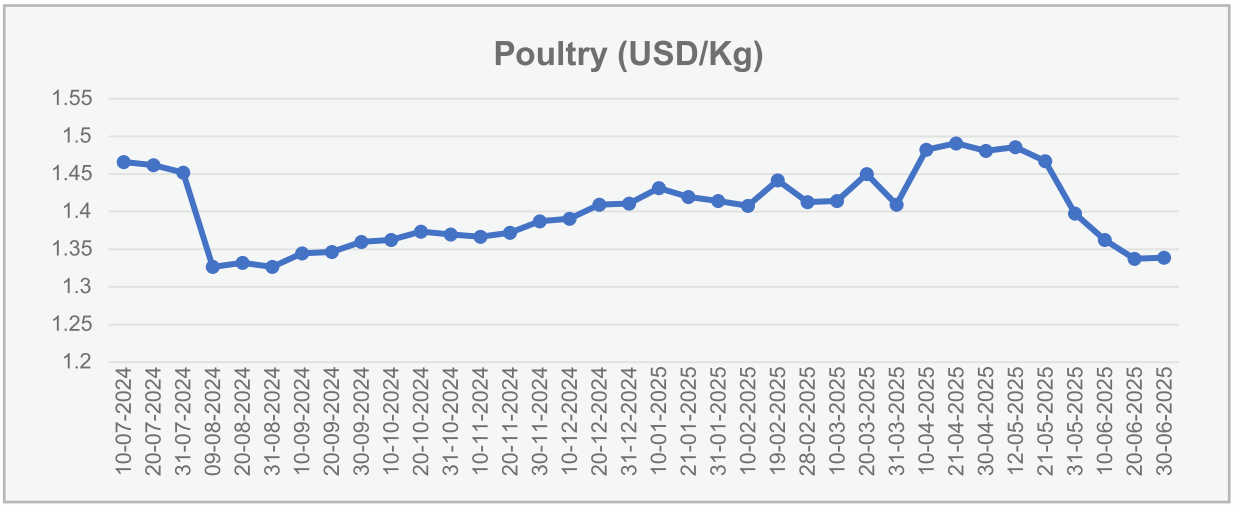
1 BRL (Brazilian Real) = 0.17 USD

*-Poultry price refers to the cost of the chicken in the wholesale market of São Paulo, Brazil. The price is converted from BRL to USD using above conversion rate.



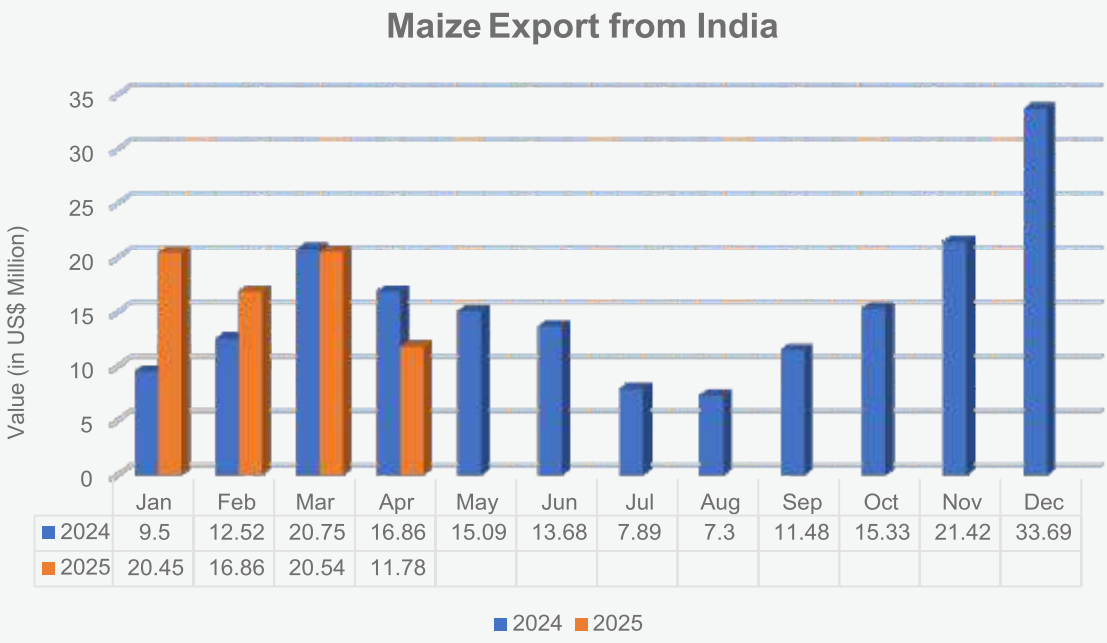
2. Global Commodity Prices





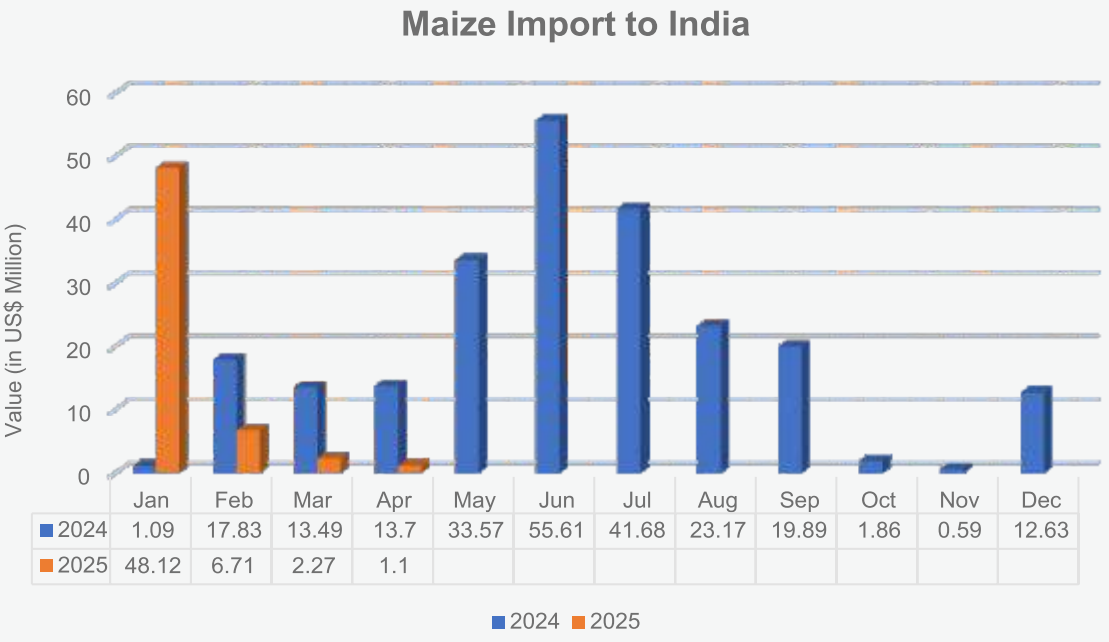
3. Trade Details

India: Maize Export



Source: Ministry of Commerce and Industry, **HS Code-1005**

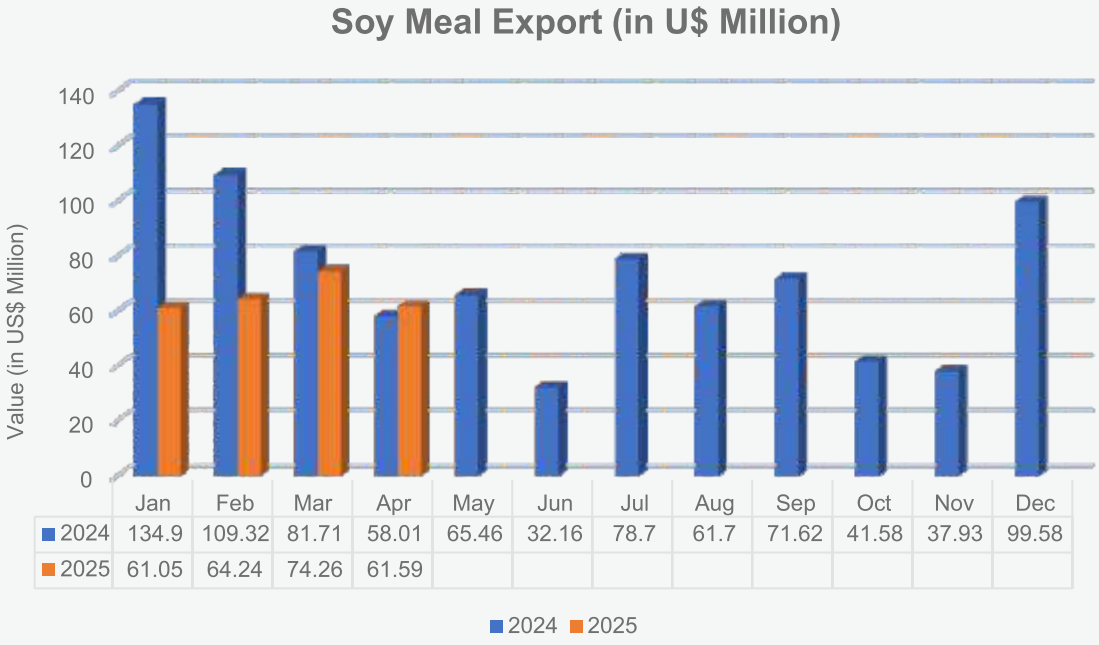
India: Maize Import



Source: Ministry of Commerce and Industry, **HS Code-1005**

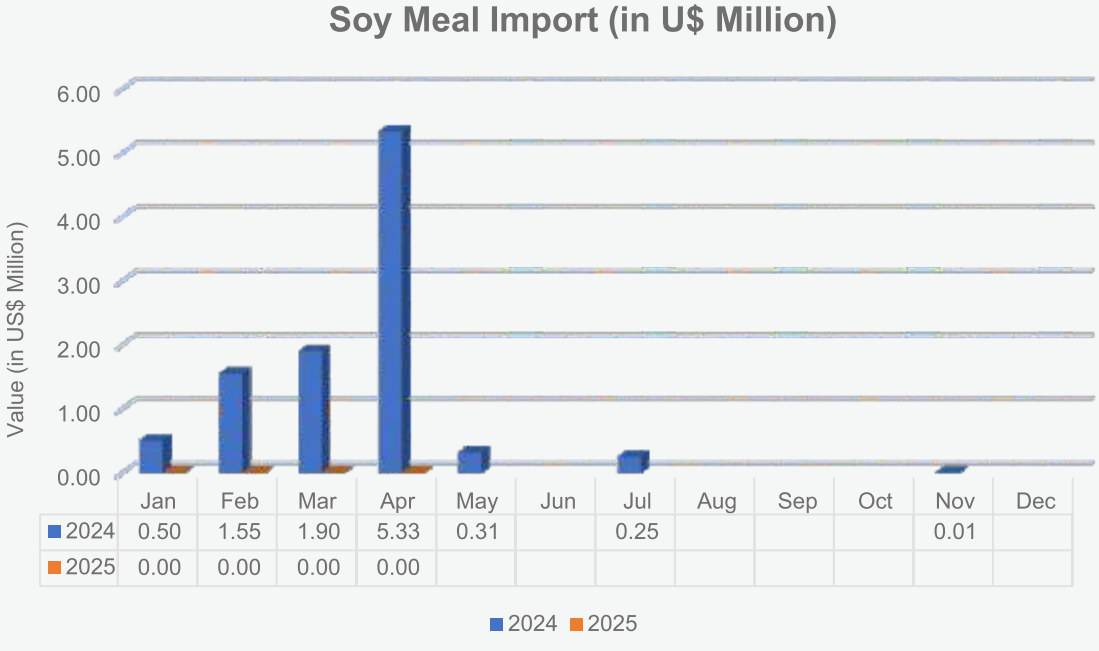
Note: This Data is sourced from the Ministry of Commerce and Industry, which was last updated in April.

India: Soy Meal Export



Source: Ministry of Commerce and Industry,**HS Code-23040030**

India: Soy Meal Import



Source: Ministry of Commerce and Industry,**HS Code-23040030**

Note: This Data is sourced from the Ministry of Commerce and Industry, which was last updated in April.

