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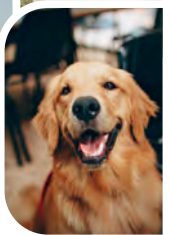
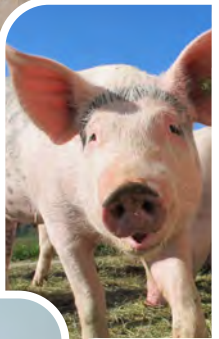
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Veterinary Vials for Viability...

Livestock has played an indispensable role in the Indian economy. Animal husbandry is culturally and economically integrated into the society. Livestock is a source of protein, livelihood and draught power. Diverse enterprises like Apiculture, Sericulture and Pisciculture have flourished for long. Animal husbandry acts as a buffer to crop failure and sudden monetary losses. Rearing a wide variety of animals like yaks, camels and mithun apart from cattle, sheep and goat are unique characteristics of animal husbandry in India. Indigenous stock has higher resistant to diseases and can better adapt to climate change.

Animal Health and related allied sectors are crucial in realizing Hon'ble Prime Minister's vision of Natural Farming for an evergreen planet. The link between humans, animals and the surrounding environment is particularly close in developing regions where animals contribute to agriculture, soil health, fuel, clothing and proteins (meat, eggs and milk). Animal health is necessary for sustainable livestock production. Animal products are a major source of income for farmers across India.

With growing rural to urban migration by men, there is feminisation of the agriculture sector. Women are playing a significant role in the rearing of livestock and are responsible for most of the operations relating to feeding, breeding, management and health care. A rapidly increasing demand for livestock products also creates opportunities for the empowerment of women.

Technological backwardness, financial constraints and inadequate veterinary services are some issues that hinder progress in the sector.

When the animals fall sick, they become unproductive and their care expenses may be high. Veterinary care needs to be accessible. Doorstep treatment should be available since farmers find it difficult and expensive to transport large animals to care centres. Animal health services are important in reducing losses due to animal diseases. Technologies for disease control and cure are known but delivery problems exist. Some state governments in India are pursuing a cost recovery approach. They are encouraging private practitioners to cope with the financial constraints and to deliver broad and effective animal health and breeding services.



This edition of Agriculture Today on all crucial aspects of ANIMAL HEALTH and RELATED ALLIED SECTORS with emphasis on Policy Interventions for Boosting the Socio-Economic Relevance of Animal Health in India.

Happy reading

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DR. M.J. KHAN

ANIMAL HEALTH IS KEY TO ANIMAL WEALTH

An industry which provides for year round income, gainful employment and acts as a source of protein for its producers who are mostly concentrated in rural areas must be guarded with utmost care. Animal husbandry is one sector which has been particularly steady in its outcome and performance. It is the succour for the marginalized and weak segments of the society. Significantly, animal wealth is closely related to animal health.

Animals must be safeguarded, fostered and provided with all essential nutrients and health care facilities if we intend to depend on them economically. Besides, the all-encompassing 'One Health' concept is being applied invariably across countries. It thus becomes binding on us to adhere to this unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes that the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.

When it comes to animal health, we are fortunate to experience the fruits of cutting edge technologies in the sector. Biotechnological innovations have percolated the animal health sector. We have access to next-generation vaccines to prevent diseases. It is also reassuring to find that antibiotic alternatives are being developed to combat antibiotic resistance. Antibiotic resistance is on the rise, posing a global threat to humans, animals, and the environment. Alternative products including vaccines, probiotics and immune modulators are offering veterinarians and farmers more options for reducing antibiotic use.

Nutrition and feed quantity and quality are also a priority in animal rearing. Microbial enhancements to soil, methods to prevent spoilage, the use of micro-organisms to increase animal digestion abilities, novel mineral and enzyme supplements, and the use of gene editing technologies to boost nutrient levels in plants enhance animal nutrition. New markets for innovative protein sources, ranging from cricket-based baking flour to the manufacture of animal protein from cell-based cultures are also emerging.

This is the most opportune time for raising awareness and spreading the knowledge of advanced technologies in animal health among stakeholders. Animal health is an important segment that needs the undivided attention of the government. India Animal Health Summit 2022 organised jointly by Indian Chamber of Food and Agriculture (ICFA) and Agriculture Today Group on July 6-7 plans to raise this issue at the national level. I am sure the deliberations and discussions shall provide a road map for redefining India's animal health care strategies. India boasts of abundant animal wealth. To sustain our richness, we must invest in animal health.



WHO STOLE THE FLAVOUR FROM THE BANANAS IN NORTH INDIA?



RAJNI SHALEEN CHOPRA

For about five years now, I have been troubled by how bland and tasteless the bananas are in north India. At times you can taste the pesticide residue in the fruit. It has finally dawned upon me that this is a pattern. We just don't get good bananas in north India. The only thing resembling the banana that is reaching our homes is the look and the colour of the fruit. They are so lacking in flavour that I now chop bananas and sprinkle powdered sugar on them before I eat them.

Who is responsible for giving the consumers such tasteless fruit? Where and how did the bananas lose their flavour? Is it too much of pesticides? Post harvest, too much of the ripening agent? Too many chemicals to make sure the fruit does not suffer in transit? Surely this seems to be the case.

If the banana that reaches us is almost unpalatable, is it a long-term gain for our farmers? Truly I feel a degree of distaste now towards the banana. I continue to buy it from force of habit. We have relished bananas and other fruits since we were children. But the fruit no longer pleases the taste buds the way it did earlier.

Do these bananas also lack nutrition? I don't know. I have no lab at home to test whether a banana is nutritious or not. Our Moms used to tell us bananas are highly nutritious. Given the crop that we get, I don't think our generation can tell our kids the same.

There is a new variety called Happy Banana. It is the most unhappy banana that I have come across. It is zero on flavour. The peel will be sunshine yellow but inside, you shall find the fruit rotten at places.

I must observe that in south India, bananas continue to be flavourful and delicious. Perhaps because they are organically grown in south India and are abundantly available. Don't we in north India deserve the same? Here they are abundantly available all right. But also loaded with chemicals, pesticides and ripening agents, which seep in from the peel to the fruit.

I am now beginning to wish for imported bananas in the market. I am currently paying Rs 70 to Rs 80 a dozen for bananas. I am willing to pay Rs 150 or even Rs 200 a dozen, but please give me bananas that have flavour. And hopefully nutrition too.

This is what some agriculture economists have been warning the farmers about. If you don't give the consumers what they seek, they shall favour imported fruit. When imported fruits start ruling the market, then don't blame the consumers for making a choice for what they think is better.



Govt Wishes To Transform The Animal Husbandry Sector

Sir, the AH&D contributes immensely to the national economy. Sir, please tell us about the success of National Animal Disease Control Programme (NADCP). Please throw light on the targets set by the government for the new financial year to ensure livestock health.

