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&
64th National Symposium 2023

18th & 19th August 2023

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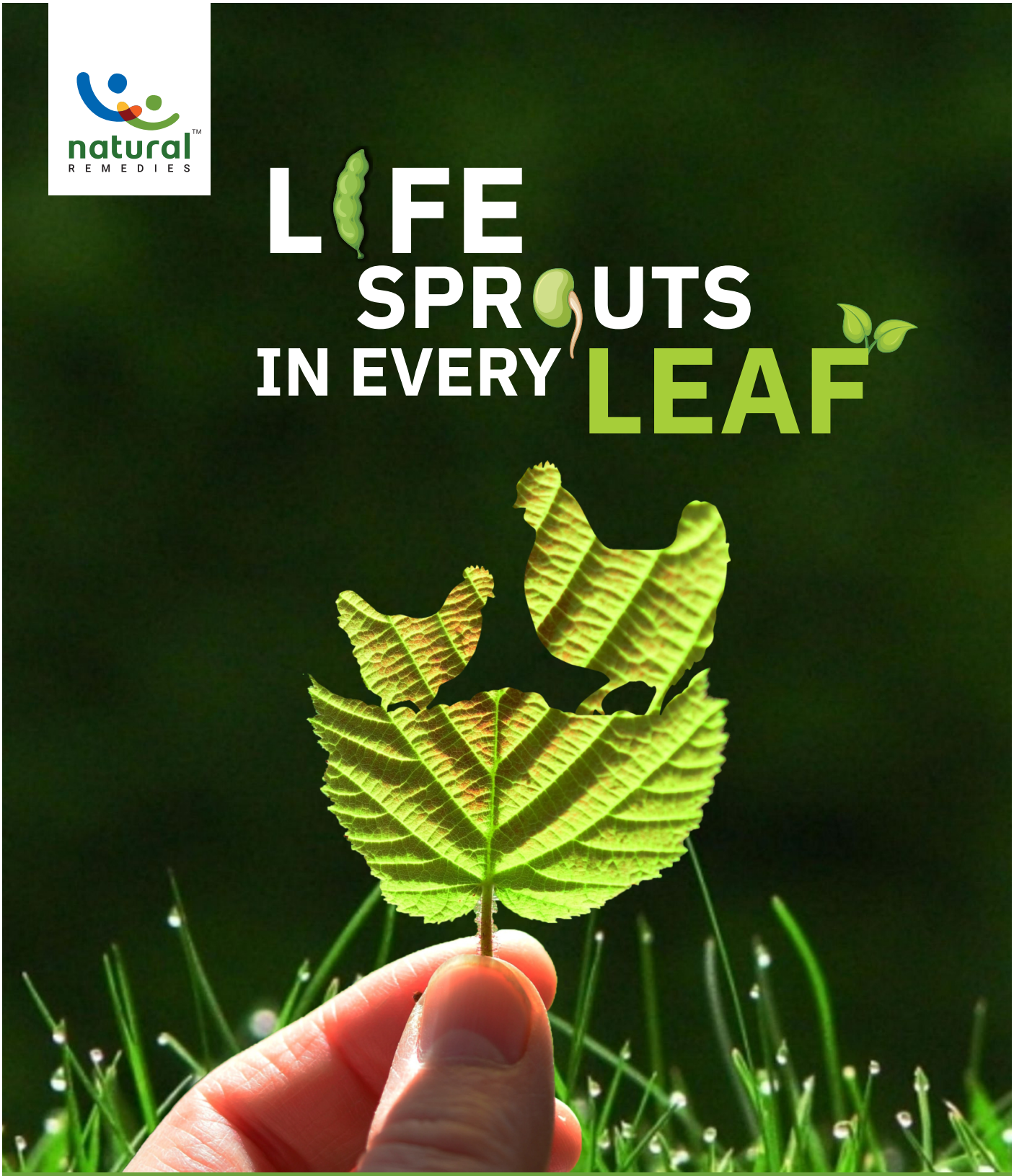

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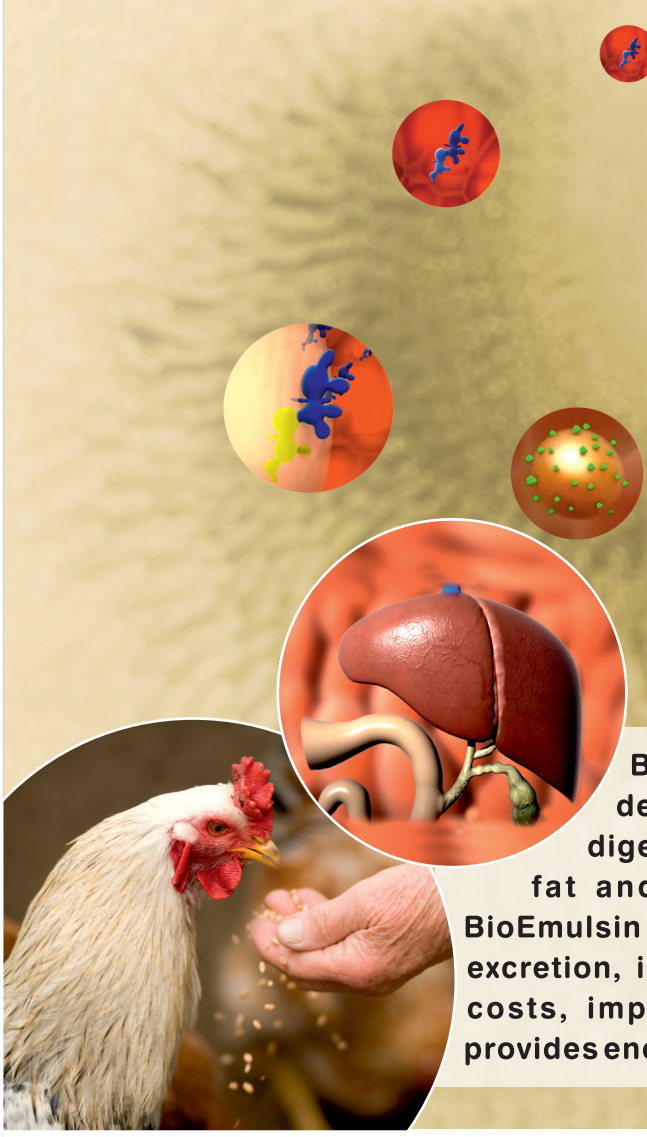

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18 JUL 2023



MESSAGE

I am glad to know that, CLFMA OF INDIA is organizing its 56th Annual General Meeting and the 64th National Symposium on 18th August, 2023 and 19th August, 2023 at New Delhi. The theme of the Symposium is "**Livestock Sector: Looking Beyond the Present".**

As you are aware, the Livestock sector plays an important role in the Indian economy and forms an important livelihood activity for most of the farmers, supporting agriculture in the form of critical inputs, contributing to the health and nutrition of the household, supplementing incomes, offering employment opportunities, and finally being a dependable "bank on hooves" in times of need. It acts as a supplementary and complementary enterprise. Livestock is a principal source of draught power in rural areas and provides milk, meat, eggs, wool, hides & skins, manure, and fuel.

The outlook of the livestock sector looking beyond the present is positive. The sector is seeing increased investment and interest from both the public and private sectors. Additionally, the introduction of e-commerce and direct-to-consumer sales are making it eaiser for producers to reach new markets and consumers. The need for Livestock Sector to transit from the traditional industrial model into a new futuristic and sustainable model is more demanding.

I appreciate efforts of CLFMA to make the livestock sector dynamic & hope that the 56th Annual General Meeting & 64th National Symposium 2023 of CLFMA OF INDIA would be beneficial for all the Stakeholders of the Livestock Sector.

I extend my best wish to the Organizer and the participants for all the success of the event.

(Parshottam Rupala)

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MESSAGE

I am happy to hear that, CLFMA OF INDIA is organizing its 56th Annual General Meeting and the 64th National Symposium on the theme "Livestock Sector: Looking Beyond the Present" on 18th and 19th August, 2023 at Hotel Le Maridien, New Delhi.

Livestock Sector in India is one of the largest in the world. Livestock is a major source of livelihood and employment to two-third of rural community in India. The Livestock Sector needs more focus and CLFMA Symposium is a knowledge-sharing event, where novel ideas about the livestock sector will be discussed. The aforesaid theme has been well selected by CLFMA OF INDIA and the same will be a very good platform for sharing new ideas to face the future challenges of the sector. I acknowledge the focused efforts by CLFMA towards the overall development of the Livestock sector as a whole.

On the occasion of the 56th Annual General Meeting & the 64th National Symposium 2023 of CLFMA OF INDIA, I extend my best wishes to the organizers and participants for the grand success of the event.

(Dr. Sanjeev Kumar Balyan)

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Joint Secretary
Government of India
Ministry of Fisheries, Animal Husbandry & Dairying
Department of Animal Husbandry and Dairying
Krishi Bhawan, New Delhi-110001

MESSAGE

It gives me immense pleasure to know that CLFMA of India is organizing their 56th Annual General Meeting & 64th National Symposium on the theme 'Livestock Sector: Looking Beyond Present' on 18-19 August, 2023 in New Delhi.

Globally the growth potential of Animal Agriculture is tremendous and is accelerated by the consumer preference as well as technological advancement in Management, Breeding, Nutrition, Reproduction, Disease Diagnosis & Therapeutics. The rapid penetration of the technologies will bring about better sophistication in Farm management and new strategies in Animal Production.

The role of CLFMA to tune the Indian Feed Industry as per the future production trend is appreciative. The consistent efforts and dynamic interaction of Association always help this Department for prompt interventions in the sector.

I believe that 64th National Symposium organized by CLFMA would bring out constructive and proactive ideas to take the sector towards sustainable growth.

On this occasion, I extent my best wishes for the grand success of the event.

(Dr. O.P. Chaudhary)

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Ruud Tijssens
Chairman
International Feed Industry Federation

International Feed Industry Federation
P.O. Box 1340
51657 Wiehl
Germany
www.ifif.org

28 July 2023

Dear Mr. Deora,

On behalf of the International Feed Industry Federation (IFIF) I would like to thank you very much for your kind invitation to the inaugural session of CLFMA OF INDIA's 64th National Symposium on 18 and 19 August 2023.

Thank you also for the invitation to IFIF Executive Director Alexandra de Athayde to speak at the Symposium and we are delighted she will join you and the Indian Feed Industry colleagues at this special occasion.

The theme of your Symposium "Livestock Sector: Looking Beyond the Present" is of great relevance, especially in an important livestock market such as India. IFIF appreciates the support and strong collaboration with CLFMA OF INDIA. Working together we can further grow and strengthen the global feed industry to promote and support sustainable, safe, nutritious and affordable food for a growing world population.

IFIF represents over 80% of the animal feed production worldwide and we work closely with our members and collaboratively with the global agricultural chain to address key issues, including feed and food safety, sustainability and good production practices to ensure high standards of health and welfare for animals and people and meet the many challenges ahead for the global feed & food chain.

The animal feed industry plays a crucial role in supporting sustainable livestock production by leveraging innovation and efficiency. Animal nutrition, through its continuous advancements, continues to be an essential part of the solution to make the livestock production chain more sustainable. It ensures animal resilience and productivity, producing more with less, optimizing environmental resources, applicable to farmers in developed countries, as well for smallholder farmers in low- and middle-income countries.

On behalf of the IFIF Board of Directors, I wish you fruitful discussions and much success for your 64th National Symposium and IFIF looks forward to join this important event.

Sincerely,

Ruud Tijssens
Chairman
International Feed Industry Federation

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Soybean meal is one of the most utilized feed ingredients in poultry nutrition, where the main countries[1] involved in global trade of soybeans and soybean meal include Argentina, Brazil and the U.S. Buyers should focus on nutritional characteristics that impact the final diet's nutritional value and associated performance, not just on minimizing the cost of ingredients.



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Whole Soybean Quality: The U.S. has notably less whole soybean damage compared to Brazil[3]. Lower damage of soybeans preserves the quality of the soybean meal and lower moisture results in higher nutrient concentration - two extremely desirable characteristics in feed ingredients.

Soybean Processing Indicators: The methods and conditions in which soybean meal is processed can impact the nutritional quality of its protein content. The U.S. has better soybean meal processing conditions resulting in better quality soybean meal. This is driven by significantly lower levels of Trypsin Inhibitor Activity (TIA), in case of Brazil, an anti-nutritional factor that decreases animal performance. It is also a result of more consistent Processing Conditions as determined by the Processing Condition Indicator (PCI).

Digestible Amino Acids (protein): The value of soybean meal in the diet is determined by its amino acid (AA) profile and the digestibility of those amino acids. Consequently, that affects the quantity of soybean meal in the diet. U.S. soybean meal has better AA digestibility for poultry compared to Argentina and Brazil. Higher amino acid digestibility translates into superior animal performance, less nitrogen wasted, and reduced diet costs.

Energy: The energy content must be considered when assessing the total intrinsic nutritional value of the soybean meal in poultry diets. Compared to other soybean meal origins analyzed, the U.S. has a higher Net Energy (NE) and Apparent Metabolizable Energy, nitrogen corrected (AMEn) values than Brazil and Argentina. NE and AMEn are the most common energy measures for poultry diets, respectively.

When collectively considering these intrinsic quality factors, the U.S. has lower damaged whole soybeans with lower moisture, better soybean meal processing conditions, greater levels of digestible amino acids and levels of energy. These benefits translate into better animal performance, reduced diet costs, reduced formulation challenges, increased sustainability and, ultimately, provides superior intrinsic value to soybean meal end-users.

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[1] https://marketviewdb.centrec.com/?bi=Global_Soy_ExportsbyOrigin
[2] Data obtained from Evonik and summarized based on international trading specifications and includes observations with crude protein values between 46.0-49.0% and fiber values between 3.5-3.9% and U.S. data are from the USDA FGIS public database. Brazilian data are collected from different surveyors. The data is based on limited samples and is not meant to reflect a statistically significant sample size of the overall soybean crop. Due to lack of soybean supplies in Brazil in December 2020 and January 2021, no data were available for those two months.
[3] Comparable whole soybean quality (e.g., damage, moisture, etc.) data from Argentina are not available publicly or in a consistent manner



NICOLÒ CINOTTI
SECRETARY GENERAL
INTERNATIONAL POULTRY COUNCIL

MESSAGE

On behalf of the International Poultry Council, I would like to commend CLFMA OF INDIA and the Indian poultry sector for their unwavering dedication and efforts to feeding India and the world. The role of poultry and livestock at large is paramount to the development of rural areas across the globe and India is no exception. The Indian poultry sector is known the world over for its innovation and resilience, working everyday towards building a sustainable poultry value chain. By leveraging innovation, technology and a strong appetite for change, India has every opportunity at its fingertips to transform its livestock sector and shape a bright future for poultry production.

Thank you for bringing together the best of the best for this excellent symposium on Looking Beyond the Present in livestock. I look forward to hearing the outcomes of all discussions and to working with CLFMA OF INDIA and the India poultry industry for a better and stronger future for poultry.

(Nicolò Cinotti)
SECRETARY GENERAL
INTERNATIONAL POULTRY COUNCIL

Convenor Address



It is my privilege and honour to welcome you all to the CLFMA of India's 64th National Symposium scheduled on August 18 and 19 , 2023, at the Hotel Le Meridien, New Delhi.

Further, I extend my sincere gratitude to our Esteemed Dignitaries from Government, Industry, Special Guests, Expert Speakers, Delegates, Sponsors, and all others who have supported making this symposium a grand success.

CLFMA has successfully witnessed 56 eventful years due to the incredible contributions, aspirations, and tireless work of each and every member.

This year, the Theme of the 64th National Symposium has been set as "Livestock Sector: Looking Beyond the Present," which will offer us a chance to share the latest happenings related to the theme, enabling us to draw a roadmap for the growth of animal farmers in India and the industry at large.

Precisely speaking about the Livestock Industry background, the livestock farming in the rural areas, serves as an additional source of income for farmers and mitigates the risks associated with crop production. Many farmers in India have adopted animal husbandry because of the increasing demand for animal products such as milk, meat, eggs, and many others in the market. Moreover, consumer preferences are shifting towards non-vegetarian food, which has increased the demand for livestock products. In addition to that, India is a major exporter of livestock products such as meat, dairy, and leather. The demand for Indian livestock products has increased significantly in the international market because of a competitive advantage in terms of cost of production, availability of feed, and a large livestock population. The government of India has implemented various schemes and programs to promote livestock farming, improve animal husbandry practices, and increase productivity. The government schemes include the national livestock mission, livestock health, and disease control scheme, national animal disease control programme, livestock insurance scheme, and many others.

The above scenario emphasizes that this sector is a happening sector and needs to be given more focus and hence the CLFMA Experts have chosen the appropriate theme for deliberation

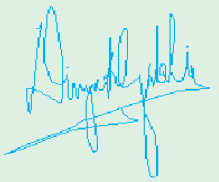
The Symposium will have discussions addressing Graduating from Quantity to Quality for Making Our Agriculture, Livestock and Fishery Globally Competitive, Challenges of Feed Security for Bridging the Demand and Supply Gap, Development Initiative and Regulatory Frame Work and the sessions will be deliberated by experts from Industry and Government from Aquaculture, Dairy, Poultry & Other Livestock related sectors.

We also have stellar speakers and pioneers from national and international level who will be discussing the latest trends and developments and the Symposium would be attended by many senior officials from the industry (Dairy, Poultry, Fishery, and other stakeholders of livestock industry), Academic Institutions, Farmers, Poultry Integrators, Government Institutions, International Organizations, etc., from the sector.