5. Market Drivers

Maize	
Market Drivers	**Monthly Outlook**
Growing Demand for Poultry and Livestock Feed	Bullish
Rising demand for Ethanol in Auto-fuels	Bullish
Increasing Demand as a Wheat Substitute due to Wheat Export Ban	Bullish
Increasing Food Inflation	Bearish
Commercialization of Genetic Modified Maize Crop	Bullish
Increasing demand for Coarse Cereals	Bullish

Poultry	
Market Drivers	**Monthly Outlook**
Rapid Growth in Consumer Demand for Livestock Products	Bullish
Rising Demand for White Feather Broilers	Bullish
Increasing Broiler Chicken Price Increases Due to Higher Feed Cost	Bearish
Increasing Food and Feed Inflation	Bearish
Enhancement of Backyard Poultry Farming	Bullish
Increasing the Demand of Organic Poultry Farming	Bullish

Regards,
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ORGANIC ACID DERIVATIVES

PROPIONATES

SODIUM PROPIONATE POWDER

CALCIUM PROPIONATE POWDER

AMMONIUM PROPIONATE LIQUID/POWDER

AMMONIUM DIPROPIONATE LIQUID/POWDER

BUTYRATES

SODIUM BUTYRATE POWDER (98 %)

SODIUM BUTYRATE COATED (30%,60% & 90 %)

CALCIUM BUTYRATE POWDER (98 %)

CALCIUM BUTYRATE COATED (30%,60% & 90%)

FORMATES

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POTASSIUM DIFORMATE POWDER

CHELATED TRACE MINERALS

GLYCINE CHELATED TRACE MINERALS

ZINC GLYCINE SULPHATE

COPPER GLYCINE SULPHATE

MANGANESE GLYCINE SULPHATE

FERROUS GLYCINE SULPHATE

COBALT GLYCINE SULPHATE

CHROMIUM GLYCINE SULPHATE

CHELATED SELENIUM

CHELATED IODINE

BISGLYCINATES

ZINC BISGLYCINATE

COPPER BISGLYCINATE

MANGANESE BISGLYCINATE

FERROUS BISGLYCINATE

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MANGANESE GLYCINATE 15 %

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"India Comes 2nd in Fisheries Production Across World," Says Union Minister Rajiv Ranjan

Union Minister Rajiv Ranjan Singh attended Inland Fisheries & Aquaculture Meet 2025 held at Madhya Pradesh's Indore district on June 13 and highlighted that India comes 2nd in the world in fisheries production. Speaking to reporters here, Union Minister Singh said, "The production of fisheries has to be increased first, the quality will be improved later. India comes 2nd in the world in fisheries production. 70 percent of the contribution comes from the inland states. There is a growth of around 137 per cent in the last 10 years due to the efforts of Prime Minister Narendra Modi and initiative taken by him to boost fisheries production." Additionally, he thrusted that they still believe that there is a huge potential to increase fisheries production in inland states and held a meeting in Indore for the same purpose. "We believe that the inland state has immense potential to increase the fisheries production even today and we are here to explore those possibilities. We had a meeting with the governments of the inland states. We will also have a technical session in which discussion will be held and then later, we will decide how to move ahead...," he added. The Union Minister further highlighted that they are promoting aquaculture, sustainable fishing, promoting technology and establishing food processing and production units. Export has doubled in the last 10 years from Rs 30,000 crores to Rs 60,000 crores. According to a release, Inland fisheries and aquaculture involve catching and farming fish in freshwater and brackish water bodies like rivers, lakes, ponds, and reservoirs. While inland fisheries harvest fish from naturally available species in fresh and brackish water, aquaculture uses controlled methods of fish farming such as pond and cage culture, along with technologies like Recirculatory Aquaculture Systems (RAS) and Biofloc. Inland fisheries and aquaculture offer year-round production, greater control over inputs and outputs, and better suitability for small-scale farmers. They also offer the unique advantage of bringing underutilised or unproductive ponds and saline-affected lands into productive use, effectively turning 'waste land' into 'wealth land' while generating income and livelihoods, especially in rural areas. With support from 8 ICAR fisheries institutes, four fisheries subordinate offices and fisheries universities technology has become pivotal to the growth of inland fisheries and aquaculture. Under PMMSY (Pradhan Mantri Matsya Sampada Yojana) and the Blue Revolution, 45,000 units--including RAS, cages, Biofloc systems, and raceways--have been approved across inland states and UTs, boosting productivity up to 20-fold.

Maharashtra Govt Grants Agriculture Status To Fisheries Sector; 'move Will Boost Production'

Mumbai, In a significant initiative, the Maharashtra cabinet on April 22 accorded the agriculture status to the fisheries sector, enabling fishermen to avail of facilities and concessions on par with farmers. The decision will benefit fishermen and fish conservationists who can claim water, electricity, and other infrastructure facilities. State Fisheries Minister Nitesh Rane hailed the cabinet move as "historic and revolutionary". He said 4,83,000 fishermen will be benefited. "The fisheries sector in Maharashtra has the potential for substantial production and generate income, just like traditional agriculture. Due to the lack of agricultural status, fishermen, aqua-culturists, and fish farmers were deprived of several basic facilities and benefits," he told reporters. This decision will strengthen the rural economy as fisheries stakeholders are set to receive various infrastructural facilities and subsidies, Rane added. "There will be a significant increase in the state's fish production. Just as farmers benefit from subsidies for seeds, tractors, ploughs and fertilisers, fishermen will now receive subsidies for purchasing fish seed, feed, paddle-wheel aerators, and air pumps," the minister informed. He said the decision allows fish farmers and aqua-culturists to claim insurance, like the crop insurance for farmers, to cover losses in fish seed and production. In case of natural disasters like droughts or excessive rainfall, fishermen will receive government relief packages similar to those provided to farmers, he said. "Granting agriculture status to fisheries will drive economic development in coastal and inland regions, create employment opportunities, and generate income.

Poultry Count Doublesin Punjab

The preliminary report of the 21st Livestock Census has revealed a remarkable surge in the population of poultry across the state. According to data, the total number of poultry — mostly broilers and layers — has more

than doubled, increasing from 1.76 crore in the 20th Livestock Census in 2019 to 3.57 crore at present. This sharp increase highlighted a growing public interest in poultry farming as a viable commercial activity, said a senior official of the Animal Husbandry Department. "While the population of cattle and buffaloes has seen a decline, the public has shown a noticeable interest in allied sectors such as commercial poultry farming, goat rearing and even horse breeding. People are diversifying their livestock-related activities and moving beyond traditional cattle-based farming," the official added. Dr Gurdit Singh, Deputy Director, Animal Husbandry Department, said, "Multiple factors have contributed, including the absence of major bird diseases in recent years, and consistently better egg prices. Moreover, the rise of contract broiler and layer farming has further boosted the sector." A poultry farm owner said, "The contract farming has led to a rise in poultry numbers. For example, those who earlier reared 5,000 birds are now rearing 10,000. Under the contracts, companies provide inputs, technical support and marketing, while farm owners offer land, labour and other facilities. In return, they receive either a fixed fee or a share of profits." Animal Husbandry Minister Gurmeet Singh Khuddian acknowledged the upward trend in poultry numbers. "The poultry population in the state has more than doubled in the past five years. This clearly reflects the growing enthusiasm among people for allied agricultural ventures," he said. The minister, however, expressed concern over the declining population of cattle and buffaloes. "We are taking this matter seriously. Efforts will be made to address the reasons behind the decline and to encourage livestock owners to reinvest in traditional cattle and buffalo farming," Khuddian said. He further said the department planned to launch new initiatives aimed at boosting interest in cattle and buffalo rearing, along with organising more livestock-related events and awareness drives to support the overall growth of the sector.

Dairy Firms may see 11–13% Revenue Rise in Fy26: Crisil

Dairy companies are likely to witness 11-13 per cent revenue growth this financial year on strong demand, increasing share of value-added products (VAP) and higher milk prices, a report said on June 02. The profitability will improve by 20-30 basis points (bps), aided by better realisations, healthy milk supply keeping procurement prices in check and a favourable shift towards VAP, which fetches higher margins, Crisil Ratings said in a report. The rating agency further stated that to capitalise on the healthy growth momentum, companies will ramp up capital expenditure (capex) by 10 per cent this fiscal. A sizable portion of this capex will be to enhance capacities for VAP, a segment that continues to outpace the traditional liquid milk category, it added. Despite the higher capex, credit profiles of dairy companies are expected to remain stable because of improving cash flows and strong balance sheets, the report said. "The VAP segment is expected to clock a strong 16-18 per cent growth this fiscal, driven by changing consumer tastes, rising nutritional awareness and preference for protein-rich diets. Consequently, its share in the product mix will increase to 45 per cent from 40 per cent a couple of years back. In contrast, growth for liquid milk should be stable at 10 per cent. "Overall, improved product mix, healthy volumes and rising retail prices are expected to help dairy companies to see a revenue growth of 11-13 per cent in FY26," Crisil Ratings Director Shounak Chakravarty said. A favourable monsoon forecast is also expected to support the dairies, while stable fodder prices and increased adoption of artificial insemination are likely to boost productivity, which will ensure a steady availability of raw milk, therefore, limiting the increase in procurement prices to a modest 2-3 per cent this fiscal, said the report. According to Crisil Ratings, profitability will benefit from improving realisations and a modest increase in procurement prices, resulting in a 20-30 bps improvement in operating margin to 5.3 per cent, supporting the overall cash generation.

Jharkhand will Produce Surplus Milk in 5 To 7 Years: Hemant

Jharkhand would soon be able to produce surplus milk and sell it outside the state, chief minister Hemant Soren said while inaugurating the the state's first milk powder generation plant on the Medha Diary premises at Hotwar here. Inaugurating the plant jointly with Hemant, state agriculture, dairy and animal husbandry department minister Shilpi Neha Tirkey also said the new plant would mean a new chapter in Jharkhand's 'White Revolution' making its dependence on Assam and Chhattisgarh for converting excess milk into milk powder end. The powder plant will have a capacity of 20 MT per day and will be constructed at a total cost of Rs 80 crore. Hemant also laid the foundation for a silage plant in Nagri, Ranchi, which will use leftover fruit and vegetable residues from the

Mother Dairy complex to produce feeds for animals. It will not only provide an additional source of income for the state's farmers but also serve as a nutritious option for animals throughout the year. Additionally, the CM unveiled the 'Medha Ragi Laddu', organic fertilizer 'Medha Sudhan', and a distributor app developed by the National Dairy Development Board (NDDB) on the occasion. Addressing a function on the occasion attended by 2,000 dairy farmers, Hemant said Medha dairy is among the priority sectors of the govt to augment farmers' income, and put the state on the development map. "The way we are progressing, our state will not just be able to become self-sufficient in the next five to seven years, but will also be in a position to become a surplus milk-producing state." He appealed to the farmers to help protect the environment. The chief minister further said, "Commercial agriculture is the need of the hour. Special attention must be given to increasing the value addition of agricultural products. Our govt is supporting farmers through various means." On a lighter note, Hemant said, "If cricketing icon M S Dhoni can do farming, why can't others?" He also said, "Despite all challenges, our govt is making continuous efforts to promote agriculture and animal husbandry. We are taking concrete steps to make the state self-sufficient in the production of milk, fish and meat among others.

Indian Oilmeal Exports Remain Flat in April

Oilmeal exports from India remained flat in April due to the lack of demand in the international market. Data compiled by the Solvent Extractors' Association of India (SEA) showed that India exported 4,65,863 tonnes of oilmeal in April 2025 against 4,65,156 tonnes in April 2024. BV Mehta, Executive Director of SEA, said that India harvested a record crop of soyabean in kharif season and rape-mustard in rabi season. This led to higher crushing and increased availability of meal. Stating that the export demand is lacking due to disparity in international market, he said the total exports of soyabean meal decreased to 13.35 lakh tonnes (lt) during the first six months of the current season (November to April) from 16.58 lt in the corresponding period of the previous season. Export of rapeseed meal also decreased to 9.11 lt during November-April of the current season (9.30 lt during the same period of the previous season). Stating that there is an export opportunity of rapeseed meal to China, he said China relies on imports from Canada and the EU. Given the prevailing supply constraints and rising costs, India now has a valuable opportunity to regain its foothold in the Chinese market, if China relaxes its stringent import conditions on Indian rapeseed meal and India could emerge as a key supplier to China, he said. Currently, international price of rapeseed meal stands at $308 a tonne (ex-Hamburg). However, the Indian rapeseed meal (ex-Kandla FAS) is available at just $202 a tonne. He said the SEA has represented to the Union Ministry of Commerce to take up this matter with the Chinese government for relaxation of import condition. Only three units, which are registered with the General Administration of Customs of China, are now exporting rapeseed meal to China, he said. On the impact of DDGS (distillers dried grains with solubles) on cattle and poultry feeds, he said the increasing adoption of DDGS in animal feed is influencing the demand for traditional oilmeals, particularly in cattle and poultry feed sectors. Being a cost-effective and protein-rich alternative, DDGS is being increasingly used as a partial substitute for soyabean meal, rapeseed meal and de-oiled rice bran in feed formulations.