The Department is implementing a scheme "National Animal Disease Control Programme (NADCP) for control of Foot & Mouth Disease and Brucellosis" by vaccinating 100% cattle, buffalo, sheep, goat and pig population for FMD and 100% bovine female calves of 4-8 months of age for brucellosis. So far, a cumulative 23.84 crore cattle and buffaloes have been ear-tagged on field. In the current round of vaccination around 10.28 crore cattle and buffaloes have been vaccinated against FMD and around 1 crore female calves have been vaccinated against Brucellosis. The target is to cover all eligible animals as per schedule with 22 crore sheep and goats to be vaccinated against PPR, 9 million pigs to be vaccinated against CSF, around 36 crore animals to be vaccinated against FMD and 3.6 crore female calves to be vaccinated against brucellosis.

the Indian fishery industry has the potential to emerge as a major player in the global market. Please tell us about the initiatives and schemes rolled out by the Centre to boost the fisheries sector.

Fisheries is considered as a 'Sunrise Sec-

GOI envisages to transform the fisheries sector through its continual efforts by bringing in structural changes, empowering stakeholders and generating livelihood in a multi-pronged holistic approach

tor' with immense potential for equitable, sustainable, and inclusive growth towards transforming the overall economy. Department of Fisheries under the Ministry of Fisheries, Animal Husbandry & Dairying is running various schemes to develop the Indian fisheries sector as a crucial one for livelihood generation, by creating large number of jobs and fostering entrepreneurship in Fisheries and allied sectors. India's growth trajectory in total fish production has been spectacular in the last couple of years. The Department envisages to transform the sector through its continual efforts by bringing in structural changes, empowering stakeholders and generating livelihood in a multi-pronged holistic approach.

With the objective to reach newer heights, the Department of Fisheries, Gov-

ernment of India has infused funds through following multiple schemes and programs:

The Fisheries and Aquaculture Infrastructure Development Fund (FIDF) was created in October 2018 with fund size of Rs. 7,522.48 crores for the creation of fisheries infrastructure facilities.

First time ever Government of India (GoI) decided to extend the facilities of Kisan Credit Card (KCC) to fishers and fish farmers to help them meet their working capital requirements in the year 2019, aiming a coverage of 2.5 Crore Farmers with a credit flow of Rs. 2 lakh Crores.

The Department of Fisheries, Ministry of Fisheries is implementing a flagship scheme namely Pradhan Mantri Matsya Sampada Yojana (PMMSY)" with highest ever estimated investment of ₹20050 crore in fisheries sector for a period of 5 years with effect from the financial year 2020-21 as a part of Aatma Nirbhar Bharat Package.

Targets of PMMSY (2020-25):

Additional fish production of 70 lakh metric tons by 2024-25

Enhance aquaculture productivity from the present national average of 3 tons to 5 tons per hectare

Reduce post-harvest losses from 25% to around 10%

55 lakhs direct and indirect employment generation

Double fisheries exports to Rs 1 lakh crores by 2024-25

Enhance per capita fish consumption from the current 5-6 kg to 12 kg

Major Achievements under PMMSY (2020-22)

AATM NIRBHAR

Shri Parshottam Rupala

Minister of Fisheries, Animal Husbandry and Dairying
Government Of India

AATM NIRBHAR

Projects worth of Rs. 7242.90 crores with Central liability of Rs. 2773.40 crores approved

Project worth Rs. 615.28 crores approved for developing 5 major fishing harbours as hubs of economic activity with world-class infrastructure and amenities in Kochi, Chennai, Visakhapatnam, Paradip and Mallet Bandar, Mumbai

India has a very strong dairy sector, but farmers did not take up breed improvement on a large scale. Please enumerate the measures being taken by the government to give a fillip to breed improvement of local cattle.

For the first time in the country, Rashtriya Gokul Mission has been initiated in December 2014 for development and conservation of indigenous bovine breeds and to undertake breed improvement programme for indigenous cattle breeds so as to improve their genetic makeup and increase the stock. Now, the scheme has slightly been restructured from 2021-22 to 2025-26. Under this scheme, breed improvement activity is supported through support to semen production facilities, bull production programme and breed multiplication farms. 50% capital subsidy is made available to entrepreneurs directly for breed multiplication farms for production and supply of high genetic merit heifers to farmers. The extension of artificial insemination coverage is undertaken

Subsidy of 50% (up to Rs 2 crores per farm) on capital cost (excluding land cost) is being provided to private entrepreneurs for establishment of breed multiplication farms

primarily through incentives for AI technicians and promoting usage of sex sorted semen. Further, the scheme focuses on making available reproductive technologies at farmers' doorstep at affordable price.

the Prime Minister had announced last year that strengthening India's dairy sector is one of the top priorities of the government. Please tell us about the roadmap being adopted by the government to further boost the dairy sector and also ensure quality milk production.

The dairy sector in India has





grown substantially over the years. As a result of prudent policy intervention, India ranks first among the world's milk producing Nations since 1998 and has the largest bovine population in the World. Milk production has increased by 44.10% over the past six years from 137.7 million tonnes during 2013-14 to 209.90 million metric tonnes (provisional) during 2020-21. Milk production is growing at the annual growth rate of 6.22% over the past six years whereas world milk production is growing at 2.35% per annum. The per capita availability of milk is 406 gram per day in 2019-20 as against the world average of 318 grams per day during 2020. Per capita availability has increased from 307 grams in 2013-14 to 427 grams in 2020-21 showing a growth of 39.10%. Value of output of milk (at current price) is Rs.9,31,969 crore (2020-21) which is the highest of the agriculture produce and even more than the combined value of Paddy and Wheat. The demand for milk and milk products is expected to grow to 266.5 million metric tonnes (MMT) by 2030. The growth in demand is by and large on account of increase in population—especially the young and the aged and enhanced incomes resulting in change of taste and consumer aspirations. Towards fulfilling this Demand and to strengthen the dairy infrastructure, Government of India is making efforts for strengthening infrastructure for production of quality milk, procurement, processing and marketing of milk and milk products through various Dairy Development Schemes viz. National Programme for Dairy Development (NPDD), Dairy Processing and Infrastructure Development Fund

(DIDF), Supporting Dairy Cooperatives & Farmer Producer Organisations engaged in dairy activities (SDC&FPO) with the aim to enhance quality of milk and milk products, increase share of organized procurement, processing, value addition and marketing and provide soft loans/interest subvention on working capital loans.

The Prime Minister has emphasized that the use of modern technology such as Artificial Intelligence and drones to make farming in India “modern and smart”. Please tell us about the initiatives being taken by the government to achieve this vision.

To enhance production and productivity in the animal husbandry and dairying sector, Department is using modern technologies like IVF technology, ETT, Sex Sorted semen, genomic chips etc. Considering the updates in technology in the sector, the new components like Cattle feed/ feed supplement plants, Milk transportation system (Refer van/insulated tankers etc), Marketing infrastructure (including e-market system, bulk vending system, Parlour, deep freezer, cold storage etc., Commodity and Cattle feed go-downs, ICT infrastructure (e.g. block chain technology, servers, IT solutions, Near Real Time devices etc), R&D (lab & equipment, new technology, innovations, product development etc), Renewable energy infrastructure/ plants, trigen/ energy efficiency infrastructure, Pet bottle/packaging material manufacturing units for dairy purposes, Training centre (complete with civil and other necessary infrastructure) has been included under Dairy Processing and Infrastructure Development Fund (DIDF) scheme. Department is also planning to use drones for supply of vaccines, delivery of semen etc. in remote areas of the country.