I am confident that, during the two days, there will be plenty of opportunities for all the participants to share and discuss the critical issues faced by the industry and have interactions with senior government representatives and the outcome of this would help to accelerate the overall growth of the livestock sector in a sustainable manner and improve the wellbeing of several livestock farmers and other related stake holders of the country's livestock industry.

I look forward to seeing you soon at Hotel Le-Meridian, New Delhi.

With Regards,



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Chairman's Address



It gives me immense pleasure to welcome you all to CLFMA OF INDIA's 56th Annual General Meeting and 64th National Symposium 2023 scheduled on 18th & 19th August 2023 at Hotel Le Meridien, New Delhi.

I extend my sincere thanks to our Chief Guest, Guests of Honour, Esteemed Dignitaries, Eminent Speakers, Key Government Officials, and participants from different parts of the country and abroad for their gracious presence and for making this program a grand success.

Last year, we witnessed the presence of unmatched galaxy of Hon'ble Ministers, Senior Policy Makers, and Regulatory Authorities along with several shining stars of the industry and academia, which made the event a success.

This year, we have chosen an extremely apt topic for the purpose of discussion and the theme is **"Livestock Sector: Looking Beyond the Present."**

A brief background on the theme; The Livestock sector is an important sector contributing to the Indian economy and is an important livelihood activity for most farmers, supporting agriculture in the form of critical inputs, contributing to the health and nutrition of households, supplementing incomes and offering employment opportunities. Livestock is accounted for about 6.17% of total GVA of India (at current prices) and 30.87% of the GVA of Agriculture and allied sector.

The livestock sector is seeing increased investment and interest from both public and private sectors. The Government is taking note of the potential of the livestock sector to provide both economic benefits and environmental sustainability, with many countries investing in animal health services and helping small scale ranchers to become more efficient.

In the long term, the sector is expected to grow and continue to benefit from global trends with increased meat consumption as well as a growing appetite for specialty and high value products. As more countries recognize the benefits of livestock products, the sector will continue to rise in prominence as an important part of the global economy.

Fish production has increased 22-fold during the past 75 years, according to the Ministry of Fisheries, Animal Husbandry, and Dairying, GOI. With a 10.34% increase in fish output from 2020-21 to 2021-22. India's overall fish production increased from just 7.5 lakh tons in 1950-51 to a record 162.48 lakh tons per year in 2021-22 with around 8% of the world's total fish production, India is currently the third largest fish producer.

Milk production during 2020-21 and 2021-22 is 209.96 million tons and 221.06 million tons respectively, showing an annual growth of 5.29%.

The surging focus on building livestock related schemes by the government is propelling the industry growth for the future. Further a sizeable portion of the whole budget, Rs. 2349.71 Crore, was allocated to the livestock health and disease management program. In Aquaculture, a major initiative taken by the government is the Pradhan Mantri Matsya Sampada Yojana, which has further provided a boost to the aquaculture industry in the country.

The Rashtriya Gokul Mission was initiated in December 2014 exclusively for development and conservation of indigenous bovine breeds in a scientific holistic manner.

The main objective of this Symposium is to share novel ideas about quality production rather than quantity to make our industry globally competitive and to discuss the challenges related to feed security. The symposium will also discuss details on the current position of animal husbandry in India, as well as cover a quick overview of the significance of the livestock sector and it's potential for growth the development initiatives and regulatory frame work for the same.

Against the above background and objectives, this symposium is being organized to build partnership with the government to take forward the aforesaid agenda. With a healthy blend of

experts from the government and the private sector, the deliberations during the symposium are expected to produce tangible ideas to take the sector forward towards sustainable growth.

The conference will be attended by many senior officials from the Industry, Academic Institutions, Government Institutions, International Organizations, Ambassador from various countries and The International Feed Industry Federation (IFIF).

I am confident that the 64th Symposium will be a great opportunity for the confluence of innovative and path-breaking ideas that will take the sector to new heights in the future.

I am grateful to all our sponsors for their patronage and continuous, wholehearted support to CLFMA and its initiatives. I thank all the Office Bearers, Members of the Managing Committee, members of the association, and delegates for their great support and active involvement, as always. I express my sincere gratitude for the continuous support from the government to CLFMA and am look forward to their involvement in the future.

Hoping to seeing you at Hotel Le Meridien, New Delhi.

With Regards,



Suresh Deora
Chairman
CLFMA OF INDIA

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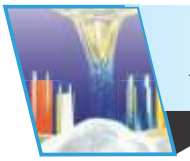

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PROGRAMME

CLFMA 56th AGM & 64th National Symposium 2023

18th & 19th August 2023

Hotel Le Meridien, Windsor Place Janpath,
New Delhi - 110 001.

"Livestock Sector: Looking Beyond the Present"

Day-1: Friday, August 18, 2023

Time	Session
09:00 hrs	Registration of Delegates
11:00 hrs - 12:00 hrs	Managing Committee Meeting
12:00 hrs - 13:30 hrs	Lunch
13:30 hrs - 14:30 hrs	56th Annual General Meeting
Inaugural Session	
16:00 hrs	**Inviting Dignitaries to the Dais, Inauguration & Lighting of Lamp**
16:05 hrs	**Welcome Address by Convenor** Mr. Divya Kumar Gulati, Deputy Chairman, CLFMA OF INDIA
16:10 hrs	**Chairman Address by** Mr. Suresh Deora, CLFMA OF INDIA
16:15 hrs	**CLFMA Audio Visual Presentation**
16: 30 hrs	**Keynote Address by** Mr. Nadir B. Godrej, Past Chairman, CLFMA OF INDIA / Chairman & MD of Godrej Industries Ltd.
16:45 hrs	**Address By Guest of Honour** Dr. Sanjeev Kumar Balyan, Hon'ble Minister of State of Fisheries, Animal Husbandry & Dairying, Government of India
17:00 hrs	**Souvenir & Survey Report (Volume – II) Launching**
17:05hrs	CLFMA Awards
17:15 hrs	CLFMA Lifetime Achievement Award
17:30 hrs	**Address By Chief Guest,** Shri. Parshottam Rupala, Hon'ble Minister of Fisheries, Animal Husbandry & Dairying, Government of India
18:00 hrs	**Vote of Thanks by** Mr. Abhay Shah, Honorary Secretary, CLFMA OF INDIA
19:00 hrs	**Networking Dinner & Live Performance**

Day-2: Saturday, August 19, 2023

09:00 hrs	Registration
09:50 hrs	Welcome Address by Mr. Suresh Deora, Chairman, CLFMA OF INDIA
09:55 hrs	Introduction of Symposium – Mr. Sandeep Kumar Singh, Deputy Chairman, CLFMA OF INDIA
10:00 hrs – 11:30 hrs	**Session 1: - Graduating from Quantity to Quality: Making Our Agriculture, Livestock and Fishery Globally Competitive**
	Moderator: Mr. Balram Singh Yadav, Past Chairman, CLFMA OF INDIA
	Speakers / Panelists: • Smt. Alka Upadhyaya, IAS, Secretary AHD, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. • Shri Rajesh Kumar Singh, IAS, Secretary, Department for Promotion of Industry, and Internal Trade (DPIIT), Government of India. • Shri. Tarun Shridhar, IAS (Retd.), Former Secretary, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India.
11:30 hrs – 11:40 hrs	Tea Break
11.45 hrs – 13.30 hrs	**Session 2: - Challenges of Feed Security: Bridging the Demand and Supply Gap**
	Moderator: Mr. Neeraj Kumar Srivastava, Immediate Past Chairman, CLFMA OF INDIA
	Panelists: • Dr. O. P. Chaudhary, Joint Secretary (NLM/PC), Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. • Shri. Sagar Mehra, Joint Secretary (Inland Fisheries), Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. • Shri. G. N. Singh, Joint Secretary (Admin/Trade/GC/IC/IT), Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. • Ms. Alexandra de Athayde, Executive Director, International Feed Industry Federation (IFIF). • Dr. Praveen Malik, Chief Executive Officer, Agrinnovate India Ltd., (A Government of India Enterprise), New Delhi. • Mr. Naveen Pasuparthy, Deputy Chairman, CLFMA OF INDIA • Dr. Sandeep Karkhanis, Member, CLFMA OF INDIA
13:30 hrs – 14:30 hrs	Lunch Break
14:30 hrs – 16:00 hrs	**Session-3: - Development Initiative and Regulatory Frame Work**
	Moderator: Mr. Sandeep Kumar Singh, Deputy Chairman, CLFMA OF INDIA
	Panelists: • Ms. Varsha Joshi, Additional Secretary (CDD), Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. • Dr. Abhijit Mitra, Animal Husbandry Commissioner, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. • Dr. Sujit K. Dutta, Joint Commissioner (AH), Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. • Dr. Gagan Garg, Deputy Commissioner (Trade), Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. • Smt. Suneeti Toteja, Scientist – E, Bureau of Indian Standards (BIS), Government of India. • Dr. Monica Puniya, Deputy Director, Food Safety and Standards Authority of India (FSSAI), Government of India. • Dr. Prashant Shinde, Managing Committee Member, CLFMA OF INDIA • Mr. Suresh Rayudu Chitturi, Member, CLFMA OF INDIA
16:00 hrs – 16:10 hrs	**Presentation on "Right to Protein" by Mr. Jaison John, CLFMA Managing Committee Member**
16:10 hrs – 16:25 hrs	**Valedictory Session:** Summation of Symposium – **Mr. S. V. Bhave,** Past Chairman, CLFMA OF INDIA
16:25 hrs	Felicitation of Sponsors, Media, Guests, and Invitees
17:00 hrs	Vote of Thanks by – Dr. Anup Kalra, President North - II, CLFMA OF INDIA
19:00 hrs	Networking Dinner

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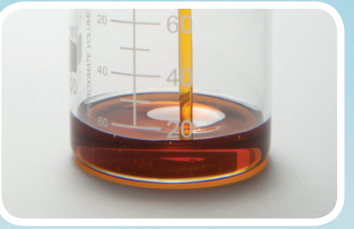
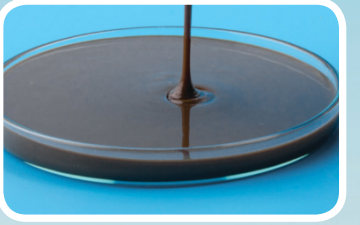

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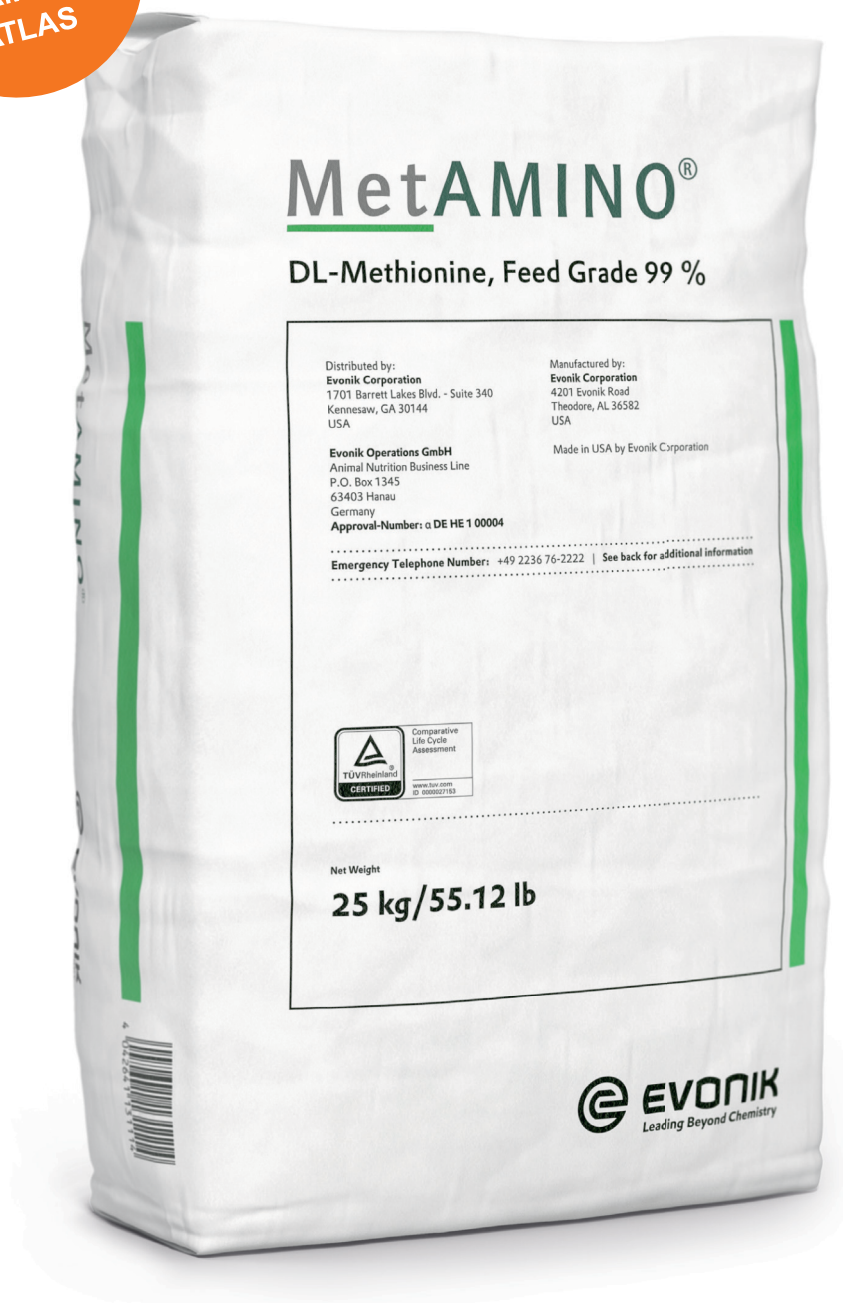

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CLFMA Lifetime Achievement Award



Mr. Nadir B. Godrej
Chairman and Managing Director of Godrej Industries Ltd.

Mr. Nadir B. Godrej is the Chairman and Managing Director of Godrej Industries Ltd. and Chairman of Godrej Agrovet Ltd. He is also the Co-Chair of Godrej Good & Green Governing Council. He holds a Master of Science degree in chemical engineering from Stanford University and an MBA from Harvard Business School. He has been a Director of several Godrej companies since 1977 and has developed the animal feed, agricultural inputs and chemicals businesses of Godrej Industries and other associate companies, and has been very active in research.

Mr. Godrej is deeply committed to the GOOD and GREEN strategies and achievement of set targets for the Godrej Group. He encourages and supports a shared vision value for all programs of Good and Green.

Mr. Godrej is the President of The Alliance Française De Bombay. And also a Member of the CII National Council and past Chairman of the CII National Committee on Chemicals.

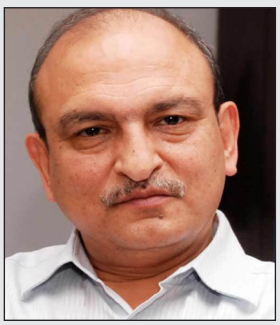
Mr. Godrej has been awarded the Chevalier de Legion d'Honneur, Globoil Life Time Achievement Award – 2012, OTAI Life Time Achievement Award – 2012, Chemtech CEW Leadership & Excellence Award -2013, and Chemexcil Life Time Achievement Award – 2013. He also received the Porter Prize 2013 for Creating Shared Value awarded to Godrej Industries Ltd. Mr. Godrej was conferred a Lifetime Achievement Award by the The All India Liquid Bulk Importers and Exporters Association (AILBIEA) at their 16th Anniversary celebrations on April 1, 2016. Mr. Godrej has also received the prestigious CHEMTECH Leadership & Excellence Award 2017 - Hall of Fame.

Also, the Board of Management of Manav Rachna University has unanimously conferred Mr. Godrej with an Honorary Degree of Doctor of Philosophy. And Mr. Godrej was presented the award in Business Excellence at the IBG function on 31st January, 2018. In February 2023 he received the Hurun award for most respected Indian Industrialist of the Year. Recently Mr. Godrej received a special award for “Excellence in Healthcare” from the Navabharat Group. He also received a Doctor of Philosophy in Business Management from XIM University, Bhubaneswar in recognition of his contribution to Industry and Society.

PERSONAL

Science, linguistics, swimming and poetry; author of "Life and Other Poems" & "Nadir Godrej The Poet", a collection of English and French poems. Mr. Godrej is known to make speeches in verse!

CLFMA Lifetime Achievement Award



Shri. Tarun Shridhar
Member (Administrative),
Central Administrative Tribunal

Past Service: IAS (Himachal Pradesh:1984); retired from IAS on 31.07.2019

Experience related to Agriculture, Animal Husbandry, Fisheries, Rural Development and Public Affairs:

1. **Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India:** I was closely involved in the creation of this ministry in 2019 and had assisted in preparation of the detailed background paper in this regard. Prior to that, I had drafted the proposal for creation of a separate Department of Fisheries. Significant contributions were a) initiation of ETT and IVF for production of HGM Bulls; b) genomic selection programme; c) extension of AI programme; d) launching FMD and Brucellosis control programme, the biggest of animal disease programme of its kind; e) introduction of sex sorted semen production facility; f) launch of Dairy Infrastructure Development fund and Fisheries Infrastructure Development Fund; g) National Dairy Plan to strengthen dairy cooperatives infrastructure; h) Dairy Development Project under JICA assistance
2. **Additional Chief Secretary, Departments of Animal Husbandry and Fisheries, Government of Himachal Pradesh:** a) expanded the ambit and activities of milk cooperatives; b) prepared a scheme for door delivery of animal health and disease control services; c) launched a programme for genetic improvement of indigenous breeds, basically the Pahari Cow
3. Additional Chief Secretary, Department of Environment and Forest; Power; Horticulture.
4. Chairman, State Electricity Board.
5. **Joint Secretary, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India:** a) revived the shrimp industry through introduction of disease resistant and high productivity species leading to unprecedented growth making India the biggest shrimp exporter in the world; b) launched the national aquatic diseases surveillance and control programme; c) established the National Fisheries Development Board; d) established country's first and only aquatic quarantine facility; e) started the intensive reservoir stocking programme; f) represented the country in WTO negotiations on fisheries subsidies; g) introduced uniform vessel registration and fishermen's biometric identity card scheme; h) programme for enhancement of fresh water aquaculture productivity
6. **Principal Secretary, Departments of Animal Husbandry and Fisheries, Government of Himachal Pradesh:** a) organised and strengthened milk cooperatives; b) expanded and revived the ailing state Milk Cooperative Federation;

c) expanded AI coverage; d) organised a massive outreach programme for livestock farmers; e) introduced trout fish farming.