3 Maize Hybrids Developed by Pau get Icar Nod for National Release

Three maize hybrids developed by Punjab Agricultural University (PAU) have been identified for national release by the varietal identification committee (VIC) of the Indian Council of Agricultural Research (ICAR). The identification took place under the chairmanship of Dr. DK Yadava, deputy director general (crop sciences), ICAR, during the 68th annual meeting of the All India Coordinated Research Programme (AICRP) on maize, held at Tamil Nadu Agricultural University, Coimbatore, recently. The varieties comprised Punjab Baby Corn 3, PMH 18 and PMH 19. Punjab Baby Corn 3 (JH 32484) was identified for release in four of the five AICRP maize zones — Zone I, III, IV, and V — covering a wide range of states including Jammu and Kashmir, Himachal Pradesh, Uttarakhand (Hills), the North Eastern Hill Region, Bihar, Jharkhand, Odisha, West Bengal, Eastern Uttar Pradesh, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, Maharashtra, Gujarat, Rajasthan, Madhya Pradesh, and Chhattisgarh. The hybrid demonstrated up to 36.69% higher baby corn yield over existing checks. PMH 18 (JH 20088), a medium-maturing Kharif hybrid, was identified for the Central Western Zone (CWZ), comprising Gujarat, Rajasthan, Madhya Pradesh, and Chhattisgarh. It recorded an average grain yield of 8,068 kg/ha, outperforming checks BIO 9544, CMH08-292, and LG 34.05 by 9.6%, 11.08%, and 14.4%, respectively. PMH 19 (JH 18056), a medium-maturing Spring maize hybrid, was identified for

the North-Western Plains Zone (NWPZ), which included Punjab, Haryana, Delhi, Uttarakhand (Plains), and Western Uttar Pradesh. It yielded an average of 10,441 kg/ha, showing 6.4% and 17.1% superiority over the checks BIO 9544 and DHM 117, respectively. Dr. Satbir Singh Gosal, vice-chancellor of PAU, expressed immense pride at this feat, stating, "The simultaneous identification of three PAU maize hybrids in a single meet is a prestigious honour for the university and a testament to the strength of our maize research programme."

India Pegs Wheat, Maize and Rice Production at Record High

The Indian government on May 28 said the country achieved a record foodgrains production of 353.96 million tonnes (mt) in the current crop year to June 30. The record production included an all-time high output of 149.07 mt in rice, 117.51 mt in wheat and 42.28 mt in maize. The current year's foodgrain output is 6.5 per cent higher from 332.3 mt achieved in 2023-24. Union Agriculture Minister Shivraj Singh Chouhan released the third advance estimate of the crop year, by including the output from the summer (zaid) season. The second estimate had data only from kharif and rabi seasons. Summer crops are of very short duration grown between rabi and kharif seasons. Chouhan said production in rice, wheat, maize, groundnut, and soyabean has broken all previous records. He said the feat is due to the "tireless hard work" of the farmers, the "efficiency of agricultural scientists" and the successful implementation of farmer- friendly policies and schemes of the Centre.

The policies and schemes got implemented with the cooperation of the State governments. Union Agriculture Minister Shivraj Singh Chouhan released the third advance estimate of the crop year, by including the output from the summer (zaid) season. The second estimate had data only from kharif and rabi seasons. Summer crops are of very short duration grown between rabi and kharif seasons. Chouhan said production in rice, wheat, maize, groundnut, and soyabean has broken all previous records. He said the feat is due to the "tireless hard work" of the farmers, the "efficiency of agricultural scientists" and the successful implementation of farmer-friendly policies and schemes of the Centre. The policies and schemes got implemented with the cooperation of the State governments. Though production is increasing continuously, the minister said the output of pulses and oilseeds has to be increased further.

He expressed satisfaction over the significant increase in the area under cultivation during the kharif season. An increase has also been registered in the yield of major kharif crops such as paddy, maize, millet, moong, soyabean and sugarcane. Hindubusinessline was first to report on May 19 on India's emergence as the world's largest producer of rice, and also achieving all-time high output of wheat, maize and overall foodgrains during 2024-25. The government has raised the production of wheat, a winter crop, to 117.51 mt, which is 3.7 per cent higher from 113.29 mt in 2023-24. it is higher than what was estimated in March. Similarly, the total production of rice included 121.85 mt from the kharif season, 15.67 mt from rabi and 11.55 mt from the zaid crop.

Uttar Pradesh News: Pulses Production Rises 2.5x, Oilseeds Output Doubles In 8 Years Under Yogi Govt's Agri Push

Uttar Pradesh is inching closer to self-reliance in pulses and oilseeds as the Yogi-led government's sustained efforts begin to show measurable progress. Over the past eight years, pulse production surged from 23.95 to 59.19 lakh metric tonnes—a 2.5x growth. Oilseed output rose from 12.40 to 29.20 lakh metric tonnes during the same period. This boost follows multiple initiatives: free distribution of high-yielding seeds like urad, arhar, moong, and gram; deployment of 46.33 lakh mini kits; and farmer training through Kisan Pathshalas and agri-fairs. Intercropping pulses with sugarcane and seasonal seminars further strengthened field-level adoption. The Agriculture Department also pushed adoption of modern methods like drip irrigation and border sowing, alongside localized crop planning based on agroclimatic zones. Demonstration farms at progressive farmer plots made new techniques visible and replicable. The goal is to expand cultivation area to 28.84 lakh hectares (pulses) and 22.63 lakh hectares(oilseeds) by 2026–27, reducing dependence on volatile global markets and ensuring kitchen affordability.

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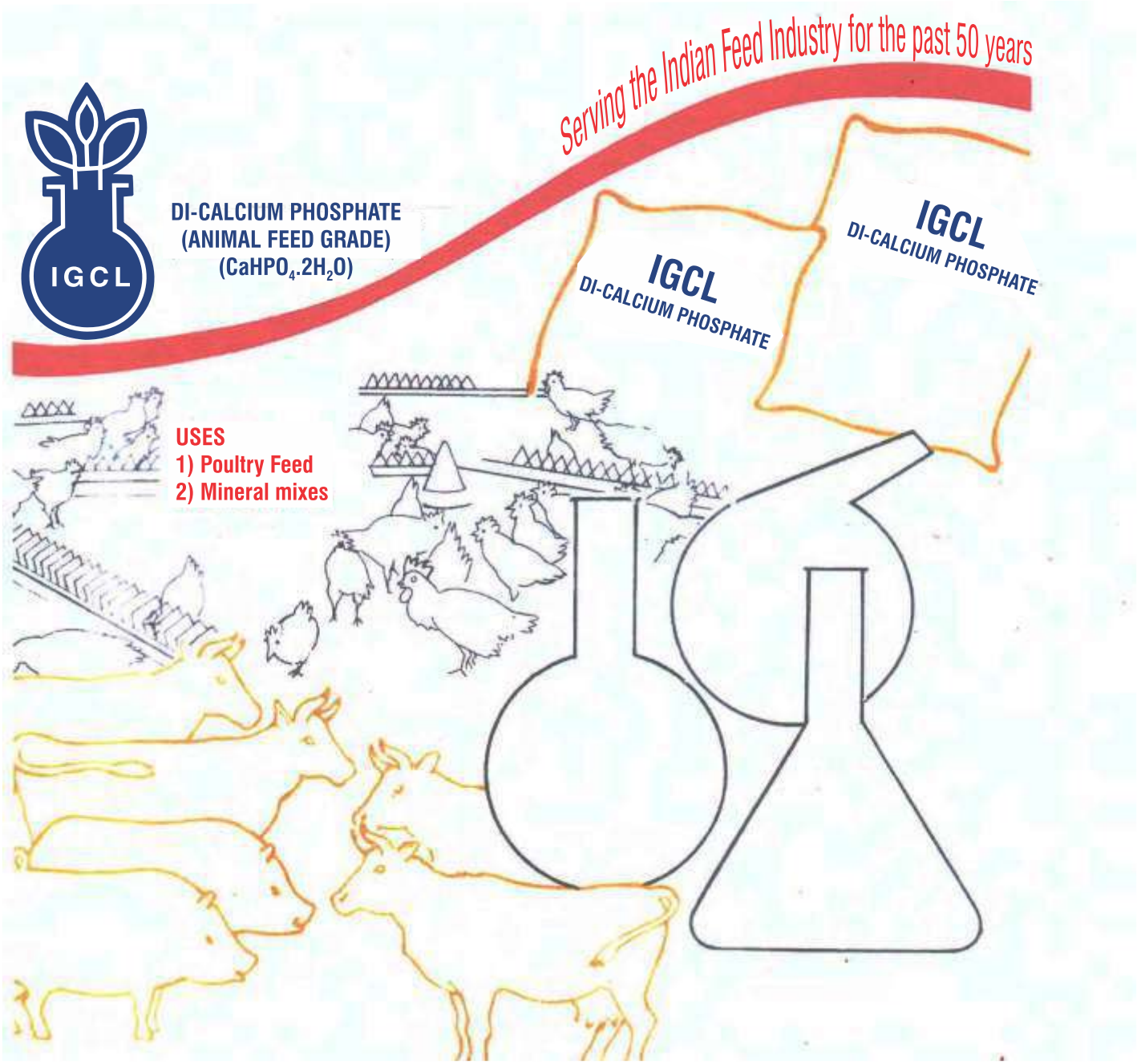

SPECIFICATIONS

(1) Moisture content	7. 0% Max
(2) Phosphorous as "P"(Total)	16.6-18.3 %
(3) P205 (Total)	38-41 %
(4) Calcium as CA	23.0 % Min
(5) Acid insoluble ash	1. 0 % Max.
(6) Flourine as F	0.2 % Max.

N.B.: The contents for item (2) to (6) are on moisture-free basis.

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Microchipping Chickens: The Future of Poultry Biosecurity and Disease Prevention

Ranveer Godara

Introduction

In the modern era of agriculture, poultry farming stands as one of the fastest-growing and most dynamic sectors, feeding billions and supporting countless livelihoods across the globe. But with this rapid expansion comes a serious responsibility: ensuring the health, safety, and traceability of millions of birds in an increasingly interconnected world.

In recent years, outbreaks of devastating diseases like avian influenza and Newcastle disease have underscored a glaring truth — traditional methods of identification and disease monitoring are no longer sufficient. To build truly resilient and secure poultry systems, innovative tools are needed. One such emerging innovation is the microchipping of chickens.

Though commonly associated with pet identification, microchipping is beginning to make its mark in the poultry industry, offering precise, tamper-proof identification and opening doors to real-time tracking, digital health records, and better disease response. As technology merges with farming, microchipping is poised to become a game-changer in poultry biosecurity and disease prevention.

What is Microchipping?

A microchip is a tiny, rice-grain-sized electronic device that is implanted under the skin of an animal, typically using a sterile injector. It contains a unique identification number (UID) that can be read with a special scanner. Microchips are passive devices — they do not have a power source and remain functional for the lifetime of the animal.

In chickens, the microchip is usually inserted under the wing or at the back of the neck. The procedure is quick, safe, and causes minimal discomfort.

Why Microchip Chickens?

1. Permanent Identification

Unlike leg bands or wing tags that can fall off or fade, microchips offer permanent, tamper-proof identification. This is essential in breeding programs, show birds, and for tracking valuable heritage or exotic poultry breeds.

2. Improved Biosecurity

With the integration of microchip data into digital management systems, farmers can monitor:

- The origin and movement of birds
- Health status and vaccination records
- Disease outbreaks and quarantine measures

This level of detail makes it easier to track, trace, and contain diseases when outbreaks occur.

3. Vaccination and Health Monitoring

Each bird's microchip can be linked to its complete vaccination history, medical treatments, and production data. This allows targeted treatments and reduces unnecessary antibiotic use — a key factor in combating antimicrobial resistance.

4. Disease Outbreak Control

In the event of an outbreak, microchipped chickens can help:

- Quickly identify exposed or infected birds
- Trace contacts and movements
- Implement zone-specific culling or quarantine instead of blanket depopulation

This reduces economic losses and limits the spread of infection.

5. Smart Poultry Management

When integrated with digital tools like mobile apps or cloud-based dashboards, microchipping helps in:

- Monitoring egg production per hen
- Recording feed consumption patterns
- Identifying unproductive or sick birds early

This improves efficiency and decision-making on farms.

Microchipping: Practical Applications in Poultry:

Application Area	Benefits
Breeding and Genetics	Track lineage, reduce inbreeding
Layer Farms	Monitor laying performance
Disease Surveillance	Early detection and rapid response
Research and Education	Individual data collection & tracking
Backyard & Hobby Farms	Loss prevention and pet ID

Challenges in Microchipping Chickens

While the concept is promising, several challenges must be addressed for large-scale adoption:

- Cost: Microchips and scanners are relatively expensive, especially for large flocks.
- Labour: Implanting and scanning each bird requires time and trained personnel.
- Technology Integration: Small farmers may lack access to digital tools or internet connectivity.
- Ethical Concerns: Animal welfare groups may raise concerns about implant procedures, although they are considered minimally invasive.

Despite these challenges, pilot projects and technological innovations are making microchipping more feasible and affordable.

Global Trends and Research

In countries like Japan, the Netherlands, and parts of the U.S., microchipping poultry is being tested in disease surveillance programs, especially in high-value poultry like:

- Exhibition chickens
- Rare breeds
- Research lines

Researchers are also exploring injectable nano-sensors and RFID (Radio Frequency Identification) tags that work similarly but are cheaper and easier to apply.

India's Potential for Microchipping in Poultry

In India, where poultry contributes significantly to rural livelihoods and food security, the adoption of microchipping could:

- Strengthen disease control programs
- Boost consumer confidence in food safety
- Assist in tracking and certifying organic or free-range products
- Help in traceability during bird flu outbreaks

Government support, public-private partnerships, and farmer training can accelerate its implementation.