Entrepreneurship is now being promoted in all the sectors of animal husbandry including feed and fodder development.

What are the major people centric reforms in Animal Husbandry and Dairying sector undertaken under your leadership. Please let us know about the schemes to promote Entrepreneurship in the field of AHD.

Focus of the Government is on the development of entrepreneurship in Animal Husbandry Sector. This will not only increase investment in the sector but also create hub and spoke model where small and marginal dairy farmers can thrive with the help of a local hub. Entrepreneurship is now being promoted in all the sectors of animal husbandry including feed and fodder development.

A major constraint for aspiring dairy farmers is the difficulty of procuring high quality heifers or milch animals from their local areas. To address this issue a subsidy of 50% (up to Rs 2 crores per farm) on capital cost (excluding land cost) is being provided to private entrepreneurs for establishment of breed multiplication farms. Similarly entrepreneurship development programme have been initiated by the Government in goat, sheep and poultry. Under Realigned National Livestock Mission Scheme, the first time provision has been made for incentivizing the individual, FPO, FCO, JLG, SHG and Section 8 companies to establish Poultry farms in the Rural Sector using Low Input Technology Bird, Sheep & Goat, Piggery Farm and Feed and Fodder activities. The programme envisages to create entrepreneurs and Central Government is providing 50% capital subsidy with subsidy ceiling of Rs. 25 lakh for Poultry, Rs. 50 lakh for Sheep and Goat, Rs. 30 lakh for piggery and Rs. 50 lakh for feed and fodder activities like establishment of silage making unit and TMR plant.

What are the Awareness initiatives taken by the Ministry. Please tell us about the role of State Governments in enhancing the outreach programme in AHD and Fisheries.

Outreach efforts for vaccination programme have been enhanced by DAHD both through

Central level and State level interventions, supported financially under NADCP. Some of the steps taken so far include wide publicity through films and awareness campaigns in all languages, radio jingles in all languages, advertisement through Doordarshan and AIR, print publications and banners across the country and training through AV films on tagging & vaccination in all languages among others. The funding support to States/UTs have also been provided for extension and publicity for reaching out to district and block level. Extensive use of existing social infrastructure at the ground level from Agriculture extension, KVKs, SHGs & community-based workers of SRLM are also being undertaken with the support of Departments/Ministries concerned.

The Department is creating various IEC materials through National Film Development Corporation (NFDC), Bureau of Outreach and Communication (BOC) and their agencies. These Brochures, short films etc. are being disseminated through various social media platforms, State / UTs Governments, Hon'ble Members of Parliament.

The Department is doing capacity building of farmers through training programs on Dairying and Livestock Management to 80000 (Eighty thousand) farmers by arranging 2000 three day training programs through 400 KVKs across the country through the ICAR established Krishi Vigyan Kendra (KVK).

Awareness Programmes on Re-aligned Entrepreneurship schemes / Infrastructure Development and other Flagship schemes of the Department is also conducting through Common Service Centres network at village level camps across the country in conjunction with State Govt.

Recently under Kisan Bhagidhari Prathmiktha Hamari Abhiyan, Department organized awareness Programme on Entrepreneurship schemes and other beneficiary oriented flagship programs of the Department through Common Service Centers network by holding 8000 village level camps across the country from 25th April to 29th April 2022. Each day one lakh farmers joined through Common Service Centres zone wise, across the country.

Department organized a Conclave of 75



successful Entrepreneurs in livestock sector and a Digital Exhibition of 75 Indigenous Livestock Breeds which have the potential to transform the Animal Husbandry sector through improved production and better resilience. The farmers / Entrepreneurs from various State / UTs along with State Govt. officials attended the event.

What are the digital initiatives of your Ministry for helping AHD and fish farmers in managing their business, buying and selling of products?

In so far as digital/technological initiatives in milk processing sector are concerned, the following some major intervention taken National Programme for Dairy Development (NPDD) scheme has helped milk producers gain benefit:

Automatic Milk Collection Units (AMCU)/Data Processing and Milk Collection Unit (DPMCU) at village level milk collection centre has helped milk producers to get transparency in payment system, real-time information of quantity of milk poured by them to dairy societies and its price on his mobile (through software). About 80,000 AMCU/DPMCU is available with the dairy cooperative societies/milk collection centres. About 20,000 AMCU/DPMCU have been provided by DAHD, Gol through NPDD scheme.

Bulk Milk Coolers (BMC) at village lev-

el/cluster level milk collection centres have provided market access and prevented loss of milk of farmers. The function of BMC is that it chills the milk upto 4°C and preserve milk at collection level to get deteriorate. About 19,000 BMCs (about 500 Lakh Litres capacity) is available at the village level milk collection centres, covering about 1 lakh milk collection centres of cooperative dairies (approx. 4-5 villages/BMC). About 2300 BMC have been provided by DAHD, Gol through NPDD scheme.

Digitalization of Livestock productivity & health data: Complete record regarding Animal productivity and health related data is now being maintained under **Information Network for Animal Productivity & Health INAPH** for ensuring traceability of Livestock and dairy products leading to better price realization to farmers. It facilitates capturing and dissemination of data by the milk Unions/Federations, State and Central governments, other End Implementing Agencies on animal productivity, health and nutrition using a Centralized Server Architecture and through desktop/Android Phone based field IT Applications.

Please throw some lights on Incentives and Awards that are being given by the Ministry in Fishery and AHF sector as encouragement.

Gopal Ratna Award 2021: Gopal Ratna

Award has been launched by the Department in 2021 and is one of the highest National Awards in the field of livestock and dairy sector. Objective of the award is to encourage all individual farmers, artificial insemination technicians and Dairy cooperative societies working in this sector. Awards are conferred in three categories, namely (i) Best Dairy Farmer Rearing Indigenous Cattle/buffalo Breeds; (ii) Best Artificial Insemination Technician (AIT) and best Dairy Cooperative. Award consists of a Certificate of merit, a memento and following cash amount in each category: Rs. 5,00,000/- (Rupee five lakh) for 1st rank holder; Rs. 3,00,000/- (Rupee three lakh) to 2nd rank holder and Rs. 2,00,000/- (Rupee two lakh) to 3rd rank holder. For the first time, applications were invited on self nomination basis through online application portal <https://gopalratnaaward.qcin.org> from 15.07.2021 to 15.10.2021. Total 4401 applications were received and were evaluated by the Department and 4 best dairy farmers, 3 best AI technicians and 3 best dairy cooperatives in the country were felicitated on 26th November 2021.