7. **Principal Adviser National Cooperative Development Corporation (NCDC)** (post retirement): Advised and guided the organisation in organising cooperatives for remunerative livestock, dairying and fisheries activities. Prominent initiatives in the short period were a) launch of Meghalaya Milk Mission; b) Revival of milk cooperatives in Puducherry; c) Capacity building of Dairy professionals; d) ornamental fisheries, etc.
8. **Deputy Director (Senior), Lal Bahadur Shastri National Academy of Administration, Government of India:** Specialised in training fresh recruits and in-service civil servants in Agriculture and Rural Development sectors.
9. **Public Sector Undertakings:** Successfully and profitably managed the following organisations as a) Chairman, Himachal Pradesh State Electricity Board Limited; b) Managing Director, Himachal Pradesh Tourism Development Corporation and c) Managing Director, Himachal Road Transport Corporation
10. **Director, Ministry of Petroleum and Natural Gas, Government of India:** Looked after the marketing issues of Indian Oil, Bharat Petroleum, Hindustan Petroleum and erstwhile IBP oil companies.

Conferred the Policy Leadership Award for the Dairy Sector in 2020

Awarded the degree of Doctor of Philosophy (Honoraria Causa) in Veterinary and Animal Science by the Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana, Punjab.

Conferred honorary Fellowship of the National Academy of Veterinary Sciences.

Conferred Animal Health Policy Leadership Award in 2022

Publications: Over 150 articles, **both in English and Hindi**, primarily on Agriculture, Rural affairs, Livestock, Fisheries and Dairy sectors in both mainstream and technical publications, all except four, after retirement. The articles relate to diverse sub-sectors like dairy policy, economy, marketing milk products, value addition, livestock health, one health concept, fisheries and aquaculture economy, poultry etc. i) Indian Express, ii) Dainik Jagran, iii) Dainik Bhaskar, iv) The Tribune, v) Outlook, vi) Fair Observer (a USA based web magazine); and technical journals like i) Agriculture Today, ii) Indian Poultry Review, iii) Indian Dairyman, iv) Dairy India.

Writing on the sector on a regular basis.

Other Activities post retirement from IAS: 1. Authored Review of the Status of Aquaculture in Asia Pacific for Food and Agriculture Organisation (FAO); 2. Participated in FAO's global conference on Aquaculture as one of the three subject experts from the Asia Pacific region, and the only one from India; 3. Keynote speaker at the convocation of Puducherry Veterinary College; 4. Delivered keynote address at International Fish Expo; 5. Keynote address in webinar on Atmanirbhar Indian Poultry organised by Veterinary University, Mathura; 6. Keynote speaker in two sessions, one on livestock health and the other on poultry in the conference during Indo-Dutch summit; 7. Regular participation as subject expert in national and international conferences on Dairy, Poultry, Fishery and related subjects; 8. Consultancy and advice on a regular basis, purely in honorary capacity, to a large number of organisations and entities.

CLFMA Award



Dr. Anand Kumar Pathak

Dr. Anand Kumar Pathak was born on 5th January, 1974 and did his BVSc & AH, MVSc from Veterinary College, Durg and Ph.D (Animal Nutrition) from IVRI. Presently, he is working as Senior Assistant Professor (Animal Nutrition) in SKUAST-Jammu. Dr. Pathak has 18 years of experience. He has instrumental and pioneer worker in designing, fabricating and developing manually operated MNB and DCF block making machines and **commercialized *MNB-CT technology* and *CT-DCFB technology*** is ready for commercialization. He has credited for more than 375 publications (including research, review & popular articles, books, book chapters, manuals, technical bulletins with ISBN numbers, etc.) and organized 16 trainings as Co-coordinator/ Coordinator. He has successfully guided 09 MVSc students (two got **Best Thesis Award**). He is recipient of distinguish scientist award, award for excellence in research, Dr Verghese Kurien Best scientist award, Best Innovator award, ANA-Dr MS Rahal ANFT Best Paper Published Award, Publons peer reviewer award, Outstanding scientist award, NAVS Associate, 16 best oral/ poster presentation awards, Fellow of BSS, ISRD, NAVNAW and ANA. He is associated with many projects, village visit programmes, active member of IPR Cell-SKUAST-Jammu, Roadmap for Feed and Fodder development under NLM and Policy framing for UT of J&K. He is continuously engaged in teaching, research and extension activities and his research work solely based on farmers and feed industry need oriented. He has expertise in least cost feed formulation using locally available conventional and unconventional feed resources.

CLFMA Award



Dr. Pankaj Kumar Singh
Bihar Animal Sciences University, India.

Dr. Pankaj Kumar Singh is Professor and Head of Animal Nutrition Department of Bihar Animal Sciences University, Patna, India. He has 21 years experience of teaching of Animal Nutrition and Feed Technology at undergraduate and post graduate levels. Dr. Singh has contributed in area of scarcity feeding, area specific mineral mixture, unconventional feed resources and economical ration for livestock and poultry. He has handled 10 research projects and guided 12 master and doctoral students. Dr. Singh has also an international exposure of 'University of Florida, USA as a visiting scientist. He has authored 8 books, 6 laboratory manuals, and more than 100 publications in reputed journals, and presented many papers in conferences and symposia. Dr. Singh has served Animal Feed Industry as an experienced feed formulator. He has been vice-president of Animal Nutrition Society and Animal Nutrition Association of India. He is Member of editorial boards of national and international scientific journals. Dr. Singh is recipient 'Fellow of Animal Nutrition Association of India', 'Young Scientist Award' of Uttarakhand State Council of Science & Technology, 'Dr. S.K.Ranjhan Best Doctoral Thesis' award of Animal Nutrition Society of India, 'Best Teacher Award-2021' of Bihar Animal Sciences University and many more.



Smt. Alka Upadhyaya
Secretary, Department of Animal Husbandry and Dairying

Smt. Alka Upadhyaya, an Indian Administrative Service Officer (IAS) (Madhya Pradesh:1990) was appointed as Secretary, Department of Animal Husbandry and Dairying on 24th April, 2023. Prior to this she was Secretary, Ministry of Road Transport & Highways, Government of India. Mrs. Upadhyaya has served in various positions in the Government of Madhya Pradesh & Government of India. She has been involved in policy making and decisions in various sectors like Personnel, Finance, Health & Rural Development. Smt. Upadhyaya has done M.Sc. (Organic Chemistry), MA (Economics) & Masters in Public Administration.

She has worked in the road sector for more than a decade. Prior to joining as Secretary, Ministry of Road Transport &Highways, Smt. Upadhyaya served as Chairperson, National Highways Authority of India, and Additional Secretary & Director General, National Rural Infrastructure Development Agency, Ministry of Rural Development, Government of India, handling Prime Minister Gram Sadak Yojana (Rural Roads). She was also Mission Director of National Rural Livelihood Mission. She worked extensively with Self Help Groups & their Federations for inclusion of women in Government schemes & entitlements, creating rural enterprise of women and setting large Producer Collectives – Registered Companies.

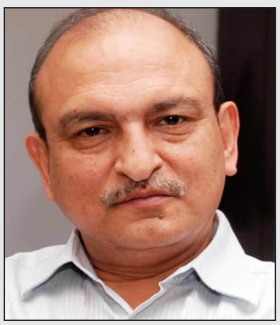
In the State, has worked in Finance, Health & Personnel Department. She has strong focus on building IT systems to bring in transparency and efficiency. She has worked on GIS mapping of Roads with all attributes & all facilities for planning of Road Network across the country through the PM Gati Shakti platform. She has also worked on developing Robust Asset Management System in the country with IT enabled system in rural roads as well as National Highways Authority of India and introduction of Performance Based Management Contracts in Maintenance, Development of Transaction Based System in National Highways Authority of India. Building ecologically sustainable roads has been a priority with usage of local material, propagated wide scale use of plastic waste in rural roads and now in National Highways.



Shri. Rajesh Kumar Singh, IAS
Secretary, Department for Promotion of
Industry and Internal Trade (DPIIT)

Shri. Rajesh Kumar Singh is an Indian Administrative Service officer of 1989 Batch from Kerala cadre. He has assumed the charge of Secretary, Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry on 24th April 2023. Prior to this, he was serving as Secretary, Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying.

He has held many important positions in the Union Government as Commissioner - DDA, Joint Secretary - Ministry of Petroleum and Natural Gas, Joint Secretary - Department of Agriculture, Cooperation & Farmers Welfare and Chief Vigilance Officer – Food Corporation of India. He has also held important positions in the State Government as Secretary Urban Development and lately as Finance Secretary, Government of Kerala.



Shri. Tarun Shridhar
Member (Administrative),
Central Administrative Tribunal

Past Service: IAS (Himachal Pradesh:1984); retired from IAS on 31.07.2019

Experience related to Agriculture, Animal Husbandry, Fisheries, Rural Development and Public Affairs:

1. **Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India:** I was closely involved in the creation of this ministry in 2019 and had assisted in preparation of the detailed background paper in this regard. Prior to that, I had drafted the proposal for creation of a separate Department of Fisheries. Significant contributions were a) initiation of ETT and IVF for production of HGM Bulls; b) genomic selection programme; c) extension of AI programme; d) launching FMD and Brucellosis control programme, the biggest of animal disease programme of its kind; e) introduction of sex sorted semen production facility; f) launch of Dairy Infrastructure Development fund and Fisheries Infrastructure Development Fund; g) National Dairy Plan to strengthen dairy cooperatives infrastructure; h) Dairy Development Project under JICA assistance
2. **Additional Chief Secretary, Departments of Animal Husbandry and Fisheries, Government of Himachal Pradesh:** a) expanded the ambit and activities of milk cooperatives; b) prepared a scheme for door delivery of animal health and disease control services; c) launched a programme for genetic improvement of indigenous breeds, basically the Pahari Cow
3. Additional Chief Secretary, Department of Environment and Forest; Power; Horticulture.
4. Chairman, State Electricity Board.
5. **Joint Secretary, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India:** a) revived the shrimp industry through introduction of disease resistant and high productivity species leading to unprecedented growth making India the biggest shrimp exporter in the world; b) launched the national aquatic diseases surveillance and control programme; c) established the National Fisheries Development Board; d) established country's first and only aquatic quarantine facility; e) started the intensive reservoir stocking programme; f) represented the country in WTO negotiations on fisheries subsidies; g) introduced uniform vessel registration and fishermen's biometric identity card scheme; h) programme for enhancement of fresh water aquaculture productivity
6. **Principal Secretary, Departments of Animal Husbandry and Fisheries, Government of Himachal Pradesh:** a) organised and strengthened milk cooperatives; b) expanded and revived the ailing state Milk Cooperative Federation;

c) expanded AI coverage; d) organised a massive outreach programme for livestock farmers; e) introduced trout fish farming.

7. **Principal Adviser National Cooperative Development Corporation (NCDC)** (post retirement): Advised and guided the organisation in organising cooperatives for remunerative livestock, dairying and fisheries activities. Prominent initiatives in the short period were a) launch of Meghalaya Milk Mission; b) Revival of milk cooperatives in Puducherry; c) Capacity building of Dairy professionals; d) ornamental fisheries, etc.
8. **Deputy Director (Senior), Lal Bahadur Shastri National Academy of Administration, Government of India:** Specialised in training fresh recruits and in-service civil servants in Agriculture and Rural Development sectors.
9. **Public Sector Undertakings:** Successfully and profitably managed the following organisations as a) Chairman, Himachal Pradesh State Electricity Board Limited; b) Managing Director, Himachal Pradesh Tourism Development Corporation and c) Managing Director, Himachal Road Transport Corporation
10. **Director, Ministry of Petroleum and Natural Gas, Government of India:** Looked after the marketing issues of Indian Oil, Bharat Petroleum, Hindustan Petroleum and erstwhile IBP oil companies.

Conferred the Policy Leadership Award for the Dairy Sector in 2020

Awarded the degree of Doctor of Philosophy (Honoraria Causa) in Veterinary and Animal Science by the Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana, Punjab.

Conferred honorary Fellowship of the National Academy of Veterinary Sciences.

Conferred Animal Health Policy Leadership Award in 2022

Publications: Over 150 articles, **both in English and Hindi**, primarily on Agriculture, Rural affairs, Livestock, Fisheries and Dairy sectors in both mainstream and technical publications, all except four, after retirement. The articles relate to diverse sub-sectors like dairy policy, economy, marketing milk products, value addition, livestock health, one health concept, fisheries and aquaculture economy, poultry etc. i) Indian Express, ii) Dainik Jagran, iii) Dainik Bhaskar, iv) The Tribune, v) Outlook, vi) Fair Observer (a USA based web magazine); and technical journals like i) Agriculture Today, ii) Indian Poultry Review, iii) Indian Dairyman, iv) Dairy India.

Writing on the sector on a regular basis.

Other Activities post retirement from IAS: 1. Authored Review of the Status of Aquaculture in Asia Pacific for Food and Agriculture Organisation (FAO); 2. Participated in FAO's global conference on Aquaculture as one of the three subject experts from the Asia Pacific region, and the only one from India; 3. Keynote speaker at the convocation of Puducherry Veterinary College; 4. Delivered keynote address at International Fish Expo; 5. Keynote address in webinar on Atmanirbhar Indian Poultry organised by Veterinary University, Mathura; 6. Keynote speaker in two sessions, one on livestock health and the other on poultry in the conference during Indo-Dutch summit; 7. Regular participation as subject expert in national and international conferences on Dairy, Poultry, Fishery and related subjects; 8. Consultancy and advice on a regular basis, purely in honorary capacity, to a large number of organisations and entities.



Dr. O. P. Chaudhary
IFS, Joint Secretary & Chairman
(Animal Welfare Board of India),
Department of Animal Husbandry & Dairying

1. Name : Dr. O. P. Chaudhary

2. Service : IFS (MP:1989)

3. Educational Achievements:

(i) B.Sc. (Gold Medalist), Agra College Agra, Agra University

(ii) M.Sc. in Physics (Gold Medalist), Agra College Agra, Agra University

(iii) M.Tech (Conversation of Rivers and Lakes), IIT Roorkee

(iv) One year General Management Programme for executives, IIM Lucknow

(v) Postgraduate Diploma in Human Rights Law, National Law School of India, Bengaluru (NLSIU)

(vi) Ph.D (Finance Management), Symbiosis International University, Pune

(viii) Certificate Course on Leadership for 21st Century at JFK School, Harvard University, USA

4. Current Positions Holding:

I.Joint Secretary & Mission Director of National Livestock Mission:
Revised and revamped the Key Scheme of Department and now leading its implementation to develop entrepreneurship models in rural poultry, sheep, goat, piggery & fodder sector.

II. As Joint Secretary, Animal Husbandry Infrastructure Development Fund (AHIDF):
Conceived this scheme and now successfully leading the implementation of this Flagship Scheme (Outlay Rs. 15000 crore) under Aatma Nirbhar Bharat to incentivize entrepreneurship in private sector in milk processing, feed processing and meat processing, waste to wealth.

These two schemes have potential to revolutionize animal husbandry and dairy sector as never before by unleashing the private initiative in the form of

entrepreneurship. This will reduce government dependence and will put the sector on the trajectory of self-sufficiency and export promotion.

III. As Chairman Animal Welfare Board of India:

Brought radical changes in the working of AWBI by simplifying the procedures, by bringing transparency by making whole process online. The timelines for granting pre-shoot permission and no objection certificates for the films has been made 72 hours mandatorily. This has cut out all delays and human interface. Zero pendency now

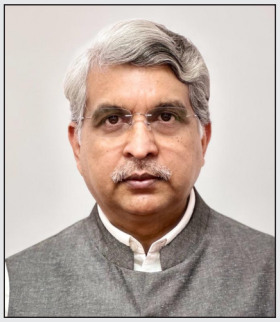
IV. As a Chairman of Committee for the Purpose of Control and supervision of Experiments in Animals (a Statutory body): Simplified the procedures and made the whole process online which has resulted into cutting all delays and human interface. Zero pendency with mandatory time limit of one month.

V. As Member Secretary of Rashtriya Kamdhenu Aayog(RKA):

Played a key role in establishment of this new Institution in the shortest possible time. Strengthened RKA by infrastructure development, hiring manpower/consultants and deputing dedicated regular staff.

5. Other Important Positions held:

- Chief Conservator of Forests (M.P.)
- Regional Provident Fund Commissioner, EPFO, Ministry of Labour, GOI.
- Vice-chancellor of Singhania University, Rajasthan.



Shri. Sagar Mehra
Joint Secretary, Department of Fisheries, Ministry of Fisheries,
Animal Husbandry and Dairying, Government of India

Shri. Sagar Mehra, Joint Secretary in the Department of Fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India since March 2019 looking after the policy matters and implementation of schemes and programmes for the development of inland fisheries and aquaculture in the country. In addition, matters relating to international cooperation and ease of doing business along with implementation of flagship schemes, Pradhan Mantri Matsya Sampada Yojana and Fisheries & Aquaculture Infrastructure Development Fund and including welfare of fishers and fish farmers.