Conclusion

Microchipping chickens may sound futuristic, but the technology is already here — and it has the power to transform poultry farming into a smarter, safer, and more sustainable practice. As the world grapples with emerging diseases, climate challenges, and food safety concerns, tools like microchips offer a practical step forward. By embracing microchipping, poultry farmers can ensure better traceability, stronger biosecurity, and ultimately, a healthier flock and a more secure livelihood.

M.V.Sc. Scholar, Department of Veterinary Public Health & Epidemiology,
CVAS Bikaner, RAJUVAS, 334001

Nutritional Interventions for Alleviating Heat Stress in Chickens Production

Aditya Raj[1], and Kaushalendra Kumar[2*]

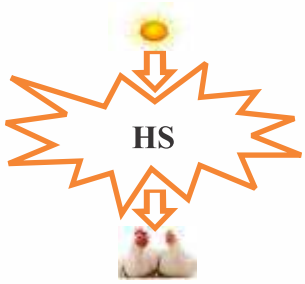
Introduction

The effects of heat stress (HS), which is brought on by high temperatures, are still a major concern for chicken production around the world. Because they lack sweat glands and are therefore inefficient at releasing heat from their bodies, poultry birds are homoeothermic and extremely vulnerable to hypoxia. An imbalance between the quantity of heat an animal produces and the amount it loses to its environment is known as heat stress. Numerous variables are negatively impacted by heat stress, including feed intake, feed conversion ratio, productivity, meat and egg quality, and immunological condition. According to Liu et al. (2020), heat stress is a major concern since it drastically changes the behaviour of birds. The optimal temperature range for laying hens and growing broilers to maximise bird productivity is 19–22°C and 18–22°C, respectively, according to Shahzad et al. (2021). As a result, higher temperatures in chicken production result in reduced growth, fertility, and egg output, as well as higher mortality and lower-quality meat and egg production. Birds that are under heat stress tend to eat less feed, which is one of the main causes of productivity decline. Bilal et al. (2021) state that feed intake decreases by about 5% for every degree Celsius that rises above 30°C, which causes the body to become deficient in important nutrients. Hence, in light of the aforementioned information and its significance, the authors outline the treatments that must be implemented in order to lessen the problems caused by heat stress in the chicken industry.

How heat stress adversely affects chicken production?

A decline in the immunity and feed efficiency of birds is caused by oxidative stress and cellular damage during heat stress. Because of decreased productivity and higher mortality, this reduction causes large economic losses.

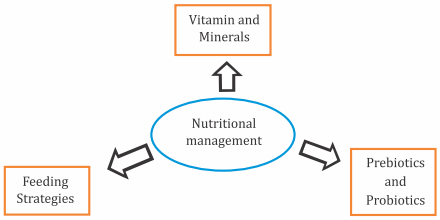
- Water intake
- Respiration rate
- Oxidative stress
- Intestinal permeability
- Dehydration
- Disease outbreaks
- Morbidity and mortality



- Feed intake
- Feed efficiency
- Body weight
- Egg production
- Immune response
- Bioavailability
- Fertility
- Product quality

Strategies to Mitigate Heat Stress in Poultry

The harmful effects of heat stress in chickens have been lessened by the implementation of a number of techniques. Genetic selection, in-ovo administration of bioactive compounds, reduced stocking density, early-life heat conditioning, environmental and housing alterations, and more are some of these methods. Enhancing feed efficiency, reducing disease outbreaks during stressful times, and enhancing immunity are all possible outcomes of nutritional interventions that could help reduce heat stress in chicken production. Nutritional approaches encompass various strategies such as energy balance, supplementation of essential amino acids, provision of sufficient minerals and vitamins, as well as dietary incorporation of numerous phytogenic additives.



Feeding strategies

Poultry generally consume less feed and nutrients when under heat stress, which can negatively impact their production and performance. Therefore, under such circumstances, modifying the nutritional profile to improve chicken feed intake becomes

essential. For poultry to be managed nutritionally at high temperatures, feeding regimens that maximise feed intake, minimise heat load, and lessen the negative effects of heat stress are particularly beneficial. Strategies include restricting feeding during hot times, giving an option between feed ingredients high in protein or energy, giving feeds with different particle sizes or structures to slow down digestion, and giving wet diets to stimulate water intake can all be used to reduce heat burden.

The practice of restricting feed involves not feeding during a set time, usually between 8 AM and 5 PM. As per Mohammed et al. (2019), this technique has been observed to decrease the metabolic rate of avian species, lower their rectal temperature, minimise death rates, and lessen the buildup of belly fat in heat-stressed grill chickens. Nevertheless, because feed limitation has a detrimental impact on the growth rate of chickens and delays their marketing age, it is not commonly used in the poultry sector, even with its advantages. Alternative feeding schemes have been introduced in addition to feed restriction to lessen the effects of heat stress on hens.

Dual feeding programmes involve giving birds a diet high in protein during the cooler part of the day and a diet high in energy during the warmer part. Studies show that during high heat waves, giving birds a diet high in protein between 4 PM and 9 AM and an energy-rich diet between 9 AM and 4 PM can lower body temperature (Teyssier et al., 2022). Worldwide acceptance of the advantages of feeding broilers produced in high-temperature areas high-energy formulations that are obtained by boosting fat and protein is well-established (Srinivasa et al., 2016). In an independent investigation, it was shown that feeding the layers 5% fat increased their feed intake by 17% while they were kept at 31°C.

Compared to conventional dry mash or pellet feed, wet feeding has many advantages, particularly in hot weather when birds could find it difficult to eat enough dry feed. Wet feed resulted in increased yolk index, shell weight, yolk percentage, moisture percentage, and better feed conversion efficiency in summertime laying hens. (Waiz and others, 2016). Enhancing feed intake, digestibility, feed efficiency, and growth performance are all greatly influenced by the size and quality of the feed, sometimes referred to as feed form. It has been demonstrated that pelleting feed increases the apparent metabolizable energy in protein sources and cereal grains (Khalil et al., 2021). Apart from the benefits of finely powdered feed, research has shown that feeding coarse diets with bigger particle sizes can increase the amount of water that a bird retains in its body, which helps with evaporative cooling and lowers body temperature. Additionally, studies have shown that coarse feed reduces heat generation, promotes gastrointestinal tract development, and lessens the effects of heat stress (Syafwan et al., 2011). Therefore, adding coarse meals may be a good way to lessen the negative consequences of heat stress.

Supplementation of minerals, vitamins and phytochemicals in the diet

Birds that experience heat stress consume less feed, which results in inadequate mineral uptake. Minerals are essential for maintaining biological and cellular processes, encouraging growth and productivity, improving nutrient uptake, strengthening immunity, and reducing oxidative stress in chicken under heat stress. Exposure to heat stress causes pulmonary alkalosis in hens, which results in a negative mineral balance and increased excretion losses of potassium and sodium ions. By adding appropriate mineral components at different stages of manufacturing, this can be mitigated (Mir et al., 2018). Adding potassium chloride to the drinking water of heat-stressed chickens markedly enhanced body weight gain, lowered body temperature, and reduced blood pH, thereby improving the birds' physiological adaptation to the stress. Chromium, another vital trace element, experiences heightened mobilization from body tissues and excretion during heat stress, elevating its nutritional demand. Chromium supplementation improves production performance, carcass characteristics, nutrient digestibility, immunological response, and oxidative stability in chicken, which is beneficial for reducing heat stress (Khan et al., 2014). Because of its strong antioxidant and immune-boosting qualities, selenium and manganese show significant benefits during heat stress. In heat-stressed chicken, dietary supplementation with selenium improves immunological function, antioxidant status, egg production, and quality (Qin et al., 2011). As the body is unable to store zinc, a trace element that is essential for many enzymes, supplementation is necessary. Breeders who supplemented with zinc throughout the hot summer months saw an increase in egg laying and behavioural activity. Li and colleagues, 2021). Prolonged panting under intense heat waves modifies the blood plasma's acid-base equilibrium and ultimately results in respiratory alkalosis. Electrolytes such NH4Cl, NaHCO3, and KCl can be supplemented to correct this acid-base imbalance. Birds excrete more bicarbonate ions from their kidneys to bring their blood pH back to

normal during respiratory alkalosis. It has been proposed that a high dietary electrolyte balance of 200–300 mEq/kg can effectively mitigate the negative effects of HS in poultry (Mushtaq et al., 2013).

A useful nutritional tactic for hens under heat stress is vitamin supplementation. Numerous vitamins have vital roles in the body as growth promoters, gut protectors, immunomodulators, anti-stress agents, antioxidants, and anti-inflammatory agents. In chickens under heat stress, vitamins A, B, D, E, and C are used to improve immunocompetence and antioxidant response (Akinyemi et al., 2021). When laying hens were given vitamin A supplements, their feed intake, laying rate, and egg weight all rose. Furthermore, it increased the percentage of peripheral T lymphocytes, which improved the immune system and laying ability of heat-stressed hens. During heat stress, vitamin E, another important antioxidant that is present naturally in the body, provides protective effects. According to Khan et al. (2011), it aids in mitigating the negative effects on poultry birds' growth performance, productivity, nutritional digestibility, immunity, and antioxidant profile. In chickens, supplemental dosages between 200 and 500 mg/kg body weight have been shown to be successful in reducing the effects of heat stress. As an essential metabolite, vitamin C acts as an electron donor and reducing agent, which makes it a strong natural antioxidant. It can be added to water or poultry feed to help lessen the negative effects of heat stress. In heat-stressed chicken, optimal vitamin C supplementation at roughly 250 mg/kg feed improves production performance, nutritional digestibility, immunological responses, and antioxidant capacity (Khan et al., 2012).

Carotenoid pigments like lycopene are present in a wide range of plants, fruits, and vegetables, including tomatoes, carrots, pink guava, watermelon, apricots, and more. On the physiology of hens, it has beneficial effects, especially in reducing oxidative stress brought on by heat. In order to support birds' oxidative balance, lycopene works through a variety of mechanisms. Activating host antioxidant enzymes including SOD, glutathione peroxidase (GSH-Px), and CAT, as well as blocking signalling pathways and acting as a free radical scavenger are these actions. When broilers under heat stress were given 200 or 400 mg/kg of lycopene supplement, their feed intake, body weight, and FCR all increased (Arain et al., 2018). Resveratrol is a naturally occurring bioactive polyphenol that is mostly present in turmeric, berries, peanuts, and grapes. Resveratrol works in poultry physiology by boosting fatty acid oxidation, altering the immunological response, and eliciting the expression of heat shock protein and antioxidant mRNA. In the broiler hens during HS, resveratrol supplementation (400 mg/kg of feed) reduced the levels of corticosterone, cholesterol, and MDA, improved average daily growth, and enhanced antioxidant capacity (Hu et al., 2019). Green tea contains a polyphenol called epigallocatechin gallate (EGCG), which has strong anti-inflammatory and antioxidant qualities. Luo et al. (2018) reported that heat-stressed grill chickens that received different dosages of EGCG in their diet (0, 300, and 600 mg/kg) showed increases in body weight, feed intake, serum total protein, glucose, and alkaline phosphatase levels. Turmeric contains a polyphenol called curcumin, which has the ability to lessen oxidative stress and inflammation, among other methods, to potentially reduce HS in chickens. Under high-stress conditions, broiler final body weight was dramatically increased when curcumin (100 mg/kg of feed) was added (Zhang et al., 2018). According to Liu et al. (2020), adding 150 mg/kg of curcumin to laying hens' diet enhanced their immune system, antioxidant enzyme activity, laying performance, and egg quality.

Supplementation of probiotics, prebiotics and synbiotics in the diet

In chicken farming, probiotics and prebiotics are important because they help lessen the effects of heat stress. Probiotics have been linked to improvements in intestinal mucosal immunity, gut shape, increased nutritional absorption, and increased egg production in laying hens under heat stress (Cao et al., 2021). Probiotics enhanced performance, body weight, feed intake, feed conversion ratio, and numerous blood parameters while reducing the harmful effects of heat stress. According to Sohail et al. (2010), broilers exposed to heat stress (35°C) showed improvements in their humoral immunity, body weight, feed efficiency, villus length, and crypt depth when they received supplements of 0.5% prebiotic (mannan oligosaccharide) and 1% probiotic (Lactobacillus based) in their diet. These supplements also decreased serum cortisol and cholesterol concentrations. Enhancing the growth performance and meat quality of broilers raised in high ambient temperatures was achieved by adding synbiotics to the diet at a dosage of 1500 mg/kg for the starting diet and 750 mg/kg for the grower. By controlling stress responses and enhancing the antioxidant status of broilers, the synbiotic (poultry star) may be able to mitigate the negative effects of HS. According to Mohammed

et al. (2019), supplementing broilers with a probiotic mixture consisting of Lactobacillus reuteri, Enterococcus faecium animalis, and Pediococcus acidilactici may help lessen the negative effects of HS. Additionally, a prebiotic called fructo-oligosaccharides may also be beneficial.

Conclusions

Novel intervention strategies are crucial in mitigating the effects of stress. Nutritional management, which includes feed restriction, dual feeding, minerals, vitamins, phytobiotics, probiotics, prebiotics, and their combination in the diet, has been adopted to dissipate heat and may be the most efficient and economical method of reducing the negative effects of heat stress in chicken production.