Startup Grand Challenge 2.0: In order to scout for innovative and commercially viable solutions to address the problems faced by the animal husbandry and dairy sector 5 Problem Statements has been prepared by the Department and organized Animal Husbandry Startup Grand Challenge 2.0 during 2021-22 in partnership with Startup India. The award was given on 1st of June 2022 to each problem area, a winner has been awarded with Rs 10 Lakh and a runner-up with Rs 7 Lakh as cash prize.

Department will provide up to 14 winners to get incubation up to 3 months, mentor matchmaking, lab facility for POC development and testing facilities (on case-to-case basis), conducting business and investor workshops, and tracking the activities of the startups for up to 9 months after the completion of the program.

Startup will also get benefit of Virtual Master classes and up to 7 virtual master classes (one for each problem statement) to be organized for providing mentorship to all startups and innovators who had participated in the challenge.



A dedicated mentor from the Department of Animal Husbandry and Dairying would be assigned to each winner for 6 months.

KCC has now been extended to AHD and fish farmers. Please tell us about it.

First time ever Government of India has extended the benefit of KCC to Animal Husbandry and Dairy Farmers during 2019. As part of the Atmanirbhar Package, this department has organized a Special drive for providing KCC to dairy farmers associated with milk cooperatives and milk producer companies held from 01.06.2020 to 31.12.2020. This step ensured credit to landless Animal Husbandry farmers at low interest to meet their working capital requirement.

So far more than 18 lakh fresh KCC were sanctioned for AHD Farmers in the country as on 09.06.2022. The details are as given below;

S No.	Type	Fresh KCC Sanctioned
1	Crop loan with dairy	4,10,423
2.	Crop loan with other allied activities	99,416
3.	Dairy	11,89,759
4.	Poultry	24,857
5.	Others	1,05,834
	TOTAL	18,30,289

Source: D/o Financial Services

Further, to expand the benefit of Kisan Credit Card to all eligible animal husbandry and fishery farmers in the country, this department, in association with the De-

partment of Fisheries (DOF) and the Department of Financial Services (DFS), has launched a “Nationwide AHDF KCC Campaign” from 15th November 2021 to 15th February 2022. This was further extended upto 31.07.2022.

As per the DFS report as on 09.06.2022, under this campaign 14,86,202 applications received out of which 14,21,713 applications accepted and 5,58,818 were sanctioned.

First time ever Government of India (GoI) decided to extend the facilities of Kisan Credit Card (KCC) to fishers and fish farmers to help them meet their working capital requirements in the year 2019, aiming a coverage of 2.5 Crore Farmers with a credit flow of Rs. 2 lakh Crores. A special drive for mobilisation of KCC applications was organized from 1st June to 31st December 2020. Followed by this, a Nationwide campaign to ensure the covering of all the stakeholders was launched on 15.11.2021 by Hon'ble Minister of Fisheries, AHD which is currently ongoing.

What are the major regulatory reforms in the Fishery sector?

Major regulatory reforms in the Fishery sector:

Online application system for issuance of Sanitary Import Permit for import of fish and fishery products, 2015:

An online web portal was developed for receipt and issuance of SIPs in FY2015-16. Before this reform, the applicant used to submit the application in physical hard copy through post which took a significant amount of time,



nearly 30 to 45 days for issuance of SIP. This reform has greatly reduced the time of issuance of SIP from 45 days to 48 hours. This in turn has reduced the time of import of fisheries products including raw material intended for export and enabled ease of doing business.

Permission for Establishment of Shrimp Brood Stock Multiplication Centers (BMCs) in Private sector to facilitate Exports, 2015 :

In the FY 2015-16, the Guidelines for Establishment and Operation of SPF shrimp BMCs were implemented allowing private parties to establish and operate Specific Pathogen Free (SPF) shrimp BMCs in the country with an aim to reduce the dependency of hatcheries owners to directly import the shrimp brood stock. Prior to this there were no BMCs in the country. Hatchery operators were importing shrimp brood-stock from overseas approved suppliers. This reform has reduced the associated risk with direct import of shrimp brood-stock and also increase the cost effectiveness of using the brood-stock develop in the BMCs. This contributes substantially to the Indian shrimp sector which is a major contributor to the Indian seafood export.

Simplification of procedure for import of ornamental fishes, 2017:

A single window online system was introduced for submission of applications for import of ornamental fishes. This significantly improved transparency and efficiency, and also reduced the time for issuance of licenses from 6 months to less than 1 month. Prior to this, the applicant had to apply in

multiple departments/ organizations like DGFT, DAHD and DoF for import of ornamental fishes. This reform has simplified the same and facilitated ease of doing business.

Growth and expansion of Specific Pathogen Free (SPF) Black Tiger shrimp cultivation in India to facilitate Export, 2018

The culture of Black Tiger shrimp *Penaeus monodon* in India was rendered negligible after devastation by the White Spot Syndrome Virus (WSSV) in late 90s. To facilitate revival of the Black Tiger shrimp *Penaeus monodon* in India and reducing the dependency on single shrimp species, dedicated infrastructure within the Aquatic Quarantine Facility at Neelankarai was created for quarantining imported of Broodstock and Post Larvae of Black Tiger shrimp *Penaeus monodon*. This reform will not only revive *P. monodon* culture in the country but will contribute to species diversification and ultimately, the export basket.

(v) Permissions for establishment of Tilapia hatcheries, 2020

Until recently, fish farmers and entrepreneurs had to apply and obtain permission from Department of Fisheries, Ministry of Fisheries, Animal Husbandry and dairying, Government of India for establishment and operation of Tilapia hatcheries which was cumbersome and a cause of significant delays. However, the Department has recently delegated the power of issuance permission for establishment and operation of Tilapia hatcheries to State/UT Governments in case the brood stock is sourced from approved sources in India. As a result, the

entrepreneurs and fish farmers can obtain permission for establishment and operation of Tilapia hatchery from the State Governments itself which has reduced.

Finally, please share your vision for some innovations in the AHD and Fishery sector that will benefit the Urban as well as Rural populace in the country.

The organized dairy sector is likely to expand and produce high quality of milk & milk products benefitting the urban consumers. On the other hand, creation of infrastructure for value addition, cold chain & milk testing facility will provide easy market access at village level, reduce milk spoilage, increase transparency and ensure higher returns to farmers/milk producers.

As a result of prudent policy intervention, transferring rural economy through scientific intervention in dairy sector has already commenced and the process is being speeded up to achieve milestone of doubling the farmers' income.

The Department of Animal Husbandry and Dairying, in partnership with Startup India, launched the 'Animal Husbandry Startup Grand Challenge', to search innovative and commercially viable solutions to address the problems faced by the animal husbandry and dairy sector.

The Schemes implemented by Department also adopts to apply modern tools, induction of new technologies in the field of Animal Breeding, disease control, dairy sector.



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But what makes Ananda a truly Power Brand is the constant desire to better products, improve standards,



and introduce variants customised for specific needs, like T20 Special Milk, used only by tea making vendors; a first in the dairy industry. Product innovations like Low-fat Paneer, High-protein & High-fat Supreme Milk, and High Protein & Low-fat FIT Milk, catered specifically for consumers further help solidify Ananda's legacy as a brand that practices what it believes in.