Prior to this, served as Joint Secretary in the erstwhile Department of Animal Husbandry, Dairying and Fisheries from Jan, 2017 to March 2019, handled the charge relating to international cooperation in livestock sector with different countries and international trade in livestock and livestock products including fisheries and animal feed and fish feed etc. Handled the matters relating to Bilateral and Multilateral Free Trade Agreements, Comprehensive Economic Partnership Agreement, Regional Comprehensive Economic Partnership and negotiation sanitary protocols for import/export of various livestock and livestock products. Also handled matters relating to CODEX, “WTO Trade Facilitation Agreement”, and flagship programme of the Government of India like “Ease of Doing Business” and “Trading Across Borders”.

From 2008-2013 served as Director in the Department of Economic Affairs, Ministry of Finance, Govt of India and handled the matters pertaining to bilateral development cooperation with European and Nordic countries apart from bilateral assistance to various Asian and African countries.



Shri. G. N. Singh
Joint Secretary (Admin/Trade/GC/IC/IT),
Ministry of Fisheries, Animal Husbandry and Dairying,
Government of India



Alexandra De Athayde
Executive Director
International Feed Industry Federation

Alexandra de Athayde is Executive Director of the International Feed Industry Federation (IFIF) and she holds a number of representative positions in International Organizations, including the United Nations Food and Agricultural Organization (FAO), the World Organisation for Animal Health (WOAH) and Codex Alimentarius.

Ms. de Athayde has extensive agriculture and international experience representing the industry with governments and businesses. She previously held positions within the Monsanto Company Corporate Affairs Department in Brazil, the US and Europe. She has also worked for the Brazilian Government as Adviser to the Deputy Minister of Agriculture and as Adviser to the Foreign Trade Secretary.

Ms. de Athayde holds an International Executive M.B.A. from the University of Pittsburgh, USA and a B.A. degree in International Relations from York University in Canada. She is based in Germany.



Dr. Praveen Malik
Chief Executive Officer, Agrinnovate India Limited, New Delhi

Dr. Praveen Malik, a Veterinary Microbiologist presently working as Principal Scientist, ICAR and Chief Executive Officer, Agrinnovate India Limited, New Delhi, has about 30 years of research and management experience on animal diseases. He had worked on surveillance of diseases in free-ranging wildlife and livestock and steered development of many diagnostics and vaccine candidates under his leadership. He also worked as In-charge National Centre for Veterinary Type Culture, a repository of microbes of animal origin. As Director, CCS National Institute of Animal Health (NIAH), he was instrumental in reviving the institute, responsible for recommending licensing of veterinary biologicals in the country.

Formerly, working as Animal Husbandry Commissioner, Government of India, he has been involved in policy formulation and technical support to policy on animal husbandry especially animal health at national and international level. He has rich experience as chairman/expert member in various national and international bodies like WOAH (OIE), FAO of the UN, DAHD, besides heading various critical disease control programmes at National level e.g. FMDCP, PPREP, NAPs on AI, ASF, Glanders, EIA and CEM at DAHD, GOI. He has gained wide exposure of international laboratories and intergovernmental bodies including WOAH, FAO, WHO and SAARC on various animal health policies. He also visited many countries across the globe and learnt the functioning of various laboratories and management systems.

He has special interest in biosecurity and biosafety at farm and laboratory levels as well as standardization of laboratory and veterinary service delivery systems, a qualified laboratory assessor/auditor for ISO17025 accreditation. His research interests include infectious diseases of livestock and wild animals, including the diseases of zoonotic importance as well as advocacy and implementation of one-health.

He is recipient of fellowships of reputed National Academy of Veterinary Science (India) (NAVSI), IAVMI, ISVIB and Indian Veterinary Association (IVA) as well as Honorary Fellowship, Metrology Society of India (MSI). He has also been conferred with Lifetime Achievement Award by the Indian Veterinary Association besides Dr PG Pandey Memorial Oration Award (IAVMI 2023).



Ms. Varsha Joshi
Additional Secretary, Cattle & Dairy Development,
Ministry of Fisheries, Animal Husbandry & Dairying,
Government of India

Ms. Varsha Joshi is an IAS officer of 1995 batch, AGMUT cadre and is presently serving as Additional Secretary, Cattle & Dairy Development, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India from July 2020.

Experience

Additional Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India – from December, 2021

Joint Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India- from July, 2020

Additional charge as Chairman, National Dairy Development Board- from December 2020 - 31st May, 2021

Commissioner, North Delhi Municipal Corporation- December 2018 - July 2020

Secretary Power, Secretary Tourism, Commissioner Transport, Government of NCT Delhi- November 2016 - December 2018

Joint Secretary, Ministry of New and Renewable Energy, Government of India- October 2014 - November 2016

Director Administration & NPR, Office of Registrar General & Census Commissioner, India- September 2012 - September 2014

Director Census Operations, Delhi- November 2009 - September 2014

Consultant, United Nations Population Fund (UNFPA)- February 2014 - March 2014

Consultant, United Nations Population Fund (UNFPA)- October 2013 - October 2013

Additional Commissioner Transport, Government of NCT of Delhi, 2009 - 2009

Deputy Commissioner South West District, Government of NCT of Delhi, 2007 – 2009

Additional CEO & Director Finance, Delhi Jal Board, 2007 – 2007

Secretary to the State Government, Government of Arunachal Pradesh, 2004 – 2007

Deputy Commissioner, Lohit District, Arunachal Pradesh, 2004 - 2004

Chairperson, Committee against Sexual Harassment, Government of Chandigarh UT, 2001 – 2003

Director Public Instruction, 2000 – 2002

CEO, Chandigarh Housing Board, 1999 – 2003

Managing Director, Chandigarh Industrial and Tourism Corporation, 2000 – 2002

Sub Divisional Magistrate, Government of NCT of Delhi, 1997 – 1999

Education

Delhi University Master's degree, Physics (1991 1993)
Hindu College, Bachelor's degree, Physics (1988-1991)

Honors-Awards

UMI Commendable Initiative Award- Best NMT Project- 2019 by Urban Mobility India Conference 2019, Ministry of Housing and Urban Affairs, Government of India

President's Silver Medal for Census of India 2011 in 2013



Dr. Abhijit Mitra
Animal Husbandry Commissioner,
DAHD, MoFAHD, Govt of India

Dr. Abhijit Mitra is presently serving as Animal Husbandry Commissioner, Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Govt of India w. e. f. November 2022.

Born on 12th November 1965 in Jamalpur, Bihar. After completing B.V.Sc. & A.H. (1987; BCKVV, West Bengal), obtained Masters in Dairying (1990) and Ph. D (1994) in Animal Genetics & Breeding from ICAR-NDRI (Deemed University), Karnal. Persuaded a part of the Doctoral research (1993-94) in Technical University of Munich, Germany as DAAD Fellow, and Post-Doctoral Fellowship in USDA-ARS, Beltsville MD, USA (2000-01) and in Roslin Institute, Edinburg, UK (2009). Conferred with Gold Medal in both graduate and post-graduate.

Before taking over the present position, Dr. Mitra served as Director, ICAR-Central Institute of Research on Cattle, Uttar Pradesh (2020-2022), Director, ICAR-National Research Centre on Mithun, Nagaland (2015-2020) and in ICAR- Indian Veterinary Research Institute, Izatnagar in the capacity of ICAR- National Fellow (2011-2015), Principal Scientist (2009-2015) and Senior Scientist (2001-2011); and in ICAR-NDRI, Karnal as Scientist (1995-2001).

Dr. Mitra has research interests in the field of genetics of disease resistance, reproductive genomics, and transgenesis. Authored more than 75 peer-reviewed research papers and several books and book chapters. Besides, cloning and characterization of genes influencing the economic traits of livestock species including novel variants of Interferon tau, delineating maternal recognition of pregnancy in buffalo, host's genetic resistance against brucellosis and genetic manipulation (RNAi) of myostatin gene, his notable contribution has been developing a noble and first-ever protocol of sperm- as well as testes-mediated gene transfer for producing transgenic goat.

As a Director, ICAR-NRC on Mithun, Dr. Mitra launched several new research and development initiatives namely the registration of mithun as a food animal under FSSAI, implementation of Artificial insemination in Mithun, developing bankable schemes for mithun rearing, semi-intensive rearing of mithun and diversifying the use of mithun as a dairy animal. Dr. Mitra has also been instrumental in popularizing scientific mithun rearing in North-Eastern Hilly states.

He has been involved in PG teaching for more than 20 years in two of the most prestigious Deemed Universities (viz., ICAR-IVRI and ICAR-NDRI); and guided 8 Ph. D and 7 M. V. Sc students. He is a Reviewer for many reckoned Journals and a Member, Editorial Board of ICAR-Indian Journal of Animal Science (2010 to date); Indian Journal of Animal Genetics & Breeding, and Ruminant Science. Dr. Mitra has developed a Mobile-App - *"Mithun Mitra"* and has registered the patent of several appliances/ tools including Mineral Dispenser and Feeder that are useful for animal husbandry.

Dr. Mitra has the distinction of receiving several awards including ICAR Team Research Award (2007-08) as a Team Leader; DST-BOYSCAST Fellow, DST-SERC Visiting Fellow, and DAAD (Germany) Fellow. He has been bestowed with distinguished Fellowships of noted academics and professional societies viz. National Academy of Agricultural Science (NAAS), National Academy of Veterinary Sciences (India), National Academy of Dairy Science (India), IAAVR and Society of Extention education (SEE), Agra and Indian Society of Veterinary Immunology & Biotechnology (ISVIB), and also has been the life member of many prestigious professional societies namely Indian Dairy Association, Association for promotion of DNA-fingerprinting and Associated Technologies (ADNAT), Indian Association of Veterinary Microbiology & Immunology, Society of Biological Chemist (SBCI).



Dr. Sujit Kumar Dutta
Joint Commissioner (AH), Member
Secretary (CPCSEA) & Secretary (AWBI)

Dr. Sujit Kumar Dutta presently working as Joint Commissioner (AH), Member Secretary (CPCSEA) & Secretary (AWBI) in the Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, New Delhi.

By profession, he is a Veterinarian. He has passed his B.V.Sc. & A.H. degree from faculty of Veterinary Science from Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal. He also did Masters of Veterinary Science (Veterinary Medicine) from Indian Veterinary Research Institute in the year 1990 and passed M.V.Sc. (Veterinary Medicine) in 1992.

After completion of his Master's Degree, he joined in the Veterinary Service in the Animal Resources Development Department, Government of West Bengal. He served as Veterinary Surgeon till 30th May 2007. During the tenure of posting as Veterinary Surgeon, he was involved in Rinder Pest eradication programme, Artificial Insemination with Frozen Semen Technology, Extension Programme, Dairy Cooperative Development, Animal Health control programme.

Dr. Dutta has joined in the Government of India, Department of Animal Husbandry, Dairying and Fisheries on June, 2007 as Assistant Commissioner. He was entrusted with the work of Animal Quarantine and Certification Services, Trade related matters, import, manufacturing and marketing of Veterinary Drugs and Vaccines, Risk Analysis, WTO Matters, Veterinary Council of India, Implementation of Livestock Importation Act, 1898, Indian Veterinary Council Act, 1984.

On 01.01.2012, he was promoted to the post of Deputy Commissioner. He was handling the charges of Livestock Health Division. Again he was promoted to the Post of Joint Commissioner from 01.01.2016. During his posting in the Livestock Health Division, he was handling the matters related to Veterinary Council of India, AQCS related matters, Risk Analysis, Trade Related Matters, Zoning and Compartmentalization, PPR control programme, Brucellosis Control Programme, International Cooperation matters and also Performance Veterinary Services. He was also trained in PVS Evaluation process.



Dr. Gagan Garg
Deputy Commissioner (Trade)
Government of India

Position in Government of India:

Deputy Commissioner (Trade)
Government of India
Ministry of Fisheries, Animal Husbandry and Dairying
Department of Animal Husbandry and Dairying
e-mail: gagan.garg@nic.in

Educational Qualifications:

- Masters in Veterinary Sciences
- Bachelor of Veterinary Sciences & Animal Husbandry
- Post Graduate Diploma in Agricultural Extension Management (PGDAEM)

Professional Experience:

- Regulation of trade in the country for livestock and livestock products including poultry
- Issuance of Sanitary Import Permits for livestock products including poultry & fishery products
- Co-ordination with International Bodies on policy, planning and maintenance of Livestock Health and Trade
- Alignment of Veterinary Health Certificates for mutual trade between the countries
- Bilateral co-operation related to livestock & livestock products
- Policy drafting, planning and implementation of livestock related schemes on all India level
- Clinical veterinarian for more than 11 years.



Mrs. Suneeti Toteja
Scientist-E/Director & Head, Food & Agriculture Department,
Bureau of Indian Standards, New Delhi –110002

Qualifications:

1. B.A.Sc (Bachelor in Applied Sciences) in Food Technology from Delhi University, 1993
2. M. Tech in Dairy Technology from NDRI, Karnal in 1996
3. Post Graduate Dip. in Human Resource Development from IGNOU, Delhi

Work Experience:

(a) Over 17 years' experience in the standards formulation activity of BIS (1999-2013 and 2019 till date) involved in the formulation of National Standards in the area of Processed food products food and agriculture with emphasis on Food Safety, Quality, Nutrition, Sampling, Packaging and Labeling across the food supply chain.

(b) Worked in Management System certification programme of BIS (2014-2016) involved in development of Quality management and Food Safety management systems certification schemes for the industry. This included development of procedures and guidelines for conduct of management system audits of the industry including the food industry.

(1) <u>On deputation as Director in FSSAI (2016-2019)</u>

(a) As in-charge of the FSMS division in FSSAI, coordinated the work for development of sector specific GHP/GMP guidelines for the medium and small food businesses.

(b) Development of third party food safety audit Regulations as a means to increase the oversight on food businesses through conduct of food safety audits by recognized auditing agencies in India.

(c) Development of training framework for food safety supervisors and food handlers across all sectors of food businesses and its implementation pan India through training partners.

APPLICATION OF NUTRIGENOMICS IN LIVESTOCK (RUMINANTS)

Dr. C. Kathirvelan and Dr. S. Banupriya

Over the last decade, advances in the biochemical technologies available for examining functional genomics have provided a number of new molecular tools for evaluating responses to nutritional strategies. These tools are largely based on an understanding of the expression and control of specific genes and gene products and have lead to the development of the sciences associated with nutrigenomics bioactive food compounds can interact with genes affecting transcription factors, protein expression and metabolite production. The study of how genes and gene products interact with dietary chemicals to alter phenotype and conversely, how genes and their products metabolize nutrients is called Nutritional genomics or "Nutrigenomics" (Kaput et al., 2005).

Nutrient gene interaction

- Genes are turned on and off according to metabolic signals that the nucleus receives from internal factors, e.g. hormones, and external factors, e.g. nutrients, which are among the most influential of environmental stimuli.

- Numerous dietary components can alter genetic events, and thereby influence health. In addition to the essential nutrients, such as carbohydrates, amino acids, fatty acids, calcium, zinc, selenium, and vitamin A, C and E, there is a variety of nonessential bioactive components that seem to significantly influence health.

- These essential and nonessential bioactive food components are known to modify a number of cellular processes associated with health and disease prevention, including carcinogen metabolism, hormonal balance, cell signaling, cell cycle control, apoptosis, and angiogenesis. Often bioactive food components will modify several processes simultaneously.

- The complex mixture of natural substances that supplies both energy and building blocks to develop and sustain organism nutrients has variety of biological activity:

- Antioxidants (act as a free radical scavengers)

- Nutritional hormone (potent signaling molecules)

- Phytochemicals (modulator for animal health and production)

- The essential nutrients imbalance of macronutrients in sub optimal level or even toxic concentration of certain feeds may cause many diseases and disorders.

Nutritional genomics in ruminants

- Dietary manipulations and nutritional strategies are key tools for influencing ruminant production.

- Genetic predisposition and nutritional management requires reproductive performance and fertility in dairy cattle.

- This is particularly important during the transition period and early lactation, when the animal is particularly sensitive to nutritional imbalances.

- Nutritional restriction due to intake of poor quality feeds, expression of specific genes associated with protein turnover, cytoskeletal remodeling, and metabolic homeostasis was clearly influenced by diet.

- Many of these changes in expression could be predicted from observed changes in animal growth and physiology during normal nutrient restriction.

- The Entophyte-infected tall fescue on gene expression in luteal tissue of heifers by using rat microarray. Revealed following changes in cell are, Specific differential expression of genes associated with neural functions, Transport function, Cell cycle regulation, Programmed cell death. This clearly indicated that nutrients act on transcriptional level (gene expression) heifers. (Jones et al., 2004)

Application of nutrigenomics in ruminants

Dietary manipulations and nutritional strategies are key tools for influencing ruminant production. Nutrition and genetic make-up strongly influences of the reproductive performance of milch animals. This is important during transition period and early lactation, when animal sensitive to nutritional imbalance. Very scares information on diet on expression of genes related to productive and reproductive performance of the livestock. It may possible to begin to understand the importance of the relationship between individual nutrients and regulation of gene expression. When animal fed with selenium deficiency feeds that cause alteration of protein synthesis at transcriptional level; selenium deficiency adverse effect is enhancement of stress through up regulation of specific genes expression and signalling pathways. Genes controlling protection of oxidative damage, detoxification mechanism these consequences cause alteration of phenotype .The identification of the gene markers related to economically important trait like milk, meat, wool production etc. These traits can be improved by dietary regimens (Kore et al., 2008).

Nutrigenomics in ruminants for improved milk fat

1. Multiple conjugated linoleic acid isomers have been observed to reduce milk fat synthesis in the cow, but most mechanistic research has focused on trans-10, cis-12 conjugated linoleic acid.