(1M.V.Sc. Scholar; 2Associate Professor)

Department of Animal Nutrition,
Bihar Veterinary College, Patna-800014, India
e-mail ID: drkaushalbvc@gmail.com

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Adopting Scientific Feeding under Integrated Farming System Approach to Enhance the Farmers' Income

Brishketu Kumar*, T. K. S. Rao, Dinesh Kumar and J. K. Movaliya

Integrated farming system represents an appropriate combination of farm enterprises viz. cropping systems, horticulture, livestock, fishery, forestry, poultry and the means available to the farmers to raise them for profitability with the main goal of increasing the income and standard of living of small and marginal farmers. Integrated systems are about bringing crops and livestock into an interactive relationship with the expectation that together, as opposed to alone, they will generate positive effects on outcomes of interest, such as profitability overall productivity, and conservation of non-renewable resources.

An IFS specially refers to a group/combination of enterprises in which the products and or the by-products of one enterprise serve as the inputs for production of other enterprise. The waste of dairying like dung, urine, refuse etc. is used for preparation of FYM, which is an input in cropping systems. The straw obtained from the crops is used as fodder for cattle's are used for different field operations for growing crops. Thus different enterprises of farming systems are highly interrelated. The farming system in its real sense will help to lift the economy of agriculture and standard of living of the farmers.

The main aim of Integrated Farming System is to

1. Raise overall profitability and productivity of farm household by complementing main and allied enterprises with each other.
2. Ensure optional utilization and conservation of available resources and effective recycling of farm residues within system.
3. Generate Income round the year. Regular stable income through the products like egg, milk, mushroom, vegetables, honey and silkworm cocoons from the linked activities in integrated farming.
4. Generate regular employment for the farm family members of small and marginal farmers.
5. Reduce production cost of components through input recycling from the by-products of allied enterprises.
6. Adoption of new technology and enhance opportunity for agriculture oriented industries.

The different livestock based Integrated Farming System is:

- Crop - livestock farming system
- Crop - livestock - fishery farming system
- Crop - livestock - poultry - fishery farming system
- Crop - fishery - poultry farming system
- Crop - fishery - duckery farming system and
- Crop - live¬stock - forestry farming system

Activities such as dairy, poultry, fish culture, sericulture, bio-gas production, edible mushroom cultivation, agro-forestry and agri-horticulture, etc., assumes critical importance in supplementing farm income. It should fit well with farm level infrastructure and ensures full utilization of by-products. Integrated farming system is only the answer to the problem of increasing food production for increasing income and for improving the nutrition of small scale farmers with limited resources.

Different livestock components which can be managed under IFS are:

Cattle/Buffaloes:

Cattle rearing in India are carried out under a variety of climatic and environmental conditions. The cattle mostly preferred under IFS are

Dairy breeds: The cows are high milk yielders but the bullocks are of poor draft quality e.g., Sahiwal, Sindhi, Gir.

Dual purpose: The cows are fairly good milkers and the bullocks are with good draft work capacity e.g. Hariana, Ongole and Kankrej.

Buffaloes: Important dairy breeds of buffalo are Murrah, Mehsana, Surti and Jaffarabadi.

Managemental Practices:

Breeding: An efficient dairy animal is the result of better breeding, but its productivity depends largely upon the feed and care given to it. It has been

estimated that India's present milk output could be doubled if dairy animals were only adequately fed. We can adopt different breeding strategies for genetic improvement of our indigenous cattle and buffalo productivity like crossbreeding and Artificial insemination programme in a précised way along with Progeny testing programme and even we can go for the recent techniques like Open Nucleus Breeding System (ONBS) with or without Multiple Ovulation and Embryo Transfer (MOET). The cows remain in milk for 9-10 months, the average calving interval being 16-18 months. A cow does not require more than 6-8 weeks of dry period. From the economic point of view, cow should ordinarily be bred during the second and third months.

Feeding: Cattle feed generally contains fibrous, coarse, low nutrient straw material called roughage and concentrates. Roughages are basic for cattle ration and include legumes, non legume hays, straw and silage of legume and grasses. Under IFS they can be raised on crop residues and agricultural by-products. One important aspects of feeding under IFS is can be by the cultivation of Azolla fodder, which can be cultivated in pita as well as in cement pits.

10 feet long, 2 feet wide and 1 feet deep concrete tank spread with 25-30 kg of soil with this mix 5 kg of decomposed dung, with this soil of gravel quarry or well soil @ 100g could be added. Keep the water level up to 5 cm. in this add 5 kg of Azolla within two weeks we can collect 35-40 kg Azolla. Pour the cow dung slurry once in ten days in fish pond.

It had also the ability to fix atmospheric nitrogen. It contains 4.5% nitrogen. For paddy it can be added @ 200 kg per acre. It gives nitrogen source to the crop and 15-20% yield also increased.

Azolla cultivation and feeding under integrated farming system

Feeding cattle: Production of 1 kg Azolla costs about 0.75 paise only. When Azolla is used as feed it could be mixed 1:1 proportion with concentrates and fed to the cattles. After familiar with this, mulching cows will started to consume Azolla alone. One kg of Azolla equal to 1 kg of oil cake. For milking cows 1-1.5 kg, white pigs 1-1.5 kg, goat 300-500 grams, rabbits 100 grams and 25-30 grams of azolla for chickens might be given to these animals. Approximately 15-20% increase in milk production in dairy cows, in addition to this increase in cholesterol and also cholesterol free solids enhanced the milk quality. So production of Azolla under Integrated farming system is not only gives income and also protects the environment. The ration per animal per day normally includes concentrates at 1 kg for 2 litres of milk yield, green fodder at 20-30 kg, straw 5-7 kg and water 32 litres.

Economic Analysis: Economic analysis of different farming systems (one hectare of irrigated land or 1.5 ha of unirrigated land) indicated that under irrigated conditions, mixed farming with crossbred cows yielded the highest net profit, followed by mixed farming with buffalo, and arable farming. Comparative productivity and economies of dairy enterprises (mixed farming with three crossbred cows on one hectare of canal irrigated land versus mixed farming with three Murrah buffalo) indicated that mixed farming with crossbred cows under canal-irrigated conditions was more efficient for the utilisation of land, capital, inputs and the labour resources of the farmer. Livestock enterprises are more lucrative than farming so it is advantageous to integrate livestock into farm activities.

Many indigenous, emerging, and developed technologies are available to support sustainable crop–livestock integration. These include improved cereal and grain legume varieties, cropping systems, weed and nutrient management strategies, the eradication of most livestock diseases, and the development of modelling and all-year-round feed packages for animals.

Goat and Sheep rearing under Integrated Farming System: In integrated farming, suitable for dry land of 1 hectare land with crop cultivation and goat rearing (20 females: 1 male) by doing this, there is three times production, net profit and increasing employment. From 20 sheeps we can get 45 lambs in a year. Moreover, from sheep manure we get 200 kg N, 106 kg P and 91 kg K. it also gives 40 to 50 thousand rupees additional income. In our country, sheeps are largely dependent on grazing land because of this sheep's productivity is low. Solving this problem tree kind fodder leaves, agricultural-products as daily feed will increase the productivity. Thus

groundnut leaves, red gram bran, black gram bran and such as the feeding of the wood leaves and tree leaves will give required nutrient-rich forage to the sheep. It removes fodder demand, increase meat production leads to getting additional income.

Poultry:

Poultry is one of the fastest growing food industries in the world. Poultry meat accounts for about 27% of the total meat consumed worldwide and its consumption is growing at an average of 5% annually. Specific poultry stocks for egg and broilers production are available. A majority of the stocks used for egg production are crosses involving the strains or inbred lines of white Leghorn. Heavy breeds such as white Plymouth Rock, White Cornish and New Hampshire are used for cross-bred broiler chickens. Hence, it is essential to consider the strain within the breed at the time of purchase. Several commercial poultry breeders are selling day old chicks in India. It is best to start with the day old chicks.

Adequate space should be provided for the birds. Floor area of about 0.2 m2 per adult bird is adequate for light breeds such as white Leghorn. About 0.3-0.4 m^2 per bird is required for heavy breeds. The house should have good ventilation and reasonably cool in summer and warm during winter; it should be located on well-drained ground from flood waters. When chicks get the optimum body weight of 1.0-1.5 around six weeks, they can be marketed for broiler. Hens may be retained for one year for production i.e. up to the age of 1½ years. After that they are disposed off for table purpose. It may not be economical to keep the hens beyond ½ years since egg production would get reduced. One hen is capable of laying 180-230 eggs in a year starting from the sixth month. In addition, a laying hen produced about 230 g of fresh droppings (75% moisture) daily. In poultry we can use feeds other than conventional grain mix like palatable green fodder leaves and unconventional feeds like agro-industrial by-products consisting of rice bran, wheat bran, copra meal, and distiller's dried grains with solubles (DDGS), insects like black soldier fly larvae, mealworms, and houseflies are rich in protein and amino acids, Azolla, a type of aquatic fern, is a nutrient-rich feed option, feeds like Moringa, velvet beans, and certain plant-based by-products like carrot, paprika, and berry waste are also being explored as potential feed sources. Unconventional feed ingredients inclusion in poultry diets can be more affordable than traditional feed, helping reduce production costs.

Duck:

Ducks account for about 7% of the poultry population in India. Ducks are predominantly of indigenous type and reared for egg production on natural foraging. They have a production potential of about 130-140 eggs/ bird/year. Ducks are quite hardy, more easily brooded and resistant to common avian diseases. In places like marshy river side, wetland and barren moors where chicken or any other type of stock do not flourish, duck farming can be a better alternative. To minimize the cost of production, locally available low cost feed ingredients or unconventional feed ingredients like broken rice, azolla, tuber crops, different insects, earthworm, etc are used for feeding of ducks.

Fishery:

Integrated fish farming systems utilize the waste of livestock, poultry and agriculture by-products for fish production. About 40-50 kg of organic manure can produce 1kg of fish. Ponds serve various useful purposes, viz. domestic requirement of water, supplementary irrigation source to adjoining crop fields and pisciculture. With the traditional management, farmers obtain hardly 300-400 kg of wild and culture fish per ha annually. However, poly-fish culture with the stocking density of 7500 fingerlings and supplementary feeding will boost the total biomass production.

Management: The fish are to be nourished with supplementary feeding with rice brans and oilseed cakes. Single-cell proteins, yeast, and algae can be cultivated and used as fish feed. Azolla, a fast-growing aquatic fern, is a promising alternative feed for various animals, including fish. This will enable faster growth and better yield. Each variety of carps could be stocked to 500 fingerlings with the total of 5000-8000 per ha. This stocking density will enable to get a maximum yield of 2000-5000 kg/ha of fish annually. Crop + Fish + Duck + Goat integration (Most beneficial). Replacing expensive conventional feed ingredients with less costly unconventional ones can significantly lower aquaculture feed costs.

Piggery:

Pigs are maintained for production of pork. They are fed with inedible feeds, forages, certain grain by-products obtained from mills, meat by-products, damage feed and garbage. Commercial pig feed is a mix of corn and soybean meal, with added supplements.

However, swill (kitchen waste) can also be a part of their diet. Most of these feeds are either not edible or not very palatable to human beings. The pig grows fast and is a prolific breeder, farrowing 10 to 12 pigs at a time. It is capable of producing two liters per year under good management conditions. The carcass return is high at 65-70% of the live weight. Large white Yorkshire and landrace are being used widely. Yorkshire is the most extensively used exotic bred in India. It is a prolific breed in India. It is a prolific breed having carcass quality, growth rate and feed conversion ability. The mother of pig is to be selected should have large litter of eight piglets or more.

*Assistant Professor, Animal Science Department, College of Agriculture, NAU, Bharuch, Gujarat
Corresponding author: Brishketu Kumar, email: brishketuk@gmail.com

Fish Muscle Cell Lines: Recent Innovations and Future Directions in Biotechnology and Aquaculture

Gowhar Iqbal[1*],

Abstract

In recent years, fish muscle cell lines have garnered increasing attention due to their wide-ranging applications in aquaculture, biotechnology, and muscle biology. These cell lines serve as powerful models for investigating muscle growth, development, and regeneration, offering valuable insights into the cellular and molecular mechanisms that govern muscle function. Advances in the isolation and characterisation of fish muscle cells have significantly deepened our understanding of muscle fibre differentiation, hypertrophy, and the influence of environmental and genetic factors on muscle dynamics. Moreover, fish muscle cell lines have enabled detailed exploration of the molecular pathways involved in muscle plasticity, metabolism, and responses to environmental stressors such as temperature changes and hypoxia. This article provides a comprehensive overview of recent progress in the development and application of fish muscle cell lines, with a particular focus on innovations in genetic engineering, in vitro culture methods, and their utility in muscle physiology research. It also examines the emerging roles of fish muscle cells in areas such as sustainable aquaculture, drug screening, and tissue engineering, while addressing current challenges and future perspectives in the field. A deeper understanding of these developments will support the advancement of sustainable aquaculture practices and contribute to new strategies aimed at improving fish muscle growth, health, and overall productivity.