Today, Ananda exports to major countries of the world like The United States, Canada, UAE, Sri Lanka, Bangladesh, and are making the products available in many more.

The introduction of Multivac packaging, an alternate distribution model through bikes, and over 100 outlets of Ananda Retail, with more to come; is helping make Mr Dixit's vision a reality: a pan-India presence by 2020, and the largest manufacturer and marketing organisation of paneer.

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SMALL AND MARGINAL FARMERS IN ANIMAL HUSBANDRY

THE RISK MITIGATION APPROACH

The livestock sector of India is one of the leading livestock sectors of the world contributing 11.60 per cent of world livestock population (535.78 million livestock heads). This includes 56.70 per cent buffaloes, 12.50 per cent cattle, 20.40 per cent small ruminants, 2.40 per cent camel, 1.40 per cent equines, 1.50 per cent pigs and 3.10 per cent poultry (20th livestock census, 2019). The sector is an integral part of agriculture in India. It contributes 25.60 percent to agriculture GDP and provides livelihood to more than two third of rural population.

The contribution of this sector is around 4.93 per cent to total GVA (at constant prices during 2020-21) and therefore plays an indispensable role in the Indian economy. Livestock contributed 16% to the income of small farm households as against an average of 14% for all rural households.

Eighty-two per cent of the livestock owners in rural India are small and marginal farmers, for whom livestock has proved to be an important productive asset and an insurance mechanism to combat the financial or other household related crisis. Women account for three-quarters of labour in animal husbandry. The sector contributes to women empowerment by giving them a source of income. Livestock act as a mobile bank as can be sold anytime anywhere, and act as a financial shock absorber for farmers during crop failure. They serve as a cushion against the income fluctuation for rural farmers.

India is the largest cattle and buffalo populated country, second largest in terms of population of goat, third in sheep

population, fourth in population of ducks and chicken, ninth in camel population, and tops the milk production chart amongst the countries of the world. We are second largest goat milk producer, third largest poultry and egg producer, and eighth largest meat producer in the world. Livestock Sector of India registered CAGR of 7.93 pc during 2014-15 to 2020-21 (at constant prices). According to National Sample Survey Office's (NSSO) 70th round survey (Jan-Dec 2013), 23% of agricultural households with less than 0.01 hectare of land holding reported livestock to be the primary source of income.

Livestock rearing has the potential to improve the economic condition of marginal and small farmers. It plays an extensive part in social and economic growth of rural households.

Untapped Potential

The huge potential of this sector is untapped to a great extent. India's productivity per animal is very low because of various reasons like neglected managerial aspect, indiscriminate breeding, shortage of feed and fodder, lack of awareness among small farmers, poor guidance, non-availability of appropriate technologies and limited accessibility of livestock extension.

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The production potential of livestock to a great extent depends on the animal health status of the nation which requires improvement in livestock services. A range of livestock services like health care, prophylactic, nutrition, pharmaceutical supply, breeding, extension, research, livestock insurance and credit, market related information etc. are needed to allow the farmer to extract full production potential from the livestock.

These all services directly or indirectly are affected by the veterinary services whose efficient availability is very important for development of livestock sector in India. Owing to the dependency small and marginal farmers have towards animal husbandry, and the huge opportunity waiting to be tapped, GOI has taken up various programmes for the improvement and development of the sector. The planning, organization and implementation of these programmes aims to uplift the animal husbandry sector, focusing and improving on various threats phased by it, and ultimately improve the economic condition of the small and marginal farmers.

Some of the major animal husbandry initiatives taken by Ministry of Animal Husbandry Dairying & Fisheries for boosting the animal husbandry sector and empowering the stakeholders involved with the sector are as follows.

Rashtriya Gokul Mission (RGM)

RGM is implemented for the development and conservation of indigenous bovine breeds. The scheme focuses on enhancing milk production and productivity of bovines using advance technologies such as sex sorted semen production for production of only female calves and IVF for propagation of elite animals of indigenous breeds. To meet the shortage of high genetic merit bulls, 33 IVF laboratories will be set up for genetic upgradation of bovine population. Genomic selection of high genetic merit bulls of indigenous breeds is being done.

NDDB has developed Indus chip and buff chip for genomic selection of cattle

ANIMAL HUSBANDRY STARTUP GRAND CHALLENGE

Department of Animal Husbandry & Dairying (DAHD), in partnership with Startup India, launched the Animal Husbandry Startup Grand Challenge (AHS GC) to scout for innovative and commercially viable solutions to address the problems faced by the animal husbandry and dairy sector. Under AHS GC 2.0, 157 applications were evaluated against six problem statements and 12 winners were awarded for innovative solutions.

Livestock sector has shown remarkable growth during last few decades in terms of production. It contributes more than 25 per cent to the gross value of agricultural output. DAHD is committed towards the poverty alleviation and economic upliftment of livestock and subsidiary farmers. To achieve this, DAHD has boosted the investment made in the sector and is making further efforts for the same, along with including new technological interventions at farm level with keeping the beneficial traditional practices.

The recent pandemic has shown that Indians are resilient, resourceful, and technologically capable. This is the time when we must test our capabilities in animal husbandry by creating and incorporating innovative ideas and adopting the best animal husbandry practices for the upliftment and development of India's animal husbandry sector at the world level, as well as for letting our farmers at the top of the game.

and buffaloes. NBAGR has developed HD Chip with more than 6 lakh markers for cattle and with 6 lakh markers for buffaloes for indigenous breeds.

Conservation of indigenous breeds will yield a population of hardy and tough animals that can withstand extreme climatic conditions unlike the exotic and crossbreeds. The milk of indigenous breeds is rich in A2 protein, which has medicinal properties. Hence this milk is costlier and is sold at premium prices.

Under RGM, National awards for Cattle and Dairy Sector named Gopal Ratna Awards are being conferred upon progressive farmers, technicians and organisations to recognize and motivate them to take up productivity enhancement of indigenous breeds of milch animals in a scientific manner. The programme will also improve the economic condition of the women.

Livestock Health and Disease Control Programme

This programme started under DAHD mainly to focus on prevention, control, and treatment of animal diseases with economic importance. The main components involved under the scheme include world's biggest vaccination programmes against Foot and Mouth Disease (FMD), Peste des Petits Ruminants (PPR), Brucellosis and Classical Swine Fever in susceptible species with 100% central assistance.

Assistance to States for Control of Animal Diseases (ASCAD) is aimed at controlling diseases of economic importance and zoonotic diseases of state priorities by prophylactic vaccination strategies, strengthening of State Veterinary Biological Production Units and laboratories meant for animal disease diagnosis, and by providing in-service training to Veterinarians and Para-veterinarians. It also provides fund for vaccination of canine rabies and control of internal parasites in cattle and buffalo.