2. Diet-induced milk fat depression is a reduction in milk fat caused by specific bioactive fatty acids produced during ruminal biohydrogenation under some dietary conditions.

3. Whole-animal metabolism, including glucose and insulin signalling, are not modified during diet-induced milk fat depression.

4. During milk fat depression, mammary lipid synthesis capacity is decreased due to a coordinated down-regulation of lipid synthesis enzymes.

5. SREBP1 and S14 are down-regulated in mammary tissue during milk fat depression, but their direct interaction with bioactive fatty acids of ruminal bio hydrogenation has not been delineated.

6. Results demonstrate the value of both the dairy cow and mouse as models to investigate the role of bioactive fatty acids in the regulation of milk fat synthesis during lactation.

7. The mechanistic understanding of the regulation of milk fat synthesis gained from investigations of diet-induced milk fat depression has had a substantial impact on dairy management and nutrition strategies.

8. The study of milk fat synthesis and its regulation by unique bioactive fatty acids is one of the most complete and successful examples of nutrigenomics in present-day animal science research (Bauman et al., 2011).

Application of nutrigenomics in ruminant reproduction and fertility

- Reproduction performance in cattle and other species of livestock is based on dietary induced changes in specific genes function.

- It is possible to understand relationship between nutrients and regulation of gene expression.

- Selenium influences the pattern of protein synthesis in mice regulating specific gene expression at transcriptional levels.

- Directly demonstrate the effects of nutritional strategies or diets on the expression of genes related to fertility in either male or female animals, it may be possible to begin to understand the importance of the relationship between individual nutrients and the regulation of gene expression.

- Selenium deficiencies can influence the patterns of protein synthesis in mice by regulating the expression of specific genes at the transcriptional level.

These changes in gene expression can be used outward phenotypic characteristic of selenium deficiencies. Several selenium sources on gene expression intestinal tract of mice using a basic 23,000 element murine microarray. This is revealed in genes influenced by selenium supplementation. 100 of these can be directly associated with reproductive function. Direct effect of dietary selenium on gene expression in key reproductive tissue yet to be examined from these data can be used to identify candidate genes that are clearly regulated by various selenium supplementations.

Conclusion

Nutrigenomics is a rapidly emerging science still in its beginning stages. It is uncertain whether the tools to study protein expression and metabolite production have been developed to the point as to enable efficient and reliable measurements. Nutrigenomics approaches will enhance researchers‟ abilities to maintain animal health, optimize animal performance and improve milk and meat quality. Also once such research has been achieved, it will need to be integrated together in order to produce results and dietary recommendations. All of these technologies are still in the process of development.

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ROLE OF PRE-PRO-POST-BIOTICS IN POULTRY SECTOR

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The gastrointestinal tract, often referred to as "the gut," is a complex system consisting of several components, including the epithelium, the immune arm, and the commensal bacteria. This intricate structure plays a crucial role in the overall health and well-being of animals. Understanding the defence mechanisms of the gut is vital for maintaining optimal gastrointestinal function and preventing the invasion of harmful pathogens. (Kogut et al., 2017)

The gut harbours a complex ecosystem of beneficial bacteria known as the micro biota. The presence of a diverse micro biota helps prevent the colonization of pathogenic bacteria by competitive exclusion and the production of antimicrobial substances.

In light of concerns regarding the development of antibiotic-resistant organisms and their impact on human health, the use of antibiotic growth promoters (AGPs) has been banned in the European Union since January 1, 2006. This ban has spurred efforts to find alternative strategies that provide the benefits associated with AGPs without the associated risks.

Several alternatives to AGPs have been explored, including

Probiotics: Beneficial bacteria such as Lactobacillus, Bacillus, yeast, and Enterococcus are used to restore and maintain a healthy gut microbiota, promoting a balanced gut environment.

Prebiotics: These are non-digestible food components such as MOS (mannan-oligosaccharides), FOS (fructo-oligosaccharides), GOS (galacto-oligosaccharides), XOS (xylo-oligosaccharides), and beta-glucans that selectively stimulate the growth and activity of beneficial bacteria in the gut.

Organic Acids: Short-chain fatty acids (SCFA) and medium-chain fatty acids (MCFA) are organic acids that have antimicrobial properties and contribute to gut health.

Phyto-biotics: These include essential oils, herbs, insoluble fibre, and plant extracts, which possess antimicrobial properties and can modulate the gut microbiota.

Peptides: Certain peptides have been found to have antimicrobial activity and can be used as alternatives to antibiotics.

Postbiotics: These are metabolic by-products produced by probiotic bacteria during fermentation, which have various health benefits and contribute to gut health.

Lysozymes: These enzymes have antimicrobial properties and can be used as natural alternatives to antibiotics.

Bacteriophages: Bacteriophages are viruses that can specifically target and kill bacteria, offering a potential alternative to antibiotics.

By exploring and implementing these alternative strategies, veterinarians and researchers aim to maintain gut health and promote animal well-being without relying on AGPs. These approaches provide promising avenues for the development of sustainable and effective interventions to safeguard the health and integrity of the gastrointestinal tract.

PREBIOTICS

Prebiotics are non-digestible feed ingredients that selectively alter the composition and metabolism of the gut microbiota, providing a health benefit to the

host. According to the International Scientific Association for Probiotics and Prebiotics (ISAPP), prebiotics are defined as substrates that are selectively utilized by host microorganisms, conferring a health benefit on the host (Gibson et al., 2017).

The main mechanism of action for prebiotics is the production of short-chain fatty acids (SCFA), primarily butyrate, propionate, and acetate, through fermentation. SCFAs play a vital role in modulating the gut environment by lowering the pH of the gut lumen and providing energy to epithelial cells. This modulation of the gut environment helps regulate inflammation and metabolic functions (Pourabedin et al., 2015).

Ideal prebiotics possess specific characteristics, including resistance to hydrolysis or absorption by mammalian enzymes or tissues, selective enrichment of beneficial bacteria, resistance to acidic pH, stimulation of the growth of beneficial bacteria in the lower gastrointestinal tract (GIT), and beneficial alterations of the intestinal microbiota and their activities. Furthermore, ideal prebiotics should also have positive effects on the luminal or systemic aspects of the host defence system.

Several prebiotics commonly used in animal nutrition, including in poultry, are:

- Inulin
- Fructo-oligosaccharides (FOS)
- Mannan-oligosaccharides (MOS)
- Galacto-oligosaccharides (GOS)
- Soya-oligosaccharides (SOS)
- Xylo-oligosaccharides (XOS)
- Pyrodextrins
- Iso-malto-oligosaccharides (IMO)
- Lactulose

PROBIOTICS

Probiotics, as defined by the International Scientific Association for Probiotics and Prebiotics (ISAPP), are live microorganisms that, when administered in adequate amounts, confer a health benefit on the host. These beneficial microorganisms can include bacteria, fungi, and yeast. The U.S. National Food Ingredient Association further describes probiotics, also known as direct-fed microbials (DFM), as a source of live microorganisms naturally occurring in the host.

Ideal probiotics possess specific characteristics that enable them to effectively confer health benefits. Firstly, they should originate from the host, ensuring compatibility and minimal risk of adverse reactions. Secondly, probiotics should be non-pathogenic, meaning they do not cause harm to the host. This is crucial for their safe use in various applications. Thirdly, probiotics should be able to withstand processing and storage conditions without losing their viability. This ensures that they remain effective throughout production and distribution. Additionally, probiotics should be able to resist the acidic and bile environments of the digestive system, allowing them to reach the intestine in sufficient numbers to exert their beneficial effects. Adhesion to the epithelium or mucus layer of the intestinal tract is another important characteristic, as it facilitates colonization and persistence of probiotic microorganisms. Furthermore, ideal probiotics should have the ability to produce inhibitory compounds, modulate immune responses, and alter microbial activities to promote a healthy gut environment.

PROBIOTICS IN POULTRY:

Lactobacillus	*Enterococcus*	*Bacillus*	*Yeast*
• L. bulgaricus • L. acidophilus • L. casei • L. helveticus • L. lactis • L. salivarius • L. plantarum	• E. faecium • E. faecalis • Streptococcus thermophilus • Bifidobacterium spp.	• B. subtilis • B. licheniformis • Bacillus coagulant • Clostridium butyricum	• Saccheromyces boulardi

POSTBIOTICS:

Postbiotics represent a fascinating and evolving area of research in the field of microbiology and gut health. The term "postbiotic" is derived from the Greek words "post" and "bios," which signify "after" and "life," respectively (Salminen et al., 2021). It refers to a novel class of microbial-derived products that are distinct from live probiotics and their metabolites.

According to the International Scientific Association for Probiotics and Prebiotics (ISAPP), postbiotics are defined as preparations of inanimate microorganisms and/or their components that provide a health benefit to the host. These preparations may consist of inactive microbial cells, along with their metabolites or cell components, which have been scientifically demonstrated to confer positive effects on the host's well-being.

An essential aspect of postbiotics is their requirement to be derived from well-characterized microorganisms or combinations of microorganisms with known genomic sequences. This ensures a precise understanding of the specific microorganisms involved in the production of postbiotic products. Moreover, the manufacturing process of postbiotics should follow a defined and reproducible technological approach for biomass production and inactivation. These measures ensure consistency, quality, and safety in the development of postbiotic preparations.

The cell wall components and cytoplasmic extracts of Lactobacilli species, including L. acidophilus, L. casei, L. fermentum, L. rhamnosus, Lactobacillus paracasei, Lactobacillus delbrueckii subsp. bulgaricus, Lactobacillus gasseri, L. helveticus, Lactobacillus reuteri, and Lactobacillus johnsonii, have shown highly effective postbiotic properties. L. plantarum strains are common postbiotic producers for poultry. Saccharomyces cerevisiae is a yeast species utilized for postbiotic production through anaerobic fermentation and drying.

Although the study of postbiotics is relatively new, ongoing research aims to unravel their specific mechanisms of action and explore their diverse applications. Postbiotics have demonstrated potential in various areas, including gut health, immune modulation, metabolic disorders, and skin health. As scientists delve deeper into understanding the intricate interactions between microorganisms and their host, postbiotics hold promise as a valuable tool in promoting human and animal health.

In conclusion, postbiotics represent a cutting-edge field of study, encompassing preparations of inanimate microorganisms and their components that provide health benefits to the host. With their well-defined origin, reproducible manufacturing processes, and therapeutic effects, postbiotics offer exciting prospects for the development of innovative interventions to improve health and well-being. Further research and technological advancements in this area will undoubtedly contribute to the growth and utilization of postbiotics in diverse fields of healthcare and beyond.

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PRECISION ANIMAL NUTRITION FOR INCREASING EFFICIENCY AND PRODUCTIVITY OF DAIRY ANIMALS

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Proper feeding is the key to profitable and sustainable dairy farming. Now with growing consumer concerns and advancements in science, sustainability is no longer just a slogan in the environmental movement; it is now the primary focus of progress in our world. Precision agriculture has been known for decades, but precision feeding is a recent notion. Towards fulfilling the objectives of judicious use of feed/ fodder resources to suffice the nutritional requirements of animals and utmost utilization of nutrients, several attempts are being made, one of these is precision feeding.

What is Precision Animal Nutrition?

Precision Animal Nutrition/ Feeding is an environment-friendly concept to promote animal welfare standards for dairy animals. Precision nutrition means feeding dairy animals precisely to meet their nutritional requirements, without wasting precious resources that could be used elsewhere, for optimum production efficiency to produce better quality animal products and to contribute cleaner environment and thereby ensure profitability. The judicious use of available feed resources is necessary for increasing the production efficiency of animals. Further, it is also necessary to ensure that dairy animals receive the required quantity of nutrients (energy, protein, vitamins, minerals & water) from the diet.

How does precision feeding optimize efficiency and profitability?

Generally speaking, precision feeding reduces the inputs required on the farm, which lowers farm overhead and improves profitability. Researchers have reported that cows fed a precision diet produced greater milk yields than those fed a standardized diet. Further, the dietary changes of cows to reduce milk urea nitrogen reduced the nitrogen lost in urine as well as a reduction in feed costs. With precision feeding loss of two compounds viz., methane and nitrogen is reduced drastically, which helps to directly reduce the impact of farming operations on the environment. Instead of slightly overfeeding animals to ensure good growth or production, either in terms of amount or quality of feed, it is necessary to focus on providing dairy animals with exactly what they need. This helps reduce the demand for feed, which in turn allows it to be used to meet other needs.

Ways to Achieve Precision Animal Nutrition

Selection of feed Ingredients

The factors like cost, availability, and nutrient composition should be considered for the selection of feed ingredients for dairy animals. Proper selection of feed ingredients is the key for optimum and cost-effective production.

Feeding a Balanced ration

It is a known fact that besides genetic potential, a balanced ration is equally important to achieve higher productivity in dairy animals. The requisite quantity of balanced ration supplied to dairy animals helps in receiving optimal milk production commensurate with its genetic potential. Research and field trials indicate that this approach of feeding has the potential to increase milk yield, reduce the cost of milk production, and contribute to reducing methane emissions. The imbalanced feeding, which is generally observed in the unorganized/ rural sector, adversely impacts not only the health and productivity of animals but also affects income from milk production since an estimated 65-70

percent of the total cost of milk production is contributed by feed alone.

Nutrient Partitioning

High milk yield in dairy cows is related to their ability to mobilize body energy reserves. Animals of high genetic merit produce more milk, have greater voluntary intakes, and use more of their body reserves in early lactation than those of low merit, therefore the coordinated approach is essential in feeding dairy animals.

Use of TMR feeding

A TMR is a method of feeding cows that combines feeds formulated to a specific nutrient content into a single feed mix comprising of feeds such as forages, grains, protein feeds, minerals, vitamins, and feed additives, and no additional free choice forages are fed. Total mixed rations (TMR) help dairy cows achieve maximum performance and are the most adopted method for feeding high-producing, indoor-housed dairy cows in the world.

Use of Feed Additives

Various feed additives are used to increase the health status, fertility, and performance of animals, and they improve feed efficiency mainly by increasing the digestibility of nutrients. These include antibiotics, organic acids, probiotics, prebiotics, enzymes, and plant extracts (condensed tannins, essential oils, saponins). Further, nutritional interventions suggested to reduce methane losses are also used to improve the performance of dairy animals.

Ammonia treatment of straws

Cereal crop residues that contain lignocellulosic material are mainly fed to livestock under rural conditions. To unlock the energy of these feedstuffs ammonia treatment through urea hydrolysis is a promising method because of the simple technology and low cost involved. The researchers have reported enhanced CP and ME content in treated dry roughage than non-treated roughage.

Suggested management aspects for implementing precision feeding

Some of the management aspects like periodic weighing of heifers, nutritional grouping of animals (based on physiological stage, milk production and BCS), adequate Feed Bunk Space and use of modern technologies in precision feeding of animals should be adopted for implementing precision feeding.

Conclusion

Precision feeding offers sustainable options that will benefit all of humanity and have a bright future for both large-scale and small-scale producers. It can contribute to improving the sustainability of dairy animal production through direct (e.g. reducing N & methane excretion) and indirect (e.g. allowing higher milk yield) actions. This approach has the potential to improve the precision of nutritional management of herbivores to improve productivity, profitability, the efficiency of resource utilization, animal health and welfare, and reduce the environmental footprint and uncertainty of decision making. However, more study is needed on a number of aspects of dairy animal precision feeding, requiring collaboration between experts from various fields, including agronomists, geneticists, nutritionists, engineers, etc., to look for workable and applicable solutions that determine real benefits rather than ephemeral chimeras.

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PROSPECTS OF INDIAN ANIMAL HUSBANDRY SECTOR IN A NEW DECADE

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The World Veterinary Day theme of 2023 significantly indicated the present mandate and strategic drive in veterinary profession namely, "Promoting Diversity, Equity and inclusiveness in Veterinary Profession".

Keeping the above theme and the mandate of Mission Karmayogi, Centre of Excellence for Animal Husbandry, The Animal Husbandry Academy is established at Hessrghatta, Bengaluru by a consortium of 5 organisations, CPDO&TI, CFSPTI, CCBF, AQCS and RFS. This centre, is mandated for capacity building for vets, entrepreneurs, farmers, financial institutions, academia of India along with foreign nationals. Apart from this as a revenue model for sustainability, largescale state of art production centre is strengthened for production and supply of poultry, dairy, fodder, export/import issues.

Indian economy is at a "bright spot" in the globe claiming 5thposition with 3.5 trillion dollar economy. The kind of growth happening in this decade gives optimism for attaining 3rd position after USA and China with 5 – 10 trillion economy by 2030.

Indian Animal Husbandry sector is growing consistently at 8 – 10% year on year compared to agriculture at 4 – 4.5%. The Animal Husbandry sector is contributing about 15 lakh crores to the current GNP of India which is double the Automobile sector (7.5 lakh crores) which many of us may not be appreciating. The dairy sector is contributing about 8 – 10 lakh crores with No.1 status in milk production (210 MMT), poultry contributing 2 lakh crores (3rd in egg production – 120 billion eggs and 5th in Chicken meat production 6 MMTs). The other sectors like small ruminents, pet industry, piggery are stated to contribute 2 – 3 lakh crores.

The theme kept for technical workshop of Indian Association of Women Veterinarians(IAWV) "DigitALL" is very apt for the present context of Indian Animal Husbandry Sector which is adopting technologies like Artificial Intelligence, Machine Learning, Internet of Things and Data Analytics in all spheres of value chain be it backend, core activity or frontend in dairy, poultry, pet industry, sheep&goat, piggery etc.