Keywords: Fish Cell Culture, *in vitro*, Aquaculture, Biotechnology

Introduction

Cell culture is a fundamental component of modern research, and fish cells are valuable models for studying various biological processes. Establishing fish cell lines reduces the need for live animal testing and allows for the generation of highly reproducible results under controlled laboratory conditions. As a result, fish cell lines have become important tools in gene function analysis, virology, endocrinology, immunology, and toxicology (Abdul Majeed et al., 2014). Given the rising incidence of pathogen infections in fish, there is a critical need to establish fish cell lines for the isolation, identification, and characterisation of fish viruses (Swaminathan et al., 2015). The origins of fish cell culture date back to the mid-20th century, when primary cultures were first developed from various tissues, including muscle. Early efforts involved explant cultures of fish tissues to study cellular behaviour under regulated conditions. In the 1960s and 1970s, researchers began developing stable fish cell lines, primarily from epithelial and fibroblast cells, as these were more amenable to in vitro culture than muscle cells. The successful establishment of fish muscle cell lines emerged alongside growing interest in fish physiology and aquaculture. Initial studies focused on satellite cells, the muscle precursor cells responsible for muscle regeneration and development. Researchers isolated and cultured these cells to explore fish muscle formation, myogenesis, and metabolic activity (Chal & Pourquie, 2017). Notably, myogenic cell lines from rainbow trout (*Oncorhynchus mykiss*) were developed, providing valuable insights into muscle fiber development and cell proliferation. Advances in enzymatic digestion techniques and specialized growth media significantly improved the viability and proliferation of muscle-derived cells.

The development of fish muscle cell lines has advanced significantly in recent decades, driven by innovations in aquaculture, toxicology, biotechnology, and regenerative medicine. These cell lines have become invaluable tools for studying muscle development, physiology, and disease mechanisms in fish. Given that muscle tissue constitutes a major component of the human diet, understanding muscle formation at the cellular and molecular levels holds great potential for improving the quality of muscle production in both aquaculture and livestock industries (Koganti et al., 2020). Moreover, this knowledge supports the growing field of cultured meat production, which has garnered considerable attention in recent years. Fish muscle cell lines can be employed to produce lab-grown fish meat, offering an innovative and sustainable

alternative to traditional seafood. Similar to cultured meat derived from terrestrial animals, lab-cultured fish has the potential to reduce pressure on marine ecosystems while meeting the increasing global demand for protein. However, several challenges remain, including the need to establish scalable, cost-effective, and safe production systems. These systems must integrate complex technologies such as the cultivation of muscle lineage cells and the engineering of suitable scaffolds for tissue growth. Muscle formation involves a sequence of tightly regulated events, including the proliferation and differentiation of muscle progenitor cells such as satellite cells and myoblasts (Chal & Pourquié, 2011). Therefore, the establishment of fish muscle lineage cell lines represents a crucial step toward elucidating the underlying mechanisms of myogenesis. Developing such cell lines from economically or nutritionally important fish species would not only contribute to fundamental scientific research but also support efforts to enhance the quality and sustainability of fish as a food source.

[1]ICAR- Central Institute of Fisheries Education, Panch Marg, Yari Road, Mumbai- 400061, India

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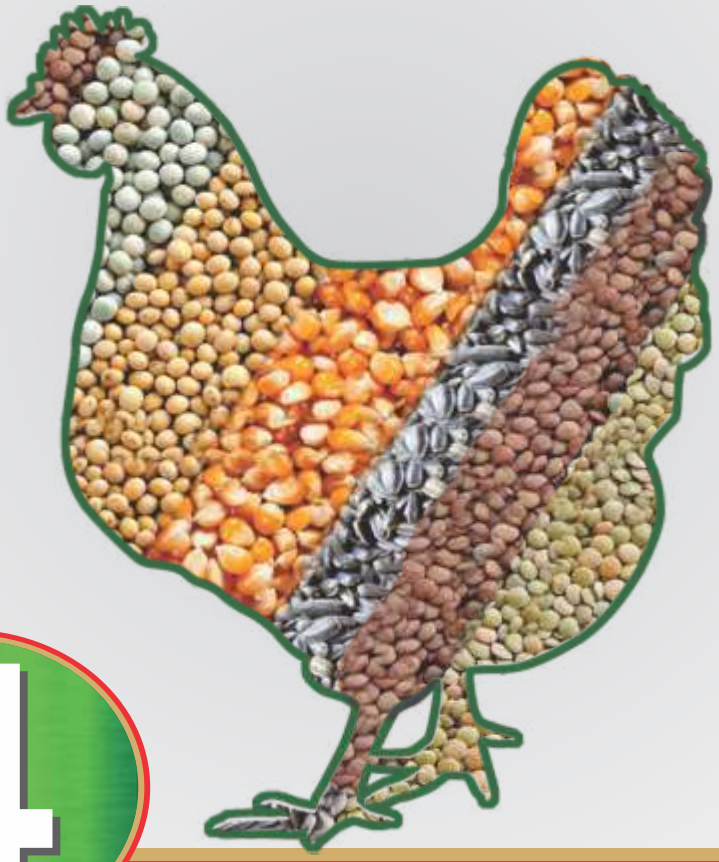

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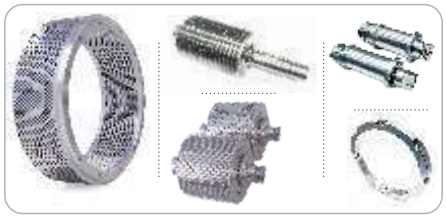

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Short Chain Fatty Acids (SCFAs): A Promising Functional Feed Additives to Improve Fish Health and Growth Performance

Pandi Kalaiselvan[1], Amit Ranjan[1,*], Albin Jemila Thangarani[1]

Abstract:

Short-chain fatty acids (SCFAs) are natural compounds produced by gut microbes when they ferment plant-based fibers in fish diets. These powerful molecules, mainly acetate, propionate, and butyrate, enhance digestion, strengthen gut integrity, modulate immunity, and improve growth performance. SCFAs can be produced in the gut from plant-based ingredients, probiotics, prebiotics, or added directly to feeds as synthetic feed additives. SCFAs play vital role in enhancing the growth, support beneficial microbes, immune modulation, and protection against disease. As a sustainable, antibiotic-free compounds SCFAs offer a promising, natural solution to enhance fish health and their performance in aquaculture and supports responsible farming practices.

Introduction:

Fish has become the most in-demand animal protein globally, surpassing even chicken, pork, and beef. To meet this growing need, aquaculture has emerged as a vital solution for meeting the demand of protein. Farmed fish often experience stress, disease, and poor nutrient absorption which can hinder growth and health. For several decades antibiotics were used to manage these issues, but rising concerns over antibiotic resistance and residue accumulation have led to tighter regulations and a push for safer, natural alternatives. One promising solution lies within the fish itself, the gut microbiota. This diverse community of beneficial microbes aids in digestion, counters harmful pathogens, and enhances immune function. SCFAs support immunity, improve digestion, suppress harmful microbes, and promote healthy growth. They can also be supplemented in feed as natural acidifiers like acetic or butyric acid to amplify their benefits.

Sources:

SCFAs are powerful compounds produced in the gut when beneficial microbes break down dietary fibers. These acids primarily acetate, propionate, and butyrate improve fish digestion, boost immunity, and support growth.

Plant-Based Ingredients: Common feed ingredients like soybean meal, corn bran, wheat bran, and rice bran are rich in fermentable fibers that gut microbes convert into SCFAs. For example, soybean meal encourages the growth of bacteria like Lactococcus lactis, known for efficient fermentation. Similarly, corn and rice bran contain fibers like pectin and hemicellulose that microbes use to produce SCFAs.

1. **Algae and Seaweed:** These natural prebiotics are rich in complex carbohydrates. Species like Dunaliella salina and Nannochloropsis have been shown to increase butyric acid levels in fish. Extracts from seaweed also help produce acetate and propionate, thanks to their low-molecular-weight polysaccharides.
2. **Aquatic Plants:** Plants like duckweed, water hyacinth, water lettuce, and Azolla are underused yet fiber-rich. Some, like Azolla pinnata, have even shown greater probiotic activity than commercial ingredients, pointing to their potential in enhancing SCFA production naturally.
3. **Probiotics and Prebiotics:** Adding good bacteria (probiotics) like Lactobacillus or Bacillus to fish diets can boost SCFA levels. Prebiotics, which are special dietary fibers, feed these microbes and increase SCFA production. Ingredients like inulin, fructooligosaccharides (FOS), and arabinoxylooligosaccharides (AXOS) have all been shown to raise SCFA levels in fish and crustaceans.
4. Resistant Starch: This type of starch bypasses digestion and is fermented in the hindgut. Sources like potato starch, lupin meal, and special maize types have been shown to increase SCFA levels, especially butyrate, which is key for gut health and tissue growth.

Fish Gut Microbiota and SCFA production-absorption mechanism:

The gut of fish are complex ecosystems, home to a variety of microorganisms that play a vital role in the health and metabolism of their host. These microbial communities are highly dynamic, shaped by factors like diet, habitat, and growth stage. Some microorganisms transiently pass through the gut via food or water, while others establish stable, beneficial relationships with the fish, contributing to its well-being. The composition of these microbial populations varies across different life stages, with newly hatched larvae hosting relatively low numbers of bacteria. However, as fish begin feeding and their morphology develops, microbial populations grow, and diversity increases. Moreover, microbial profiles can differ based on feeding habits such as carnivorous, herbivorous, and omnivorous fish all exhibit unique gut microbiota, which evolve with dietary changes and environmental adaptation. In addition to bacteria, other microorganisms, such as yeast, have been identified in fish guts, suggesting they may also play a role in gut health. Despite significant research on the human gut microbiome, much remains to be discovered about the microbial communities in fish. One of the most exciting areas of study is the production of SCFAs by gut microbes, including acetate, propionate, and butyrate. These SCFAs are produced when gut microbes' ferment undigested food components, such as fibers and amino acids. In fish, SCFAs are found predominantly in the distal intestine, particularly the colon, with minimal concentrations in the stomach due to its acidic environment. The production of SCFAs in fish depends on diet and microbial composition. Different bacteria specialize in converting substrates into various SCFAs, and the fermentation process can produce a wide range of compounds, such as branched-chain fatty acids, phenols, amines, and indoles. The concentration and ratio of SCFAs can differ not only between species but also among individuals of the same species.

Acetate is generally the most abundant SCFA in fish, followed by propionate and butyrate. Acetate is mainly produced through the acetyl-CoA pathway, using dietary compounds like pyruvate. Butyrate is synthesized from acetate, lactate, or amino acids, through either the butyryl-CoA: acetate-CoA transferase or butyrate kinase pathways. Propionate production follows different routes, including succinate, acrylate, and propanediol pathways. Once produced, SCFAs are absorbed rapidly into the bloodstream via both active and passive transport ylate mechanisms. Passive diffusion allows SCFAs in their non-ionic form to move across the gut lining, especially when the intestinal pH is favourable. Active transport, facilitated by protein carriers like monocarboxylate transporters (MCTs), also plays a crucial role in absorbing ionized SCFAs. Absorbed SCFAs are used in various metabolic processes. Acetate is involved in lipid synthesis and muscle development, while butyrate serves as an energy source for gut cells. Propionate has been linked to gluconeogenesis, the production of glucose from non-carbohydrate sources. Research on SCFAs in fish is still in its early stages, but it's clear that these compounds have significant impacts on fish health. They not only provide energy but also support vital processes such as water and salt balance by stimulating sodium and water absorption in the intestine. Understanding the production, absorption, and utilization of SCFAs could lead to innovative approaches in aquaculture, such as designing diets that promote beneficial microbial activity or using SCFA-producing probiotics to enhance fish growth and resilience. Ultimately, the gut microbiota of fish may hold the key to more sustainable and healthy farming practices, improving both productivity and environmental outcomes.

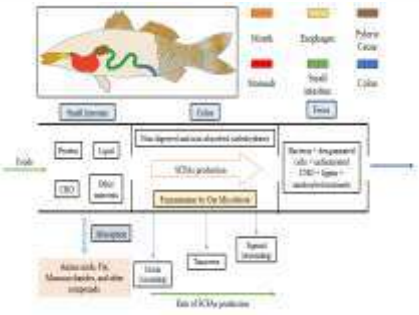

Fig 1. Schematic diagram showing SCFAs production in fish.

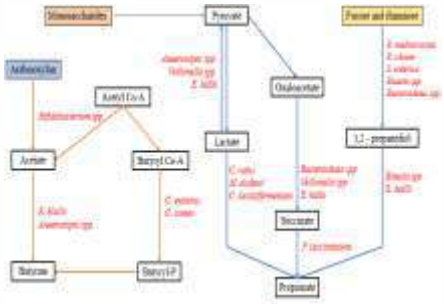

Fig 2. Microbes responsible for SCFAs production

SCFAs as Natural Immune Booster and Growth Promoter:

In fish, several studies highlight the immunomodulatory power of SCFAs, making them promising natural alternatives to antibiotics. Butyrate, for example, has shown anti-inflammatory effects by regulating neutrophil and macrophage activity in zebrafish. In common carp, sodium butyrate altered gut cytokine levels, boosting anti-inflammatory markers like TGF-β and reducing pro-inflammatory ones such as IL-1β and TNF-α. Similar outcomes were observed in zebrafish and yellowtail catfish supplemented with sodium propionate and acid blends, respectively, with changes in immune gene expression.