The programme focuses on control of emergent and exotic diseases and information and communication campaign including animal health



Source

Innovation in Nutrition

National Dairy Development Board (NDDB) has initiated Ration Balancing Programme to educate the farmers on balanced feeding of dairy animals. It has developed software compatible with mobile/laptop/desktop etc with the help of which balanced ration is formulated considering the animal's profile (i.e. cattle or buffalo, age, milk production, milk fat, and feeding regime etc) and advising farmers to adjust quantity of locally available feed.

Another key innovation in nutrition is Total Mix Ration (TMR) which is an efficient system of delivering nutrients to dairy cattle and buffaloes. TMR can be conventional, or crop residue based TMR (or Dry TMR). Dry TMR is economical, has longer shelf life and is easily customisable to need and lactation period. It enables better feed intake and digestibility and reduces feed wastage.

National Digital Livestock Mission (NDLM)

NDLM, with support from National Dairy Development Board (NDDB), is built on a vision to create technology-enabled ecosystem for the farmers where they can improve economically

camp. The effective implementation of the programme will lead to eradication of the targeted diseases, increased accessibility to efficient veterinary services and enhanced trade in livestock and poultry sector, ultimately leading to improved socio-economic status of livestock and poultry farmers.

DAHD has initiated veterinary services (VS) delivery at farmers' doorsteps through Mobile Veterinary Units (MVUs). So far about 4500 MVUs have been provided to the states. There is a provision of 100 percent funding for infrastructure. For recurring expenditure, the funding provision (central and state share) is 60:40/90:10/100:0 for states/ North-Eastern states and hilly regions/ UTs respectively.

National Livestock Mission (NLM)

The mission is launched by DAHD with the objective of employment generation through providing entrepreneurial opportunities in the sector of small ruminant, poultry, piggery, and fodder. It aims at encouraging entrepreneurs for establishing their own fodder Block/Hey Bailing/Silage Making Units by incentivising it. The scheme also aims at enhancing the productivity per animal through breed improvement, increasing the production of meat, goat milk, wool, egg, fodder, and ensuring the sufficient availability of feed and fodder for the livestock.





and technically by obtaining high quality services, authentic and need based information, and access to market. Traceability and limited identification of animals hampers with our ability to improve productivity, control diseases that affect both the farmers and the people and ensure quality products for domestic and export markets. A 12-digit unique identification number is provided to major livestock species with all details captured in a central database, INAPH, to improve animal identification. Improving traceability is vital for better market access. The tagging of cattle and buffalo is nearing completion. The data on various aspects of breeding, health, vaccination etc is uploaded on INAPH portal. Various open access, API based applications can be integrated with the system to fetch real time information that can be used for analytics and sound decision making.

One Health Initiative

Recognizing the gravity of challenges posed by zoonotic diseases, DAHD has taken the initiative to bring stakeholders

from animal, human and environment health on a common platform to address it through One-Health approach. DAHD is focussed on capacity building of stakeholders and strengthening of infrastructure for diagnostics and reporting.

Besides zoonotic diseases, episodes of exotic animal diseases of economic significance like Lumpy Skin Disease and African Swine Fever pose significant threats to food security, national economy and livelihood of rural people. To meet these emerging challenges, DAHD is focussing on strengthening the doorstep delivery of animal health services. Efforts are put in place for institutionalization of one health mechanisms, sharing of data, digital disease surveillance and reporting system, inadequate capacities of laboratory and field functionaries, and outreach to stakeholders with a vision of developing a National One-Health platform. To initiate the implementation, two pilot projects have been launched in Uttarakhand and Karnataka.

The ongoing programs are leveraged

with streamlining the regulatory processes for veterinary biological products and converting to digital architecture to prepare for any future animal pandemic. Considering issues like coordination, communication and collaboration, implementation of the One Health initiatives of DAHD will lead to enough data generation towards predicting, preventing, detecting and responding to any future disease outbreaks. These efforts, supported by Bill and Melinda Gates Foundation, will be further supplemented by another program proposed to be supported by the World Bank.

DAHD's initiatives for innovative and commercially viable solutions to address the problems faced by the animal husbandry sector, vaccination programs for disease control, innovation in animal nutrition and assisted reproductive technologies, supporting delivery of veterinary services, building capacities of field functionaries and diagnostic laboratories along with suitable communication strategies are steps in a positive direction for boosting productivity and strengthening the sector.

ANIMAL WEALTH AND ANIMAL HEALTH

AN OVERVIEW

Livestock plays an important role in Indian economy. They form an indispensable component of Indian agriculture. Their significance in improving food, nutritional and economic security has been well documented. They most often compensate for the losses incurred by the farmer during crop failure and also complement agriculture by supplying manure. About 80 million rural households are engaged in milk production with very high proportion being small, marginal farmers and landless farmers. It is an important economic incentive for the landless, small & marginal farmers particularly women. The dairy sector is therefore an important vehicle for inclusive development in the country.

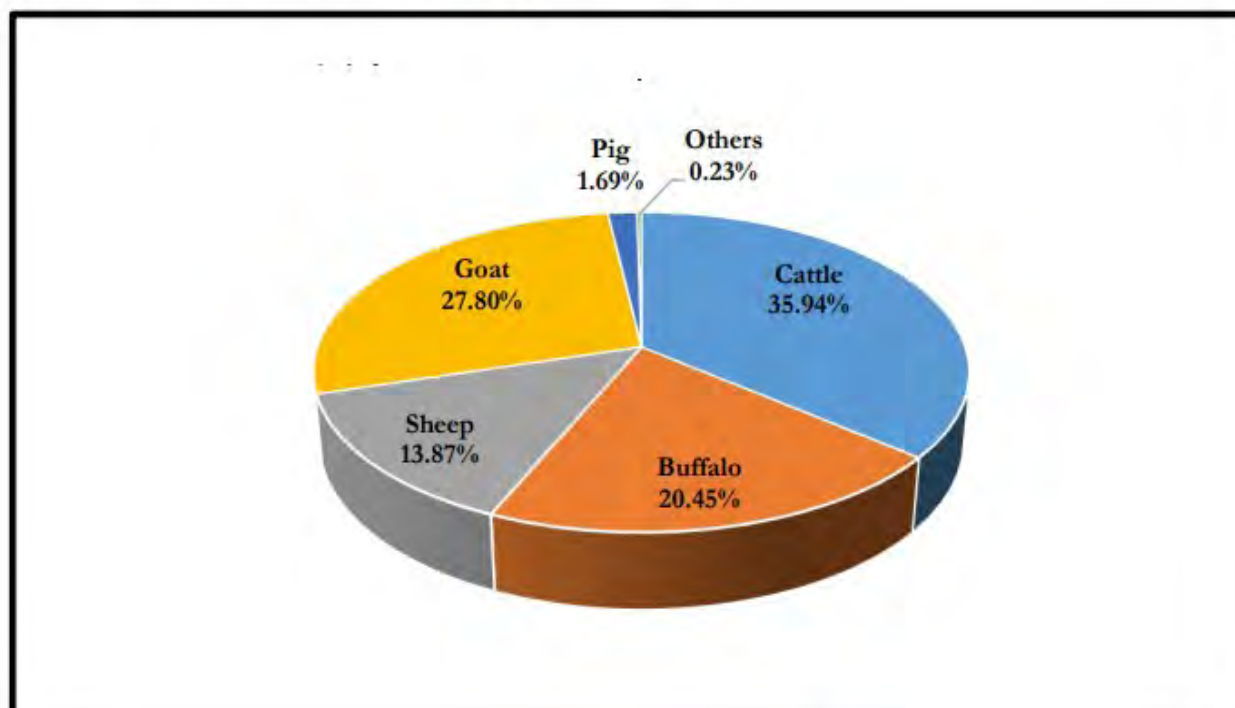
India's Animal Wealth

India has abundant animal wealth. India ranks number one in cattle & buffalo population. The Livestock Census has been conducted in the country periodically since 1919-20. The Livestock Census covers all domesticated animals and its headcounts. So far 19 such censuses have been conducted in participation with State Governments and UT Administrations. The 20th Livestock Census was conducted in participation with all States and Union Territories.