The veterinary profession is very aspirational which is evidenced by motivational vet Dr. Sanath Muliya who was an internship student at CPDO&TI in 2011 aspired to become wildlife expert which is crude successful by his recent picture as a proud vet to meet Hon'ble PM during Cheetah rehabilitation at Kuno National Park in 2022. He is rated as one of the best wildlife expert in the world.

Indian Dairy Sector:

Indian Dairy Sector is predominantly a livelihood profession for about 10 crore (100 million) rural households dependant solely on dairying for milk production and their livelihood. India produces 23% of the global milk production. Indian dairy sector is predominantly dominated by cooperative sector, few listed companies and young startups in dairy.

Amul which is formed by three cooperative setup namely Banas Dairy cooperative, which is the largest dairy in Asia with 50 lakh litres of collection in a day, Mehsana Dairy cooperative and Kaira dairy cooperative forming Amul having recent capacity of collection per day being in excess of 2 crore litres per day.

The turnover of Indian dairy cooperatives is a success story for the world. Recent turnover as on 2022 is Amul (Gujarat) – 52,000 crore, Nandini (Karnataka) – 17,000 crores, Mother Dairy(Delhi) – 11,000 crore, Aavin(Tamilnadu) – 6,000 crore, Milma(Kerala) – 4,300 crore followed by Vijay Dairy(Telangana) – 1,000 crore.

Indian Dairy companies is lead by Nestle India(Swiss company) – 16,790 crores, Hatsun Dairy(Tamilnadu) – 6,400 crore, Heritage Dairy(Andhra Pradesh)- 2,600 crore, Dodla Dairy(AP/TS) – 2096 crores, Tirumala Dairy(AP/TS) – 1,700 crore, Prabhat Dairy(Maharashtra)-1,554 crore.

Dairy sector is driven by young tech professionals disrupting the ecosystem and challenging the traditional thought process in marketing. Dairy startup ecosystem is lead by Country Delight(2015), Stellapps(2011), Milk Mantra(2009), Milk Basket(2015), Purish Dairy(2019), Whyte Farms(2015).

Indian Desi Milk startups are mushrooming in India. These are lead by Akshyakalpa, Happy Milk, Milk India company, Matratva Dairy, Kilmom Dairy to name a few.

Indian Animal Husbandry sector is further strengthened by new business models in Sheep and Goat farming, Piggery, Pet industry which are promising as a great opportunity for Indian Vets and as a country as a whole.

Poultry Sector in India:

Poultry Farming in India is a techno commercial sector producing Animal Protein for the nation. The current status of poultry sector is estimated to contribute Rs. 1.65 lakh crores to the GNP. The Broiler production stands at 11 million broilers per day and 260 million eggs per day. The poultry protein from egg and meat is considered as of superior quality because of good profile of Amino Acids.

The consumption pattern of poultry products is more limited to metros and cities wherein the per capita availability is almost double the national average. This is because of consumer trends in cities namely higher purchasing power, more awareness about protein requirements, access and availability etc.

The main drivers of poultry sector for an average annual growth of 8 to 10 per cent in broilers and 4 to 5 percent in layers are adaptation of improved genetic stocks, technology and role of large poultry companies. Poultry farming is considered to be short lifecycle (6 weeks broilers) farming with highly sophisticated production systems and biosecurity of highest standard.

Indian Economy and climate Change

Indian economy is growing at a phenomenal pace at an average GDP growth of 7 to 8 percent year on year. India surpassed United Kingdom to claim 5th position in global economic states with 3.2 trillion economy. The country has set a “Digital first” initiative to the globe with Adhar (Unique Identification of Citizens) being registered by 1.31 billion citizens of India. The initiative of UPI (Unified Payment Interface) a Digital highway to connect online payment options by just scanning within seconds. The transactions of UPI during Aug 2022 was 6 billion per month valued at 10.65 Lakh cr. This is the great example for world to follow. The introduction of E-toll is a great initiative to transform the speed of transportation in India. The monthly collection of E-Toll is at rupees 3000 cr. as on date. The other market initiative to democratize E-commerce is introduction of ONDC (Online Digital E-Commerce) by which any seller and buyer can register for their needs.

Considering the above facts of India and Poultry Sector, the important consideration to be factored to the future strategies in poultry is climate change. Globe is noticing unprecedented wild fires, floods, drought, excess rainfall etc., challenging the sustainability of humanity as a race.

Animal Husbandry sector contributes nearly 15 lak cr., to the agricultural GDP which is around 40 to 45 lack cr that is 30 percent of agriculture GDP. The dairy sector dominates by contributing around 10 to 11 lakh cr., and 3 to 4 lack cr., is by small ruminant and other species. The poultry sector contributes about 1.6 lakh cr., which is equivalent to Tata Consultancy services (TCS) recent top line. Poultry

sector employs about 6 million people whereas TCS employees about only 6 lakh people.

Human protein requirement:

The eating habits of Indians underwent a drastic change in the recent times by more consumption of carbohydrates only. An individual can postpone eating carbohydrates, fat and even water however the protein need to be consumed everyday at least 1gm per kilo body weight of the person. Protein can't be stored in the body hence, it need to be consumed daily.

The egg and chicken are an ideal capsules of protein by providing 12gm for every 100gm of eggs and 20gm of protein for every 100gm of chicken. The good saying for that in Hindi is "Dhawa math khao Anda khao" "Har roz dho Anda hafthe mey theen bar murgi" are the simple mantras to achieve at least 50 percent requirement of protein.

Market factors: The Market of poultry products has been mostly 90 percent live, 7 percent processed and 3 percent ready to eat products. Similarly in the egg sales 95 percent as table eggs in the retail shops, branded eggs with 3-4 per cent market and 1 percent as processed egg market.

The introduction of digitalization and focus on safe and hygienic factors is driving the preference of consumers for branded and online marketing. Consumer is expecting traceability and safety certifications. These will throw up new players to emerge in the market.

The startup world has produced unicorns and soonicorns in the sector encouraging tech and fintech entrepreneurs to the sector. However many home grown players like Venky's, Suguna, Indian Broiler, Sneha, Shanthi etc., have proved various models can be successful in the value chain.

The greatest example to quote a success story is Life line group, Chickmagaluru established by Mr.Kishore Hegde a futuristic perfectionist in the sector. It is illustrated by their certifications obtained for Quality Management System (ISO 9001-2015), Environmental Certification (ISO 14001-2015), Health & Safety Standard Certification (ISO 45001-2018), Export Inspection Council Approval Certificate, Food Safety System Certifications (ISO 22000, ISO 22002, FSSC 22000) and FSSAI 5 star Hygiene Rating. The Life line group committed for quality and concept of "Athma Nirbhar Bhart" as a role model in the sector.

The niche sector and the emerging sector of diversified poultry namely, desi or coloured chicken production, ducks, turkey, quail is also contributing for the choices of consumer.

Key challenges or concerns:

- Over depending corn/maize for poultry – Presently India is facing a crisis of Maize availability due to failure of monsoon reducing the availability to less than 80 percent of the requirement. The other challenge is from demand for Ethanol which drives further stress on Maize availability for poultry.

- Environmental issues – Poultry farms have to address issues of smell, dead bird disposal, fly menace and water contamination impacting the surrounding environment.

- Land and Water – Even though non arable land is used for poultry, it has been a challenge to meet the growing demand of poultry expansion to provide the requisite resources.

- Unstable prices of poultry products – India is considered as country of many countries with various religious festivals spread across the nation differently in different states. The variation of temperatures, examination schedules, floods, rails etc poses a great challenge in maintaining consistency of prices. The supply and demand mismatch occurs consistently due to above reasons making retail prices being unstable.

- Issue of Anitbiotic residues and misconception about use of hormones, steroids etc.

- Diseases like Avian Flu.

Road map for sustainable production:

- Government policy of integrating agriculture vertical (Maize and Soya mission) exclusively

for poultry production.

- Incentivizing agriculture input producers for poultry.
- Encouraging conservation of water and energy through rain water harvesting and solar energy production in poultry farms which are naturally positioned east-west directions with large surface area.
- Standardizing energy production from poultry litter (litter can be converted to biogas) to meet the energy requirements.
- Protocols to be developed for solid and water waste management and bio security audit.
- Consumer education to ward off the fears of food safety and hygiene by introduction of standard production practices and certification.
- Encouraging small/rural poultry in cluster model in rural villages with establishment of FPOs (Farmer Producing Organisations) integrating entire value chain from production to marketing.
- Inclusion of poultry products in National Mission for Protein Supplements (NMPS) – Like as in introduction of eggs in Midday meal scheme, ICDS etc.

Concluding, introduction of poultry products as staple dietary habit in India can address protein deficiency to a larger extent for children. This would pave way for changing carbohydrate centric food habits to focus on protein centric food habits as in developed countries.

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Modern Dairy



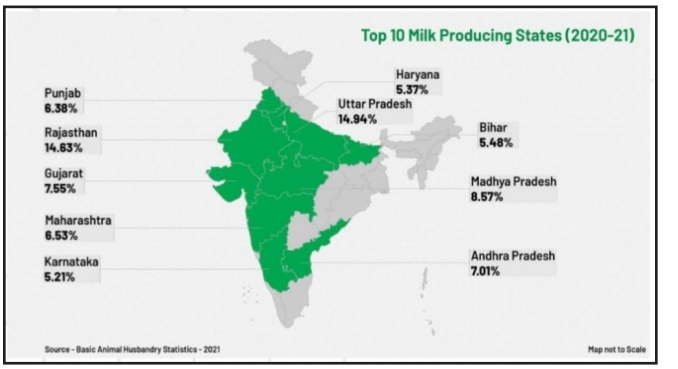
Desi Cows



Modern Sheep unit



Modern Piggery



Top 10 Milk Producing States



Ideal Broiler Farm



Ideal Layer Farm



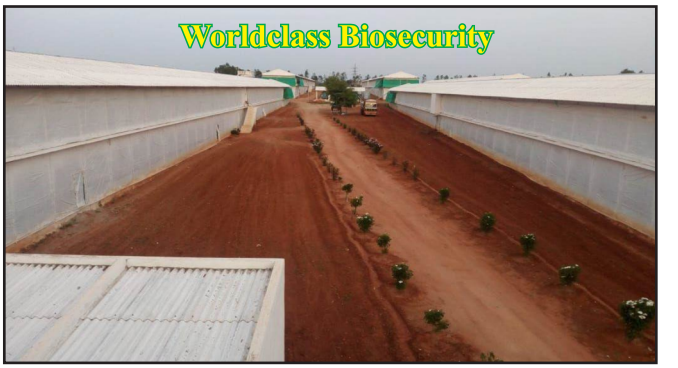
Automated Broiler Farm



Automated Layer Farm



Greenfield Turnkey Project



World-class Bio security



Dust free Feed Mill



Megh Silo (15000 MT-Maize)



An Ideal Chicken shop



Protein Stores



Chicken Shop Adjacent to Jewellery shop



Modern Egg Factory

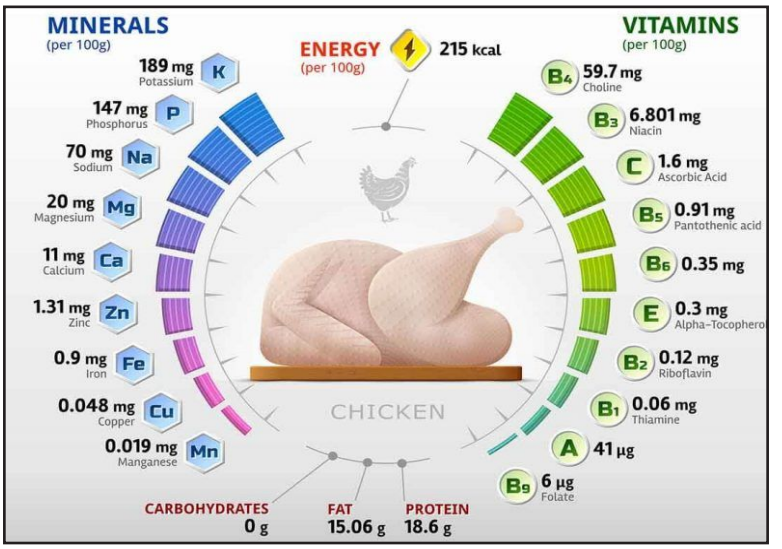


Table – 1 Nutrient composition of chicken meat (Ref: www.pinterest.com)

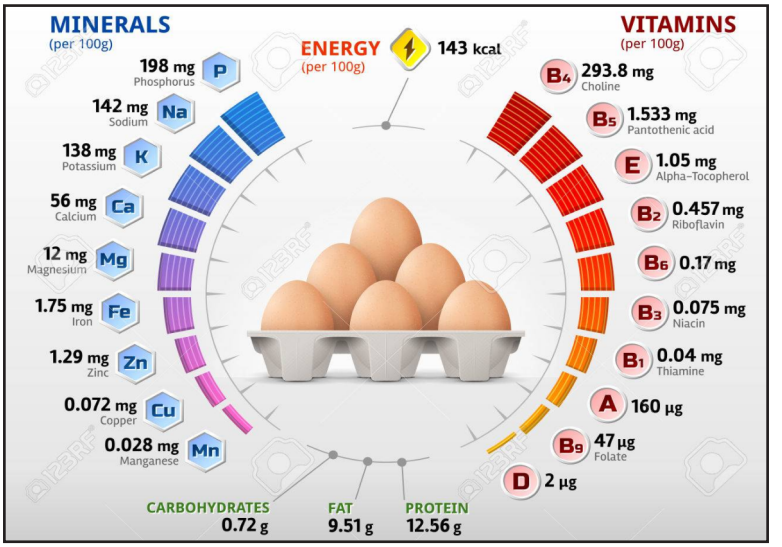


Table – 1 Nutrient composition of Chicken Eggs (Ref: www.pinterest.com)

IMPROVING ANIMAL FEED AVAILABILITY TO INCREASE PRODUCTION IN ORDER TO FULFILL FUTURE PROTEIN DEMAND

Rashmi Kumari[1], Dinesh Kumar[2*], N. Upadhyay[3], P. K. Yadav[4] and Brishketu Kumar[5]

Production of crops and livestock has been a crucial aspect of human existence since the dawn of civilisation. In a mixed agricultural setting, both production activities are complementary to one another since byproducts from one become inputs for the development of the other, and both are essential for overall food security and ecological balance. In India, agriculture and animal husbandry are intertwined economically, culturally, and religiously with the complex social fabric. In contrast, in the western culture, animals are simply seen as a component of the food chain, and the relationship is solely commercial. Animal husbandry also provides work for a significant portion of the population (70 million rural families) and accounts for about 4.9% of the GDP.

The National Statistics Office (NSO) has estimated that during the financial year 2020–21, the gross value added (GVA) of the livestock sector will be around Rs. 1114249 crores at current prices, which represents approximately 33.87% of the GVA of the agricultural and allied sectors and 6.17% of the overall GVA (Anonymous, 2022). The GVA of the cattle sector is expected to be approximately Rs. 617117 crores during the fiscal year 2020–21, representing a positive rise of 6.13% over the prior fiscal year, at constant prices (2011–12). In fact, the cattle industry is essential to helping rural populations maintain a basic standard of living. When compared to paddy and wheat, the milk group has a higher value. In hilly, dry, and semi-arid regions, this sector is a major source of family income. Moreover, livestock imparts resilience to Indian agriculture, as its output does not show year-to-year fluctuations. Livestock has been an important source of livelihood particularly for small farmers, contributing about 16% to their income, more so in states like Gujarat (24.4%), Haryana (24.2%), Punjab (20.2%) and Bihar (18.7%). Fodder development programme is the backbone of animal husbandry and livestock development in the country. Thanks to our rich genetic diversity, institutional infrastructure, competent human resource and policy support for linking small holder farmers to markets that have enabled us to witness 'White Revolution' in the country. India produces more than 222 million tonnes of milk annually, making it the world's largest milk producer today. However, due to the low performance and productivity of cattle, animal husbandry remains, for the most part, a resource-constrained industry. This is not a joyful condition for a nation where the bulk of rural residents rely heavily on animal husbandry for their subsistence. Making animal husbandry an economically feasible, environmentally friendly, and sustainable farming practice that can improve our nation's overall economy is in demand today. According to the most recent official livestock census in 2019, India has the most livestock in the world, with current inventories exceeding 536 million heads.

Livestock rearing offers unique opportunity for growth as the shifts in diet already under way and likely to continue as incomes increase. The human population in India is expected to reach over 1,400 million by 2025. The 27.8% urban population is poised to increase by over 58% by 2025. Urbanization has brought a marked shift in the lifestyle of people in feeding habits towards milk products and meat with resultant increase in demand of livestock products. But there is a huge pressure on available land, as most of which is used for arable farming and food production. The pressure is again bound to increase in future and as a result the land available for forage production will decrease. In future, production will increasingly be affected by competition for natural resources, particularly land and water, competition between

food and forages and by the need to operate in a carbon-constrained economy. Thus, the need of the hour is efficient management of land resources available for forage production. Around 75 per cent of cattle population is concentrated in rainfed areas where the access to feed, fodder and drinking water is becoming increasingly scarce. The fodder base is also not strong due to problems in pasture management and shrinking of common properties. Innovations in institutional aspects of pasture protection and management, and its sharing is required.

Rising the availability of fodder

The country has a wide range of information regarding the resources for fodder. The amount of forage produced and how it is used are influenced by a number of variables, including the cropping pattern, the climate, the socioeconomic environment, and the type of animals raised (Roy and Singh, 2008). Crop waste, produced fodder, and forages from common property resources including woods, permanent pastures, and grazing lands are the three main sources of forage supplies. The country currently (2022) has a net shortfall of about 28% green forage and 10% dry forages, which causes a shortage of energy and protein (CP) in the food supply. In fact, the availability of fodder in adequate quantity and quality is one of the key inputs for better growth of livestock sector, but development of this sector has not received the required level of attention in the past. It has been observed that the 60-70% of total cost in livestock production is due to feed resources. Hence, any attempt towards enhancing availability of feed resources and economizing the feed cost would result in better remuneration to livestock farmers/producers.