Beyond gene expression, SCFAs enhance disease resistance. In gilthead seabream, dietary butyrate improved gut integrity and resistance against Photobacterium damselae infection. European seabass and Nile tilapia also responded positively to SCFA supplementation, with increased lysozyme activity, phagocytosis, and immunoglobulin levels. Penaeus vannamei showed elevated immune gene expression and better survival against Vibrio spp. when fed with butyrate or propionate. Physiologically, SCFAs help maintain gut microbiota balance and lower pH, preventing pathogenic colonization. They also support nutrient absorption by promoting gut epithelial cell turnover and improving mineral bioavailability. In seabream, sodium butyrate increased intestinal energy supply and modulated amino acid metabolism.

SCFAs contribute directly to growth performance. Early studies in Arctic charr and rainbow trout revealed improved protein digestion and feed efficiency with lactate, propionate, or formic acid supplementation. More recent work has confirmed similar effects in tilapia, seabass, and shrimp, with better weight gain, survival, and feed conversion ratios when SCFA salts were included in diets. Importantly, the impact of SCFAs depends on species, dosage, and the SCFA source. For example, in seabream, different butyrate formulations enhanced immune responses, mucosal health, and survival against pathogens. Overall, SCFAs hold great promise as natural, multifunctional feed additives that not only strengthen fish and shrimp immunity but also optimize growth and gut health, contributing to sustainable aquaculture.

Conclusion

SCFAs are natural compounds produced when gut microbes break down non-digestible carbohydrates in the digestive tract. Among the various SCFAs, sodium butyrate stands out for its powerful effects on gut health. These molecules play a vital role in improving gut function and shape a healthier gut microbiota by encouraging beneficial bacteria and suppressing harmful ones. These effects contribute to better digestion, improved feed use, and stronger disease resistance which are all the key factors for healthier, faster-growing fish and shrimp.

[1]Institute of Fisheries Post Graduate Studies,
Tamil Nadu Dr. J. Jayalalithaa Fisheries University,
Chennai – 603 103, Tamil Nadu.
*Corresponding author: amitranjan@tnfu.ac.in/
amitranjanfcri@gmail.com

Optimizing the Utilization of Straw for Sustainable Livestock Feeding

Yamini Khatri, Antra Gupta,Komal Chauhan, Trivedi Tejaskumar,and Nitin Tyagi*

Introduction

Only 5.4% of India's farmland is dedicated to fodder cultivation, leading to a nationwide shortage of approximately 23.4% in dry fodder, 11.24% in green fodder, and 28.9% in concentrate feed (NDDB, 2024). This shortage of good-quality animal feed is a major reason for the low productivity of livestock in developing countries.Simultaneously, a significant amount of agricultural and food waste is generated annually. At the same time, India produces around 723 million tonnes of crops annually, generating approximately 585 million tonnes of crop residues, including an estimated 126 million tonnes of paddy straw each year (NPMCR, 2019). A large portion of this paddy straw is burned in open fields, releasing greenhouse gases such as CO_2, CH_4, and N_2O (Sahuet al., 2021).Paddy straw contains 38–41% glucans, 20–22% xylan, 3–4% arabinan, 3% lignin, and 17–20% ash (Singh and Kumar, 2019). Although paddy straw is widely available, its use as livestock feed is limited by several factors, including its complex structure, low nutritional value, poor palatability, and high levels of silica and oxalates. It contains only about 40% total digestible nutrients (TDN), and its digestible crude protein (DCP) content is almost negligible. However, paddy straw contains over 70% carbohydrates, highlighting its potential as an energy source for livestock if its digestibility and nutritional value can be improved(Hartley et al., 1974).Several physical, chemical, and biological methods have been used to improve straw's nutritional value and utilization, but each has limitations in terms of cost, practicality, and potential effects on animal health and product quality.Ensiling can serve as a potential way of enhancing the nutritive quality of paddy straw while using various suitable ingredients like fruit and vegetable wastes and other agro-industrial by-products (Goharet al.,2024). Incorporating agro-industrial by-products like fruit, vegetable residues, and distiller's grains offers a sustainable way to improve livestock feed, reduce waste, and support a circular economy.Implementing strategies that foster circularity, optimize waste utilization, and strengthen the regenerative potential of agri-food systems is crucial for advancing sustainable development goals, boosting the efficiency of the livestock sector, and supporting environmental stewardship.

Utilization of straw

Straw can be made more suitable for animal feed through a range of processing techniques, including physical, chemical, and biological methods, each with its own set of advantages and drawbacks. For instance, physical processes like chopping, grinding, or pelleting help break down the straw's structure, making it easier for animals to consume and digest (Doyle et al., 1996). However, while grinding increases the net energy value of straw by enhancing nutrient utilization, it can also decrease digestibility due to shorter rumination time and reduced microbial degradation (Selimet al., 2004). While physical methods often require machinery, making them less economically feasible for small-scale farms. Chemical treatments, particularly alkaline methods, are widely adopted to improve the utilization of Paddy straw. These treatments break down the ester bonds between lignin, hemicellulose, and cellulose, enhancing their accessibility to rumen microbes. Common chemicals include sodium hydroxide, ammonia, urea, chlorine, and lime, which increase the straw's degradability and palatability.Their use raises concerns regarding the potential accumulation of chemical residues in animal products such as milk and organs.On the other hand, biological treatments, such as the use of fungi or enzymes, provide an environmentally friendly and cost-effective alternative to chemical methods. Fungal species, including

white-rot, brown-rot, and soft-rot, can degrade lignin and hemicellulose, thereby improving the nutritional value of Paddy straw (Howard et al., 2003). Additionally, enzymes like cellulase and xylanase from fungi and bacteria have proven effective in enhancing the degradability of low-quality feedstuffs. Despite these advantages, the economic feasibility of enzyme-based treatments remains a significant challenge.

Ensiling of straw

While chemical treatments can cause environmental pollution and physical methods are energy-intensive (Prasad et al., 2018), ensiling has emerged as a practical preservation method. Ensiling is the process of preserving forage crops by fermenting them in anaerobic (oxygen-free) conditions.During this process, lactic acid bacteria (LAB) convert water-soluble carbohydrates into lactic acid, lowering pH and inhibiting harmful microbes (Dong et al., 2022). A good-quality silage possesses specific characteristics, as outlined in **Table 1.LAB** strains, like *Lactobacillus plantarum, L. buchneri,* and *Pediococcusacidilactici*, are commonly used due to their complementary traits (Zhu et al., 2022). Using LAB species with enzymes like xylanase boosts straw quality by increasing organic acids and sugars, and improving cellulose and hemicellulose breakdown.Ensiling Paddy straw is difficult due to its low protein, limited water-soluble carbohydrates (WSC), poor digestibility, and few natural LAB. However, using suitable additives can greatly improve its fermentation quality and nutritional value.

Table 1: Characteristics of good-quality silage

Property	Range/Characteristics
Color	Bright, light green, yellow, or green-brown
Odor	Pleasant, fruity, or slightly acidic
Texture	Firm with softer material
pH	3.5 - 4.5
Dry Matter (DM)	30–40%
Lactic Acid content	7-8%
Acetic acid content	1-3%
Butyric Acid	<0.2%
Ammonia Nitrogen (NH_3-N)	<10% of total nitrogen
Flieg point	80-120
Aerobic Stability	>72 hours
Yeasts and Molds	Minimal or absent

1. Agro-industrial by-products

In recent years, the practice of combining high-moisture forages with agricultural and agro-industrial by-products such as fruit and vegetable residues, distillers' grains, and other nutrient-rich materials has gained popularity for producing mixed silages. This strategy not only improves the DM content and fermentation characteristics essential for successful ensiling but also enhances the overall nutritional value of the silage. Moreover, it offers a sustainable solution for waste utilization, thereby supporting both environmental goals and the livestock feed industry.Wet Distiller's Grains (WDG) is the nutrient-rich residue left after the fermentation of grains like maize, rice, wheat, or barley using yeast (commonly *Saccharomyces cerevisiae*) to produce ethanol.It contains 30-35% DM, 25-35% crude protein, and 9-10% crude fat, providing an excellent source of energy and bypass protein for ruminants.Wet distiller's grains with solubles (WDGS) are highly palatable,with a cooked flavoured aroma, boosting feed intake and improving fermentation when added to straw-based silage, making WDGS a practical and efficient strategy for upgrading fibrous crop residues.

A large portion of organic waste comes from fruit and vegetable peels and scraps, which are often sent to landfills despite their high nutritional value for livestock. These wastes are rich in fermentable sugars (8–20% WSC), providing ideal substrates for lactic acid bacteria, which help preserve silage and inhibit spoilage. They also add moisture, carbohydrates, and micronutrients, improving silage palatability and quality. Potato processing, in particular, produces significant waste like potato hash-a by-product with 15–20% dry matter, 70% starch, 20–25% WSC, and 8–10% crude protein-offering valuable feed potential as processed food demand grows in India(Nkosiet al., 2010), making it a valuable feed ingredient, but its high moisture content and susceptibility to fungal growth shorten its shelf life, necessitating preservation

methods such as drying or ensiling.Given the nutritional profile and diverse applications of fruit and vegetable waste, coupled with effective preservation methods like ensiling, these by-products present a sustainable and cost-effective alternative to conventional livestock feed ingredients.

2. Additives

During ensiling, LAB ferment WSC in forage, producing lactic acid that lowers silage pH and inhibits undesirable microorganisms. Lactic acid bacteria that are ubiquitously found in the plant material intended for ensiling belong to the following genera, which include both homofermentative and heterofermentative types: *Lactobacillus, Enterococcus, Pediococcus, Lactococcus, Leuconostoc, Streptococcus, and Weisella*. For better fermentation, LAB such as *Lactobacillus plantarumis* commonly used as silage inoculants. Certain LAB, like *Pediococcus*, are selected for their rapid growth and ability to tolerate a broader pH and temperature range than Lactobacillus (Agarussiet al., 2019). *Lactobacillus acidophilus*, a homofermentative species, effectively inhibits harmful microorganisms by primarily producing lactic acid. The heterofermentative LAB, such as *Lactobacillus buchneri*, produce lactic acid, acetic acid, ethanol, and CO_2; enhance aerobic stability; reduce dry matter losses; and minimize feed-out losses. Moderate acetic acid production helps inhibit yeasts and molds that cause spoilage when exposed to air. Certain lactic acid bacteria also exhibit fibrolytic activity, providing additional support during ensiling by hydrolyzingfiber and releasing soluble carbohydrates that can replace the enzyme necessity for the fermentation process. Species such as *Lactobacillus reuteri, L. sakei, L. casei, and L. pentosus* have been reported to possess such capabilities (Srivastava, 2024).

Adding enzymes like cellulase and xylanase to paddy straw during ensiling helps break down its tough fibrous structure. These enzymes specifically target the β-1,4 bonds in cellulose and hemicellulose, releasing fermentable sugars that boost LAB activity. Xylanase is especially effective at breaking down hemicellulose, quickly increasing simple sugars and lactic acid production, which speeds up pH reduction and improves silage preservation. When used together, cellulase and xylanase disrupt the lignocellulosic matrix, lower fiber content, improve silage texture, and make the feed more digestible for ruminants.

Conclusion

The persistent fodder deficit in India, exacerbated by static land allocation and rising demand, necessitates the valorization of lignocellulosic biomass such as straw. Although inherently recalcitrant due to its high lignin, silica, and low nitrogen content, this biomass offers underlying potential for ruminant nutrition because of its rich carbohydrate matrix. Bioconversion strategies are particularly ensiling augmented with lactic acid bacteria, fibrolytic enzymes, and agro-industrial co-substrates,giving a biologically efficient and scalable pathway to enhance feed quality. These interventions not only modulate fermentation kinetics and improve fiber degradability but also mitigate post-harvest losses and environmental externalities. Integrating high-sugar, nutrient-dense by-products like fruit residues and wet distillers' grains into the ensiling matrix facilitates microbial proliferation and acidification dynamics. A paradigm shift towards circular bioresource management can thus transform crop residues from waste liabilities to functional feed assets in sustainable livestock production.

ICARNational Dairy Research Institute, Karnal

Unconventional Feed Resources to Feed Livestock for Maximizing Profit

Brishketu Kumar*, T. K. S. Rao and Dinesh Kumar

Limited feed supply and poor quality of the available feeds are the major constraints for optimal livestock and poultry productivity in our country. Unconventional feed resources generally refer to all those feeds that have not been traditionally used for feeding livestock and are not commercially used in the production of livestock feeds.

As feed constitutes 60-70 % of the total cost of production. This high feed cost may lead to a decrease in animal production which contributes to low protein intake. This vicious cycle of low productivity and intake of animal protein has been maintained and sustained by the scarcity of feeding stuff especially cereals occasioned by the fact that the available conventional sources such as maize are shared by humans. A major gap exists between the demand and supply of conventional feed resources for feeding livestock in the world. In order to manage this problem of demand and supply, it is essential to increase the availability of non-conventional feed resources for the different livestock production and management systems. So its need to improve the scientific knowledge for utilizing low cost locally available agro-industrial by-products in livestock feed in order to reduce the feed cost.