According to 20th Livestock Census, the total Livestock population is 535.78 million in the country showing an increase of 4.6% over Livestock Census-2012. Total Bovine population (Cattle, Buffalo,

Mithun and Yak) is 302.79 Million in 2019 which shows an increase of about 1% over the previous census. The total number of cattle in the country in 2019 is 192.49 million showing an increase of 0.8 % over previous Census. The Female Cattle (Cows population) is 145.12 million, increased by 18.0% over the previous census (2012). The Exotic/Crossbred and Indigenous/Non-descript Cattle population in the country is 50.42 million and 142.11 million respectively. The Indigenous/Non-descript female cattle population has increased by 10% in 2019 as compared to previous census. The population of the total Exotic/Crossbred Cattle has increased by 26.9 % in 2019 as compared to previous census. There is a decline of 6

Distribution of Livestock Population



Livestock Population, 2012 & 2019 of Major States

S.No.	States	Population (In million) 2012	Population (In million) 2019	% Change
1	Uttar Pradesh	68.7	67.8	-1.35
2	Rajasthan	57.7	56.8	-1.66
3	Madhya Pradesh	36.3	40.6	11.81
4	West Bengal	30.3	37.4	23.32
5	Bihar	32.9	36.5	10.67
6	Andhra Pradesh	29.4	34.0	15.79
7	Maharashtra	32.5	33.0	1.61
8	Telangana	26.7	32.6	22.21
9	Karnataka	27.7	29.0	4.70
10	Gujarat	27.1	26.9	-0.95

Poultry Population 2012 and 2019

	Population (In million) 2012	Population (In million) 2019	% growth
Total Poultry	729.21	851.81	16.81
Backyard poultry	217.49	317.07	45.78
Commercial Poultry	511.72	534.74	4.50

% in the total Indigenous/ Non-descript cattle population over the previous census. However, the pace of decline of Indigenous/ Non-descript cattle population during 2012-2019 is much lesser than as compared to the 2007-12 which was about 9%. The total buffaloes in the country are 109.85 million showing an increase of about 1.0% over previous Census. The total milch animals (in-milk and dry) in cows and buffaloes are 125.34 million, an increase of 6.0 % over the previous census. The total sheep in the country is 74.26 million in 2019, increased by 14.1% over previous Census.

The Goat population in the country in 2019 is 148.88 million showing an increase of 10.1% over the previous census. The total Pigs in the country is 9.06 Million in the current Census, declined by 12.03% over the previous Census. The other livestock including mithun, yak, horses, ponies, mule, donkeys, camel together contribute around 0.23% of the total livestock and

their total count is 1.24 million. The total poultry in the country is 851.81 million in 2019, which registered an increase of 16.8% in the total poultry. The total birds in the backyard poultry in the country is 317.07 million. The backyard poultry has increased by around 46% as compared to previous Census. The total Commercial Poultry in the country is 534.74 million in 2019, increased by 4.5% over previous Census.

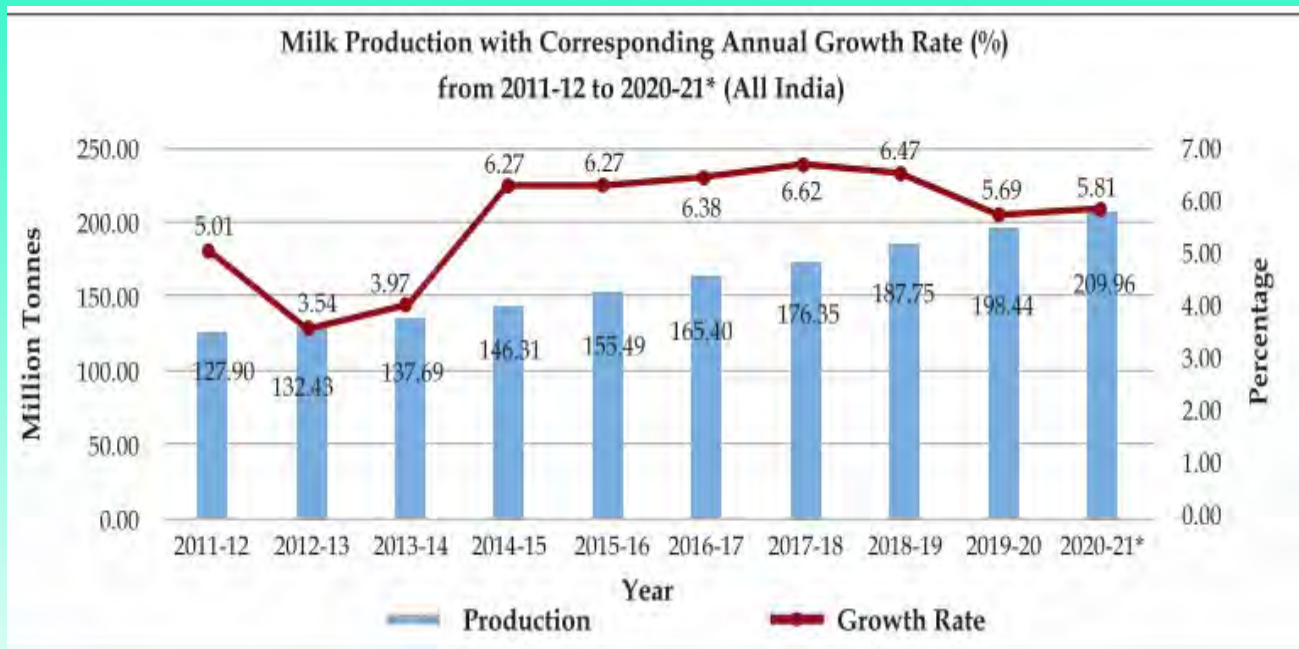
Livestock Production

As per the first revised estimates, the Gross Value Added (GVA) of livestock sector is about Rs. 11,14,249 crore at current prices during FY 2020-21 which is about 30.87% of Agricultural and Allied Sector GVA and 6.17% of Total GVA. At constant prices (2011-12), the GVA of livestock sector is about Rs. 6,17,117 crore during FY 2020-21 with a positive growth of 6.13% over previous financial year.