Area, location, and season specificity are typical for forage crops. These are grown on marginal and degraded fields with the least amount of water, energy, and fertilizer input. Since it is not feasible to transport forages across great distances, regional and seasonal shortfalls are more significant than national deficiencies in the case of forages. According to estimates, just 12 of the country's 55 micro regions have an abundance of fodder, while the rest 43 suffer from a lack of one or more types of feed supplies.

Professional utilization of available land resources

With only 2.3% of the global landmass, India is home to nearly 18% of all livestock, placing tremendous strain on the planet's arable land. The strain on land for agricultural and non-agricultural activities is slowly reducing the amount of grazing land in rural India. Only 4% of the cropping land is dedicated to the cultivation of fodder, and this percentage has been constant over the past few decades.

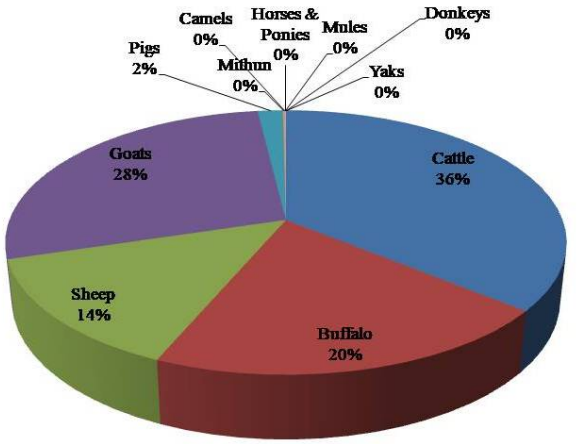


Fig 1. 20th Livestock population - 535.78

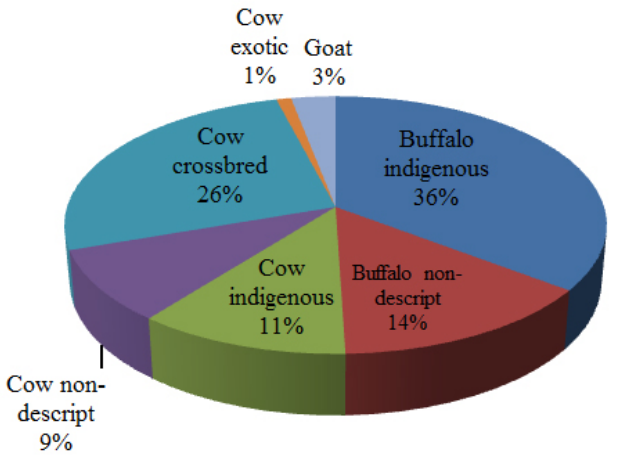


Fig 2. Current Milk Contribution (%)

Table 1. Demand and supply estimates of dry and green forages (IGFRI Vision 2050 Document)

Year	Demand (million tons)		Supply (million tons)		Deficit (%)	
	Dry	Green	Dry	Green	Dry	Green
2022	537.1	861.9	481.3	617.0	10.38	28.41
2025	549.3	881.5	483.8	638.9	11.92	27.52
2030	568.1	911.7	500.0	667.7	11.98	26.76
2040	594.9	954.8	524.4	761.7	11.86	20.22

Therefore, it is imperative to adopt the practise of using land for diverse crops in a sustainable way. The availability of pasture for the animals can be significantly increased by using silvi-pastoral and horti-pastoral models appropriate to the region. Forest Management Committees, the horti-pastoral activities can be initiated by incentivizing the farmers who are owners of the orchards.

Table 2. Throughout Year Fodder Production for Animals in different geographical area

Name	Varietie Single-cut Multi-cut	Soil	Seed Rate	Harvesting	Yield (Single-cut) (Multi-cut)
Sorghum/ Jowar/ Mower	PC-6,9, HC-136,308 C-10-2 (chasstio) S-1049 (sundhlu) Pioneer hybrid (X-988); MP. Chari, Pant chari-6, SSG-59-3, 988, CSH 24MF, 20MF Seed tree-1000	Well drained Sandy loam to black	Improved varieties Single & Multi cut- 25-30 kg/ ha	80-90 for late varieties and 65-57 for early ones First cut 55-60 days & subsequent after 40-45 days	30-50 tonne/ha 70-90 tonne/ha 100 tonne/ha (4-5 cut)
Bajara	HB-3&4 (Hybrid Bajra), PHB-10,12, 14 (Punjab); MB-72, K-559, AP complex, IC 2291-54 (ICAR), K-559	Sensitive to water logging. Best sandy loam	08-10 kg/ha	First cut 55-60 days & subsequent after 40-45 days	15-20 tonne/ha
Maize	Ganga Safed-2, Ganga-5, J-1006, Pratap, Makka Chari-6 African tall, Vikram, Vijay composite, HC-136	Well drained Sandy Loamy soil	60-80 kg/ ha	First 75-80 days (milking stage)	40-50 tonne/ha (Kharif) 60-70 tonne/ha (Winter)
Oat/ Ganer/ Ganerji/ Jai	OS-6, OS-7, Kent/ UPO-94, 212, PO-3, Bundel Jai 2004, Harita (RO-19)	Well drained Sandy-Loam to loam	80-100 kg/ha	60-70 days 1st cut, 2nd cut at 50% flowering 1-2 cut/yr	30-45 tonne/ha (Single-cut) 50-60 tonne/ha (Multi-cut)
Lucerne	Sirsa-9 (T-9), Katcchi (Taller Lucerne), GAUL-1 (Anand-2), GAUL-2 (SS-624), RL-88, Anand-3 (Cold & dry North area)	Well drained Sandy-loamy pH-7.5-8.0	20 kg/ha Rhizobium meliloti (1-1.25kg/ha)	60 days after sowing, 25-30 days after 1st cut, Annual-6 cut	60-80 t/ha 80-110 t/ha
Berseem	Mescavi, Pusa Giant, IGFRI-S-99-1, Jawaher-1, Chhindwara-561, Wardan, BL-1, 10, 42	All soil except light sandy soil, Oct-Nov	25-30 kg/ha For late sown 35 kg/ha	First cut-50-55d, Subsequent 25-35 days intervals	80-110 tonne/ha
Cowpea	GFC-1, GFC-2, GFC-3, GFC-4, **EC-4216** UPC 618, UPC 625, UPC 622	Sandy to loam pH- 5-6.5	30-35 kg/ha	70-75 days (50%flowering) Initiation of pod formation	27.5-30 tonne/ha (Single-cut) GFC-3-35 t/ha

Guar/ Cluster bean	Durgapur Safed-25, Giant Guar- IGFRI Sel-1 & 2; Anand Sel- HFG-2, 156, 277, 313 & 444, Bundel Guar-1,2,3	Sandy to sandy loan	25-30 kg/ha	60-75DAS	15-20 tonne/ha for grain, Fodder- 20-30 t/ha
Hybrid Napier (Napier× Bajra)	NB-21, CO-1, 3, 4 (Coimbatore), APBN-1 (AP), PBN - 233 BNH- 10, APBN – 1, IGFRI- 10 Phule Jayawant	Sandy- loam to clay loam, Medium black	Tussocks/ Rooted slips, Distance Bet. 0.6X0.6m= 20000/ha	90 days after planting 45-60 days in rooted slips 7-8 cuts	200-300 tonne/ha 150-200-1styr 150-2ndyr 100-3rd yr
Marvel / Charodi grass	Gujarat Marvel Grass-1	Sandy to sandy loam black soil	For one hectare 1,60000-2,50000 rooted slips	First cut 90-105 days, Rooted slips 60-75 days, 40-45days after next cut	60-80 q/ha Dry farming area, 100-120 q/ha heavy rainfall 150-200 q/ha irrigated area
Shevry	Perennial leguminous, Fodder tree, Extremely fast growth rate, multi-cut tree		10-15kg/ha	75-90 days & 60 days interval	150-200 q/ha
Sunflower (Helianthus annus)- Gujarat sunflower-1, Emergency fodder crop-EC- 684, Seed rate-40kg/ha, Yield-20-25t/ha					
Subabul (Leucaena leucocephala)- draught resistant, hardy, perennial green tree. Soil: Sandy to loam, calcareous soil, pH-5-8 Varieties: K-341, Cunningham, Hawaiangaint, Salvadar type. Contain **Mimosine** as toxin					

Adoption of fruitful forages and species for various locales

There are 8.5 million acres of feed crops planted, and a variety of fodder crops and species are grown throughout the nation. Forage crops come in a wide variety of types and locales, as well as throughout various growing seasons. We have a sizable basket of cultivated feed cereals, legumes, and range legumes. Forage types with tolerance in drought/water shortage settings hold promise and can integrate well in existing farming systems, despite fierce competition from food and other commercial crops. In ideal growing regions, these types can be adopted and marketed quite successfully.

Choosing appropriate crop combinations

Crop rotation and the use of the right crop combinations are two ways to maximize the productivity potential of most lands. Overlapping cropping systems that grow compatible mixtures of suitable perennial and annual forage species have previously been developed to enable year-round fodder production. With the use of these technologies, major dairy farmers and small farmers with tiny plots of land may both obtain a consistent supply of green forage throughout the year to suit their needs. Multiple crop sequences with three or four high yielding forage crops that are cultivated on a specific plot of land throughout the course of a year have also been identified under assured irrigation. The crop sequences are tailored for achieving high yields of green nutritious forage as well as maintenance soil fertility. These systems assure regular supply of green forage when staggered sowing and harvesting schedules are followed. These technologies are specially designed for adopting in milk-shed areas.

Forage productions from arable fields all year long

The approach should concentrate on boosting forage output per unit area and promoting forage production in systems that combine mixed crop and livestock production. It is important to stimulate the development of fodder production systems for irrigated and rainfed environments in order to provide year-round fodder supplies. Under irrigated situations, hybrid napier based cropping system (hybrid napier + (cowpea - berseem + mustard) has green fodder production potential of 273 t/ha and dry fodder potential of 44.3 t/ha per year (water requirement 1090 mm). It can supply round the year good quality fodder (cereal: legume, 67:33) which can sustain 8-10 ACU per ha (1 ACU= 350 kg body weight). The system is suitable for large scale dairy farmers in peri-urban and milk

shed areas of whole India except tropical region. Similarly, under rainfed situation, the system comprising of subabul + trispecific hybrid - fodder sorghum + pigeon pea is suitable. It has green fodder production potential of 53.3 t/ha and 13.28t dry fodder. It can sustain 3-4 ACUs with quality fodder. It also provides nutrient rich pulse for human consumption and fuel wood. It is also capable of prolonging the fodder availability up to the month of May (dry period). The system is suitable for small and medium farmers of semi-arid region (upto 500 mm rainfalls).

Restoration and development of wastelands and grasslands

In order to improve productivity, degraded grasslands must be restored, especially in hilly, semiarid, and arid locations. Participatory action should also be done to use wastelands, with a focus on range grasses and legumes. Since the possibility of expanding the area of forage production on cultivated lands is remote, concerted efforts must be made to make the most of the grazing resources that are currently available, including the wastelands next to roads and railway tracks, which must be managed and used for livestock grazing. Overgrazing is usually considered as the major cause of grassland degradation/ deterioration. There are a number of proven management options to improve grassland productivity including its quality. Different grass/legume species can also be cultivated or introduced on specified lands like forest lands, permanent pastures and other grazing areas.

Unconventional foraging methods or foraging from fresh habitats

Under various management scenarios, there are a number of non-traditional feed/fodder supplies that can complement the ruminants' current supply of green forage. Azolla (humid and sub-humid conditions), turnips and fodder beets (intensive management system), and cactus (semi-arid and arid conditions) should all be evaluated for their inclusion and efficient utilisation in livestock diets as part of efforts to improve the basket of feed resources. Azolla is incredibly productive and can grow twice as big in a week. Each pond hectare, it may generate 9 tonnes of protein each year. It has high crude protein content (18–20%) and may be used as a feed component for cattle. Fresh azolla are usually mixed with other feeds in 1:1 ratio and fed to dairy cattle, sheep and goats.

Fodder beet (Beta vulgaris) has also the potential to become a good forage crop for livestock due to their drought tolerance, excellent root-keeping qualities, high sugar content, good leaf fodder characteristics, high nutritive value, and large yields (95.6 t) per hectare compared to other forage crops. However, fodder beets do not form a complete diet (act more like a concentrate). If fodder beets are fed with grass hay, it is necessary to supplement the ration with a high protein additive such as bran or oil seed cakes. In general fodder beets are sliced or shred to prevent animals from choking on large pieces, and mix with green fodder or concentrate feeds for feeding. While cactus is a succulent plant well adapted to extreme drought conditions. It grows in areas having 200-250 mm/year of rainfall and

Table 3. Grazing resources in India (ICAR, 2009)

Resources	Area (million ha)	Percentage
Forests	69.41	22.70
Permanent pastures, grazing lands	10.90	3.60
Cultivable wasteland	13.66	4.50
Fallow land	24.99	8.10
Fallow land other than current fallows	10.19	3.30
Barren uncultivable wastelands	19.26	6.30
Total common property resources other than forests	54.01	17.70

tolerates high temperature, and can thrive where common forage species cannot grow. Usually, the yields vary between 30 and 100 tons of fresh cladodes and 2 and 20 tons of fruits per hectare per year. Thus, one hectare can produce a consumable biomass yield that exceeds those of many common forage species when cultivated in semi-arid and arid regions. Cactus cladodes are mostly fed fresh to cows, sheep, goats and dromedaries.

Hydroponic fodder production

In hydroponics there is 98% less consumption of water than conventional method and the used water is recycled. Hydroponics fodder is more nutritious than conventional green fodder. In the situations where fodders cannot be grown farmers can produce hydroponics green fodder for their animals. The locally assembled/fabricated hydroponics has low initial cost (4-5 lakh) and operational cost (approx Rs. 2/kg green fodder) which supplies fodder 7-8 months/ year. This is suitable for hot and humid regions. In comparison to conventional green fodders, hydroponics green fodders contained more crude protein (13.6 vs 10.7 %) and less crude fibre (14.1 vs 25.9%). In take of hydroponics green fodder by dairy animals was up to 24 kg/animal/day.

Silage from surplus fodder

Silage is the fodder which is conserved by reducing pH through natural anaerobic fermentation and used for feeding during scarcity period, drought or floods and a means of utilizing surplus forage. The suitable crops are sorghum, maize and oat etc. During lean period, feeding of silage acts as a green fodder and maintains livestock productivity. In general two lean periods are encountered when it can be fed. These include November-December and April-June (2+3 = 5 months). All areas (sorghum and maize growing states & in rabi season, oat growing states) where farmers face problem in providing round the year fodder to the animals, surplus fodder can be preserved as silage. Indeed, it can sustain/increase the livestock production by 10-15% during scarcity of green fodder and suitable for all categories of farmers, having excess fodder over daily need.

Judicious use of crop leftovers that is already available in field condition

After the harvest of the grains, agricultural remnants like straws and stumps are burned in several regions of the nation. In addition to polluting the environment, this has a negative influence on the supply of fodder for the cattle. In order to prevent crop leftovers from being burned in fields, policy directives must be established and strictly enforced across the nation. Similar to this, it's important to monitor the diversion of edible crop waste to the packaging business and biofuel production. Installing low-capacity fodder block manufacturing machines at each main milk cooperative/panchayat level may also increase the availability of dry fodder. There are now equipment that can make fodder blocks that can be installed to a tractor and used in the fields to store extra or dry feed.

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HEALTH BENEFITS OF GOAT MILK

Jui Lodh, D. C. Sen and Priti Saha

Introduction

Goats were considered to be the first domesticated farm animals about 10,000 years ago in the area of Mesopotamia or today's Middle East (Haenlein, 2007). Till then goat farming had a strong influence on people's lives in several ways. Presently, in Middle East, dairy goat farming is the most important component of agricultural systems and also in controlling the national economy of the countries. Goat farming has many advantages over the large animal farming like lower cost of the animals, utilization of household wastes as goat feed, the need for less feed and water, not requiring specialized housing, etc. Due to all these reasons, goat is considered as the "poor man's cow" and plays a notable role in providing supplementary income and livelihood to millions of poor farmers and landless labours of rural India.

The 94% of total world population of goat is found in the developing countries, notably in India, Pakistan and China. In India, 16% of total goat population is found in Rajasthan. Different varieties of breeds are available for meat, milk, fiber and skins. Out of total 351 goat breeds, Asia has about 146 of these indigenous breeds. There are four major dairy breeds available in India i.e., Jakhrana, Jamunapari, Beetal and Surti. Dual purpose breeds like Sirohi, Barbari, Kutchi, Mesana, Marwari, Zalawadi, Osmanabadi and Malabari also have huge potential to be developed as dairy goat. Among all, Jamunapari is giving highest milk yield followed by Beetal and Kutchi.

Goat milk shares about 4% of world milk production after cow milk and buffalo milk (FAOSTAT, 2022). The global goat milk products market is expected to grow from $11.88 billion in 2022 to $12.61 billion in 2023 at a compound annual growth rate (CAGR) of 6.2% and anticipated to reach $15.61 billion in 2027 at a CAGR of 5.5% (Anonnymous, 2023). The increasing demand for goat milk in infant food and follow-on formula are act as the driving force behind the growth in global market. Throughout the world, India is the largest producer of goat milk and accounts for approximately one-fourth of the global production. Europe is the second-largest market where Germany, Italy, and France are the major contributors. Germany is the largest importer and exporter of goat milk in the world whereas Italy is the largest consumer of goat milk.