Different types of unconventional feed resources

Most of unconventional feed resources are low in energy, protein, minerals and contain high amounts of anti-nutritional components. The major constraints to the use of these feeds are related with their collection, storage, dehydration (due to high moisture content) and detoxification processes. Processing technologies that are economic and practical are urgently required. Some of the materials like sal seed meal, neem seed cake, mahua seed cake, and galas seed cake are available in large quantities but due to the presence of potentially toxic substances, have limited value in animal feeds. Many of the forest tree seeds contain 15-35 percent oil and are used for the extraction of oil, after which the cake is valuable as animal feeds. Animal organic wastes such as dung and poultry excreta are also potentially available as a part of animal feeds. Unconventional feed resources generally refer to all those feeds that have not been traditionally used for feeding livestock and are not commercially used in the production of livestock feeds. Several known examples include palm leaf meals, palm press fiber, cassava foliage, spent brewer's grains, sugar cane bagasse, rubber seed meal and some aquatic plants. Unconventional feeds has been frequently used to describe sources such as oil palm by-products, single-cell proteins and feed materials derived from agro-industrial by-products of plant and animal origin, poor-quality cellulosic roughages from farm residues and other agro-industrial by-products such as slaughter-house by-products and those from the processing of sugar, cereal grains, citrus fruits and vegetables from the processing of food for human consumption also comes under category of unconventional feeds.

Need for unconventional feeds

- Serious shortages in animal feed of the conventional type.
- With an increasing demand for livestock products as a result of rapid growth in the world economies and shrinking land area, future hopes of feeding the animals and safe guarding their food security will depend on the better utilization of unconventional feed resources which do not compete with human food.
- Unconventional feeds could partly fill the gap in the feed supply, decrease competition for food between humans and animals,

reduce feed cost, and contribute to self-sufficiency in nutrients from locally available feed sources.

Characteristics of unconventional feeds

- They are mainly organic and can be in a solid, slurry or liquid form.
- Their economic value is less than that the cost of collection and transportation for use thus referred to as wastes.
- Some feeds contain toxic factors and have a deleterious effect on animals.
- These are by-products of food production systems that have not been used, recycled or salvaged.
- They have considerable potential as feed materials. In the case of feeds, their value can be increased by further processing.

Most unconventional resources are usually regarded as waste so; they can be used to supplement the existing limited feed resources. Recycling, reprocessing and utilization of all or a portion of the wastes, offers the possibility of returning these materials to beneficial use as opposed to the traditional methods of disposal and relocation of the same residues. The demonstration of potential value can thus make any of these waste products new feeds of value and importance.

Processing a need for unconventional feed resources

Unconventional feedstuffs must be well processed before feeding (chaffing, grinding and pelleting) and mixed into a uniform blend that discourages selection.

- Expander extruder method is of importance in processing of such feeds.
- Expanding-application of moisture, pressure, temperature to gelatinize the starch portion.
- Extruding-pressing the feeds through constrictions under pressure.

Advantages of using the unconventional feed resources

- Clean environment - The sanitary disposal of offal, such as the by-products of the slaughter house, presents great difficulties. Not only does this offal attract vermin and present danger of spreading disease, but it also tends to decompose, rapidly forming an ideal substrate for microorganisms and leads to objectionable odors. The effluents from slaughter houses and from the processing of potatoes, citrus, grapes, and wine after purification and processing produce a sludge that could be used in a dry form for livestock and poultry feeding purposes.
- Livestock health and productive agriculture-offal can be used either to manufacture fertilizers or livestock feedstuffs depending on the speed with which they are handled and the freshness of the raw materials.
- Decreasing price of animal products - The use of by-products and recycling waste will influence the price of meat and eggs to the producer of livestock. Depending on local circumstances, the return derived from the use of by-products (animal, vegetable and fruit wastes) may be used to decrease the prices of meat and eggs to the consumer or to give the livestock producers more gain for their product and by-products.
- Generation of employment - There is no doubt that the disposal of waste (inedible offal, fruit, and vegetables, tannery or municipal refuse) needs little or no manpower in developing market economies. The conversion of offal, however, into valuable by-products creates new employment and skills at the place of production.

Constraints in utilizing unconventional feeds

Limited knowledge of the chemical composition and feeding values of unconventional feeds.

- Presence of anti-nutritional factors: Most of such feeds contain anti-nutritional factors thus not suitable for use in animal feed, and little knowledge about their characterization, quantification in ingredient, and their long-range effects on animal health and productivity.
- Non availability of unconventional feeds in large quantities. Production is scattered in definite areas.
- Seasonal availability: Availability

is restricted to the particular season in a year and no storage facility.

- ➢ Lack of managerial and technical skills utilizes the feed in situ.
- ➢ Processing difficulties: Difficulties in the collection, handling, transportation, and processing of these feeds.

Advantages of using unconventional feeds

These are end products of production and consumption that have not been used.

- ✓ They are mainly organic and can be in a solid, slurry or liquid form. Their economic value is often very less.
- ✓ Fruit wastes such as banana rejects and pineapple pulp by comparison have sugars which are energetically very beneficial.
- ✓ The feed crops which generate valuable unconventional feeds are excellent sources of fermentable carbohydrates e.g. cassava and sweet potato and this is an advantage to ruminants because of their ability to utilize inorganic nitrogen.
- ✓ Concerning the feeds of crop origin, the majority are bulky poor-quality cellulosic roughages with a high crude fibre and low nitrogen contents, suitable for feeding to ruminants.
- ✓ They have considerable potential as feed materials and their value can be increased if they are converted into some usable products.

Conclusion

A distinctive gap exists between the requirements and supplies of nutrients, the unconventional feeds could partly fill this gap. Presently these by-products are not exploited to the full extent for inclusion in the livestock feed. Seasonal availability, high cost of handling and transportation from the production site to the farm, presence of anti-nutritional factors limit their use. Crop residues, agro-industrial by-products and browse foliage have an increasingly important role as feeds in the future, as human and livestock populations expand. The maximum and minimum level of incorporation of these feeds could be suggested. Identifying the incriminating factors and easy way to eliminate them could be taken care of. Biotechnological innovations and processing techniques could be done. Adoption of alternative feed resources in livestock nutrition will be a sure way to achieve the strategic plans for profitable livestock farming system.

*Assistant Professor, Department of Animal Science, College of Agriculture, NAU, Bharuch, Gujarat
Corresponding author: Brishketu Kumar,
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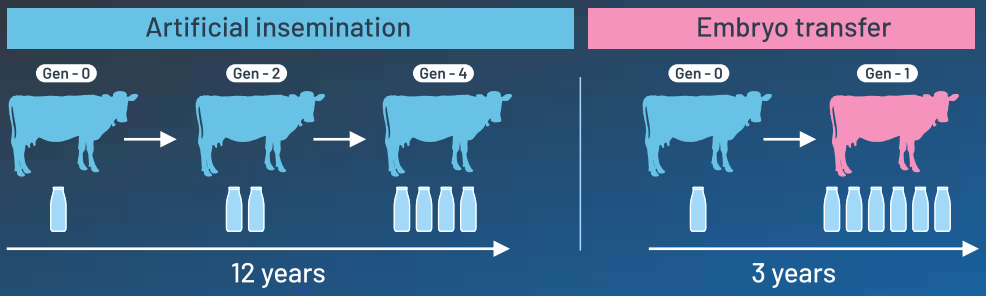

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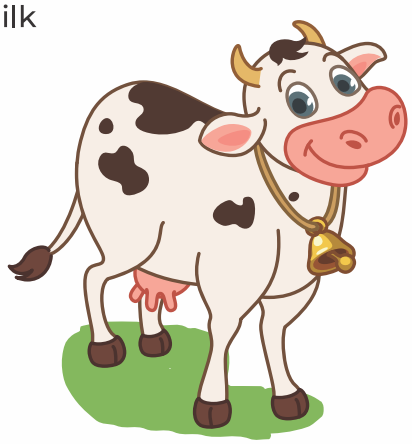
MPRO GOLD

ADVANTAGES

- Improves milk yield along with fat, protein and SNF in milk
- Improves growth performance of growing animals
- Improves rumen environment, thereby increasing microbial population, protein synthesis, feed intake, and feed utilization
- No risk of ammonia/urea toxicity
- An excellent tool for making Urea Free Feed
- Facilitates production of clean & green milk



INCREASED YIELD

ENHANCED FAT-PROTEIN-SNF

GREEN MILK

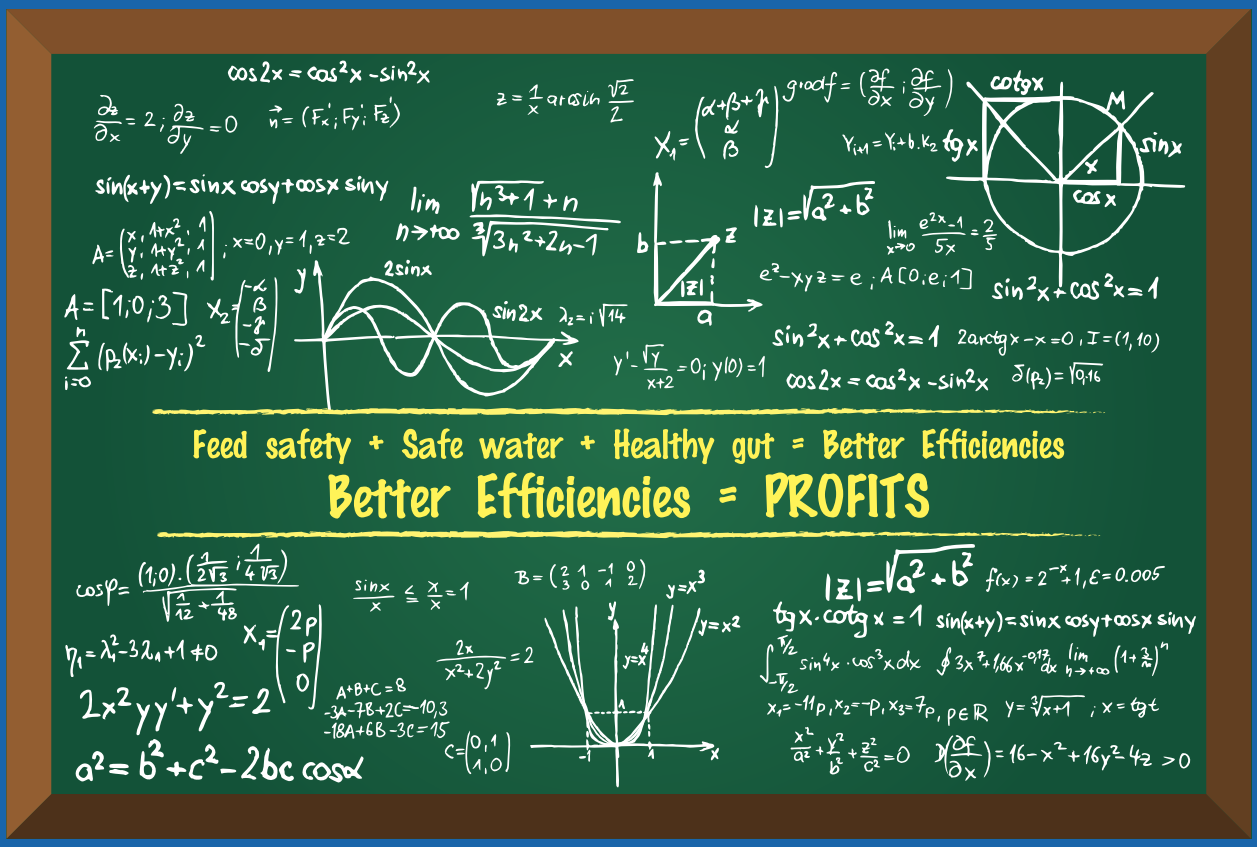
HEALTHIER, PRODUCTIVE MILCH ANIMAL

CERTIFIED BY NDRI, ICAR (KBK), SHRIRAM INSTITUTE & SGS

ARCL Lifesciences

BUDGE BUDGE TRUNK ROAD, RAMPUR, P.S., MAHESTALA, KOLKATA - 7001411

+91 92309 93593 | aqua@arcl.in | www.arcllifesciences.com



The Universal Profit Equation

Safe feed + Clean water X Healthy Gut = Performance

=> Performance = Better Efficiency + Reduce costs

=> Better Efficiency + Reduce costs = Higher Profits

QED

Profit isn't a dream, it's a strategy.
Let's build yours.

PRANAV BiTEK
FEED SCIENCE
Responsible Innovation

PRANAV BiTEK AGROTECH PVT. LTD.
Bunglow No. 5, Acacia Garden 1, Magarpatta City
Pune 411028, Customer Care No: 020-61096718
E-mail: sales@pranavbitek.in
Website: www.pranavbitek.in
Mob.: +91 98501 62703