A large amount of goat milk usually used for domestic consumption. Day by day, there has been an increased interest in the utilization of goat milk and goat milk products throughout the world due to its high nutritional value and health benefits. Owing to its favorable composition, goat milk is used for infant feeding, treatment of malnutrition, treating people suffering with cow milk allergies and gastro-intestinal disorders, etc. Moreover, the presence of special functional components, sometimes it is used for the treatment of disease like dengue.

Chemical Composition of Goat Milk

The chemical composition of goat milk is almost similar to the cow milk. The goat milk contains 13.2% total solids, 4.5% fat, 3.6% protein, 4.3% lactose, and 0.8% minerals. Table 1 shows the compositional differences among the various milking animals including human revealed that total solids, fat, total protein and minerals contents are higher in goat milk whereas lactose is less than cow and human milk. Though the gross composition of milk, irrespective of the species, varies with breed, age, environmental conditions, lactation period, health status of udder, feeding, milking period, and time.

Table: 1 Composition of Milk from Various Species

Constituents	Goat	Human	Cow	Buffalo
Food energy (Kcal/100ml)	69	70	61	102
Total solids (g/100g)	13.2	12.4	12.6	17.24
Fat (g/100g)	4.5	3.8	3.7	7.38
Total protein (g/100g)	3.6	1.0	3.4	3.60
Lactose (g/100g)	4.3	7.0	4.7	5.48
Minerals (g/100g)	0.8	0.2	0.7	0.78

(Kapadiya et al., 2016)

Lipids of Goat Milk

Milk Lipids are one of the most vital components of goat milk which influence the cost, nutritional value, physical and sensory characteristics of dairy products. The quality of fat depends on the structure of fat globules and composition of milk fat. The average fat globule size in goat milk is approximately 2.76 µm which is much smaller than cow and buffalo milk fat globules. Due to smaller size, goat milk is easily digestible in humans gut and efficiently metabolized within the system. It also contains lesser amount of agglutinin compared to the milk of other species. Small fat globule size along with lesser amount of agglutinin create some technological difficulties like reduce creaming ability especially at lower temperature.

Goat milk is enriched with short and medium chain fatty acids (FAs), such as caproic (C6:0), caprylic (C8:0), capric (C10:0), and lauric (C12:0) acids. The short chain FAs represent 15% – 18% of goat milk. FAs and largely responsible for the characteristic "goaty" odour. During digestion, lipase enzyme can be more effective on short and medium chain fatty acids than long chains and made goat milk easily digestible and well absorbed during metabolism. The essential fatty acids contents specially the positional and geometric isomers of linoleic acid, arachidonic acids are higher in goat milk than the other milk. The CLA content in goat milk is 35.75mg/100g while in cow milk, it is 15.62mg/100g. Numerous scientific evidences suggested that CLAs have several health beneficial effects such as antioxidant, antiinflammatory, anticarcinogenic, antiadipogenic, antidiabetic, antihypertensive, antiatherogenic, antiobesity, immunomodulatory, growth promoting activities, etc (Haenlein, 2004). Apart from these, goat milk also has cholesterol metabolism and malabsorption syndromes (Park and Haenlein, 2006). Goat milk fat is high in medium chain triglycerides (MCTs), mainly with 6 – 10 carbons chain FAs. The MCT and the long chain triglyceride (LCT) content in goat are 30.83% and 53.95%, respectively (Ruiz-Sala et al., 1996). Higher amount of MCT, made the goat milk readily metabolized within the body for energy production as compared to LCTs (Papamandjaris et al., 1998). Therefore, the goat milk has a promising effect on providing energy especially for growing children (Haenlein, 2004; Park and Haenlein, 2006).

Proteins of Goat Milk

The main protein fractions in goat milk are almost similar to that of human, cow, and sheep milk (Amigo and Fontecha, 2011). Protein content of milk varies on several factors like species, breed, lactation period, feeding, udder health status, and environmental conditions (Kondyli et al., 2012). The total protein and nonprotein nitrogen content of goat milk is higher and casein nitrogen content is lesser than that of cow milk (Guo, 2003). Owing to higher buffering capacity (BC), goat milk is used

for the treatment of ulcers (Park, 1992). The casein micelles size in goat milk is less than 80 nm in diameter (Guo, 2003). Due to smaller size, it is easy to digest than that of cow milk proteins (Yang lar, 2013). Scientific evidences revealed that goat can be used by the people who have been suffering from cow milk allergy (CMA) (El-Agamy, 2007; Silanikove et al., 2010) and the treatments with goat milk were able to resolve 30%-40% of the CMA cases (Ribeiro and Ribeiro, 2010). The hypoallergenic activity of goat milk might be due to the high genetic polymorphism of αs_1- casein..In addition to these, several technological properties were directly related with casein composition of goat milk like cheese-making properties, coagulation properties of milk, etc. (Guo, 2003). With lower α_{s1} casein content and small micellar sizes shorter the coagulation time, lower yield, less firmness in cheese, weak texture of yogurt, made from goat milk (Park, 2006; Park et al., 2007).

Carbohydrates of Goat Milk

Like other mammals' milk, lactose is the main carbohydrate in goat milk. The lactose content in goat milk is 4.3/100g) (Silanikove et al., 2010). Apart from lactose, lactulose, lactitol, lactobionic acid, galactooligosaccharides, and other oligosaccharides are present in goat milk. These components act as prebiotics and stimulate growth of probiotic bacteria in the gastrointestinal track, enhance the intestinal absorption of calcium and magnesium, etc. (Schaafsma, 2008). The oligosaccharides content in goat milk were found to be 250 – 300 mg/L which is almost similar to human milk. Several scientific evidences, found that goat milk can be consumed, those who are suffering from cow milk allergy (CMA) (El-Agamy, 2007; Silanikove et al., 2010). The milk oligosaccharides are able to reduce the intestinal inflammation and contribute to the recovery of damaged colonic mucosa and may be useful in treating with inflammatory bowel disease (Daddaoua et al., 2006).

Minerals of Goat Milk

Breed, diet, stage of lactation and status of udder health are the factors which mostly influence the major and trace mineral contents in goat milk. The mineral content of goal milk is higher than that of cow and human milk (Kondyli et. al., 2012).The levels of calcium, phosphorus, potassium, magnesium and chlorine are higher and sodium and sulfur contents are lower in goat milk than the cow milk (Guo, 2003). The bioavailability, of some of these minerals are high in goat milk as compare to cow milk (Alférez et al., 2003).

Vitamins of Goat Milk

Vitamins are physiological, biochemical, and metabolically organic compounds present in milk. The vitamin content of goat is influenced by diet, lactation period, or environmental factors but generally it is similar to that of cow and human milk (Kondyli et al., 2007). Goat is able to convert all β-carotene into vitamin A and appears whiter than cow milk (Kalyankar et al., 2016) but deficient in vitamin B_{12} especially folic acid, vitamins B_6, D, and ascorbic acid.

Conclusion

Goat milk is not much popular in the market as a segment of market milk industry and mainly used for household purpose. Due to its high nutritive value and health beneficial effects, the utilization of goat milk and its products are increasing day by day. Goat is generally reared for meat purposes. Moreover, goat milk is not available in plenty and on demand, sometimes sold at a premium prices. Hence, dairy goat farming can be a lucrative means to enhance the earning of marginal farmers and attempts can be made to produce various dairy products from goat milk at large scale.

REFOCUSING OUR LENS FOR SUSTAINABLE DEVELOPMENT OF LIVESTOCK SECTOR

Dr. M. R. Jawale[1], Dr. N.V. Kurkure[2], Dr. S. V. Chopde[3], Dr. A.P. Dhok[4] and Dr. S.B. Kawitkar[5]

Livestock sector is a crucial component of the Indian agricultural economy, and it plays a significant role in the nutritional security of the people. It plays a multi-faceted role in providing livelihood support to more than 60% of the rural population in India. India is blessed with a huge livestock population reared under diverse production systems and agro-climatic conditions. However, this living asset is confronted with a number of challenges, including shortages of feed and fodder, disease outbreaks (lumpy skin disease), poor livestock extension, and unorganised markets for livestock products, all of which necessitate serious measures to refocus our lens for Sustainable development of Livestock Sector.

Contribution of Livestock Sector in the Indian Economy

India's livestock sector is one of the largest in the world. About 20.5 million people depend upon livestock for their livelihood. Livestock provides employment to about 8.8 % of the population in India. India has vast livestock resources. Livestock sector contributes 4.11% GDP and 25.6% of total Agriculture GDP. Economic Survey 2020 noted that livestock sector has grown at a compound annual growth rate of 7.9 per cent during last five years and its contribution to total agriculture GVA (at constant prices) has increased from 24.3% in 2014-15 to 30.1% in 2020-21. Livestock income has become an important secondary source of income for rural families and has assumed an important role in achieving the goal of doubling farmers' income.

Employment and Gender Equality

Besides their monetary benefit and providing a steady stream of food and revenues for households, livestock provide employment to the rural family, act as insurance during crop failures and the number of livestock owned by a farmer determines the social status among the community. Dairy is the single-largest agri commodity in India. It contributes 5% to the national economy and employs 80 million dairy farmers directly. It also contributes to gender equality by generating opportunities for women.

Enhance Soil Fertility

Livestock play an important part in sustainable food systems—for example, manure is an important source of natural fertilizer, and livestock utilized as draught animals generate in situ fertilisers for enhancing the soil fertility, and also recycles waste products and residues from cropping or agro-industries.

Recognised Indigenous Livestock Species

Recently, ICAR has registered 10 new breeds of livestock species. This has taken the total number of indigenous breeds to 212 as of January, 2023.

Current Challenges Related to Livestock in India

Rising Animal Diseases

The spread of communicable diseases among animals has increased. The most recent example is an outbreak of lumpy skin disease (LSD) in cattle in several Indian states. In 2022, confirmed LSD cases were seen mostly in Northern and western states of India. Approximately 20 districts of Gujarat, 11 districts of Rajasthan, and other states were affected. Down south, African swine fever was reported in Kerala.

High economic losses due to animal diseases

The direct losses estimated based on reported diseases indicated that average annual economic losses due to Haemorrhagic Septicaemia (HS), Foot and Mouth Disease (FMD), Brucellosis, Peste des Petits Ruminants (PPR), Classical Swine Fever were in tune of Rs. 5255 crores (2014), Rs. 20000 crores (2016), Rs. 20400 crores (2015), Rs. 2417 crores (2016), and Rs. 429 crores (2016), respectively.

Shortage of Feed and Fodder

Due to rapid urbanisation and shrinking land sizes, the livestock sector is facing severe feed and fodder shortage. According to a report of ICAR-Indian Grassland and Fodder Research Institute (IGFRI), there is a deficit of 11.24%, 23.40% and 28.9% in the availability of green fodder, dry fodder and concentrates, respectively, in the country.

Low Productivity

The productivity, particularly of dairy animals has been extremely low, turning this precious asset of the poor into a liability. Over 60 percent of the rural households maintain large ruminants, mostly for milk and partly for bullock power. However, the average milk yield is significantly low.

Inadequate Financial Attention

The cattle sector does not receive the attention it deserves in terms of policy and funding. The sector receives only around 12% of total government spending on agriculture and allied sectors, which is far less than its contribution to agricultural GDP.

Underdeveloped Product Market

Markets for animal origin products in India are mainly underdeveloped, uncertain, lack transparency, and are frequently dominated by informal market intermediaries. Lack of market access discourages farmers from adopting updated technology and quality inputs; while dairy is the only product to show consistent changes, other goods lag far behind.

Issues Related to Cross-Breeding

Although crossbred dairy cattle have the strengths of the breeds from which they are sprung, it also increases their vulnerability to diseases, nutritional inadequacies, and environmental adaptations.

Impact of Climate Change on Livestock

Heat stress caused by warm and humid climatic conditions and the changing monsoon season disturbs the productive and reproductive performance of animals, and when natural disasters like as floods, animals face the same horrifying consequences as humans: injury, malnutrition, thirst, displacement, illness, and stress. Nonetheless, because they lack a voice, they are relegated to the back of the rescue queue.

Lack of Adequate Extension Services

While the value of extension services in increasing agricultural production and productivity is widely acknowledged, livestock extension has not received the attention it deserves, which is one of the reasons for India's livestock sector's low productivity. In spite of these challenges, the Indian livestock sector is performing well, however in view of fulfilling the increasing demand of livestock products, these needs to be addressed.

What Should be the Way Forward?

Fodder Security

Along with food security for citizens, there is a need to prioritise fodder security while ensuring accessibility, availability, and sustainability standards. According to the Ministry of New and Renewable Energy (MNRE) report, India generates on an average 500 million tons of crop residue per year out of which 92 million tons is burned each year, which can be potentially used for animal fodder (NPMCR, 2019). Further, there are already proven high yielding varieties of fodder and technologies that can be utilised such as silage making, hay making and urea- molasses treatment for crop residue.

Genetic Surveillance

Genetic Surveillance especially of viruses needs to be strengthened for livestock in India. Taking into consideration the lumpy skin disease outbreak which spread rapidly with high mortality, there is a need to scrutinise its genetic structure and analyse its behaviour to tackle this issue effectively.

Unified Livestock Market

There is need to strengthen Industry-Farmer linkages in a variety of livestock products, as in case of dairy (Amul), to increase commercialization of livestock production and provide farmers with additional income security, so that they will also pay more attention to their livestock health. Farmer Producer Organisations (FPOs), the government-supported organisations are being promoted to make them more efficient buyers of agricultural inputs, and more effective sellers of their products to fresh food wholesalers, retailers and large corporates sourcing raw materials.

Indigenous Breed Gene Banks

The indigenous breed must be preserved because of its ability to adapt to diseases, vulnerable environmental circumstances, and the nutritional value of its milk. Gene banks need to be established for conducting research as well as help in conserving indigenous breeds.

Veterinary Ambulance Service and Compulsory Livestock Vaccination

Veterinary Ambulatory services should be extended in order to provide rapid primary treatment for injured animals in villages. Furthermore, livestock initial vaccination should be made mandatory, and regular veterinary surveillance should be carried out on a timely basis.

Towards One-Health Approach

One-Health is an integrated, unifying approach to balance and optimize the health of people, animals and the environment. The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to develop new and better ideas that address root causes and create long-term, sustainable solutions. One Health involves the public health, veterinary, public health and environmental sectors. The One Health approach is particularly relevant for food and water safety, nutrition, the control of zoonoses (diseases that can spread between animals and humans, such as flu, rabies and Rift Valley fever), pollution management, and combatting antimicrobial resistance (the emergence of microbes that are resistant to antibiotic therapy).

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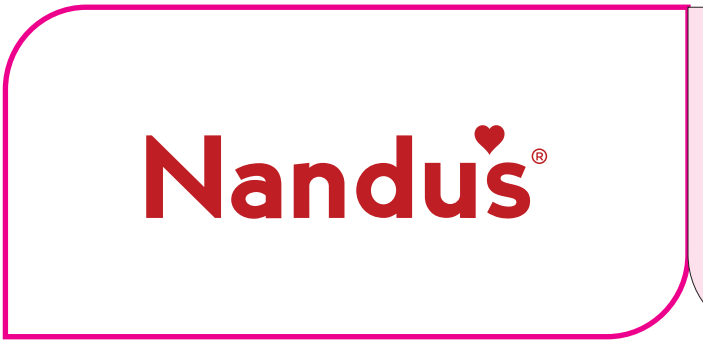

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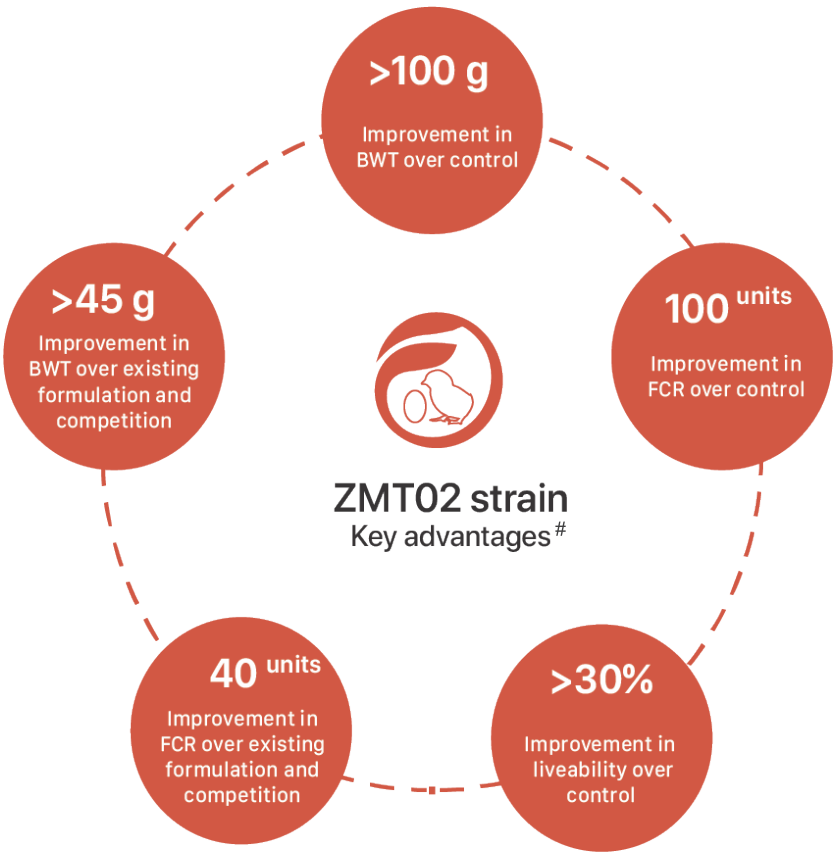

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