India continues to be the largest producer of milk in world. Several measures have

been initiated by the Government to increase the productivity of livestock, which has resulted in increasing milk production significantly. Milk production during 2019-20 and 2020-21 (Provisional) is 198.44 million tonnes and 209.96 million tonnes respectively showing an annual growth of 5.81%. The per capita availability of milk is around 427grams/day in 2020-21 (Provisional).

Poultry production in India has taken a quantum leap in the last four decades, emerging from conventional farming practices to commercial production system with state-of-the-art technological Note. Currently the total Poultry population in our country is 851.81 million (as per 20th Livestock Census) and egg production is around 122.05 billion numbers during 2020-21 (Provisional). The per capita availability during 2020-21 (Provisional) is around 90 eggs per annum. The Egg production has shown positive growth as 6.70% during 2020-21 (Provisional).



Wool production in the beginning of Twelfth Plan (2012-13) was 46.05 million Kg and increased to 48.14 million Kg in 2014-15 but declined to 36.93 million Kg in 2020-21 (Provisional). Meat production during 2014-15 was 6.69 million tonnes which has been further increased to 8.80 million tonnes in 2020-21(Provisional). The Meat production has shown positive growth as 2.31% during The Production of Major Livestock Products (MLPs) since 2011-12 to 2020-21(Provisional) The Government approved implementation of a Livestock Sector Package consisting of several activities by revising and realigning various components of following existing schemes in order to have focused development of animal husbandry and dairying across the country for next 5 years starting from 2021-22 with the outlay of Rs.9800 crore over a duration of 5 years for leveraging total investment of Rs. 54,618 crore for 5 years. Rashtriya Gokul Mission, National Programme for Dairy Development, Support to Dairy Cooperatives and Farmers Production Organisation engaged in dairy activities, National Livestock Mission, Livestock Census and Integrated Sample Survey and Livestock Health & Disease Control were some important programmes dedicated to animal husbandry.

Animal Health

With improvement in the quality of livestock through cross-breeding programmes, the susceptibility of these livestock to various diseases including exotic diseases has increased. In order to reduce morbidity and mortality, efforts are made by the State/Union Territory Governments to provide better healthcare through Polyclinics/Veterinary Hospitals, Dispensaries and First-Aid Centres including Mobile Veterinary Dispensaries, available with them. In order to effectively tackle the issue of livestock health, the Department supplements the efforts of the State Governments / Union Territories by way of financial assistance through the 'Livestock Health & Disease Control (LH&DC) Scheme. The aim is reducing risk to animal health by prophylactic vaccination against diseases of animals, capacity building of Veterinary services, disease surveillance and strengthening veterinary infrastructure. "Livestock Health & Disease Control" (LH&DC) includes three sub components (i) Critical Animal Disease Control Programme (CADCP) for eradication and control of two major diseases namely Peste des Petits Ruminants (PPR) and classical swine fever (CSF); (ii) Establishment and strengthening of mobile veterinary units(ESVHD); and (iii) Assistance to

States for control of other economically important, exotic, emergent and zoonotic animal diseases (ASCAD)

One Health

It is well known that human health and animal health are interdependent and bound to the health of the ecosystems in which they exist. This concept is envisaged to understand risks for human and animal health (including both domestic animals and wildlife) and environment as a whole. Diseases of animal origin that can be transmitted to humans (zoonotic diseases) such as Avian Influenza, Rabies, Brucellosis, Glanders, NIPAH, etc. pose worldwide risks to public health. These risks increase with globalization, climate change and changes in human behaviour, giving pathogens numerous opportunities to colonise new territories and evolve into new forms. As per OIE (World Organization for Animal Health), 60% of existing human infectious diseases are zoonotic and at least 75% of emerging infectious diseases of humans have an animal origin. Controlling zoonotic pathogens at their animal source is the most effective and economic way of protecting people.

The Department of Animal Husbandry and Dairying (DAHD), Government of India and Bill & Melinda Gates Foundation

have signed a multi-year Memorandum of Understanding on 22nd September, 2021 to work together on sustainably improving India's livestock sector to support the nation's food and nutritional security, and protect the economic wellbeing of small-scale livestock producers. Under this collaboration, One Health Support Unit (OHSU) at the Department of Animal Husbandry and Dairying (DAHD) is established for disease prevention, surveillance and response.

Animal Feed for Better Animal Health

India currently represents one of the largest feed producers in the world. The Indian feed industry is about 35 years old. It is mainly restricted to dairy and poultry feed manufacturing. The Indian Animal feed market was an estimated ~79.5 million tonnes in 2014 (all livestock & aqua). However, the actual market is much smaller because a large portion of this market is serviced by the unorganized (grazing) sector. The Organized Animal feed manufacturers are producing around 30 Million tonnes of commercial feed. Out of total production, Commercial production of cattle feed is about 8 million tonnes (organized manufacturers, as for eg Godrej Agrovet is manufacturing 1 million tonne of animal feed and is the largest compound feed manufacturer in India). Godrej Agro vet has tie-up with some of major dairy companies like Cream line Dairy, Heritage Dairy, Hatsun Dairy for cattle feed distribution). India exported 2000 tonnes of cattle feed (mainly maize basal) in current year and imported 9000 tonnes of copra based cake and feed supplement. India is exporting 74% of cattle feed to Pakistan and 21% to Belgium and importing 37% of cattle feed from Indonesia and 17% from Srilanka. However, in value terms China is the largest exporter to India. Mainly vet supplement like Folic acid based medicines, Vitamins are imported into India from China.

Recently, it was noted that raw materials used in the production of animal feed, like soybean meal, sorghum and maize, are being diverted for the consumption

of humans, leading to a shortage in the feed industry. Furthermore, the expensive nature, and price and supply volatility of these raw materials is encouraging industry players to switch to sustainable and lower-cost ingredients for livestock production. Some of these novel ingredients include insect meal and Distiller's dried grain with solubles (DDGS). Besides this, currently has a separate set of livestock policies that focus on increasing the overall productivity. Some of the schemes that are acting in favor of the animal feed market include E-Pashu Haat, Livestock Insurance Scheme, Rashtriya Gokul Mission, and National Livestock Mission. Suguna Foods Private Limited, Japfa Comfeeds India Pvt. Ltd., Venkateshwara Hatcheries Pvt. Ltd., Anmol Feeds Pvt. Ltd., Godrej Agrovet Limited (GAVL), SKM Animal Feeds and Foods (India) Ltd., Cargill, Incorporated., Kapila Krishi Udyog Ltd., Amrit Group, KSE Ltd., Avanti Feeds Ltd., Uno Feeds, Growel Feeds Pvt. Ltd., C P Aquaculture India Pvt. Ltd., Mulpuri Foods and Feeds Pvt. Ltd., The Waterbase Ltd., Grobest Feeds Corporation India Ltd., etc., are some of the important players in this segment.

The Indian Animal Health Industry

The Indian Animal Health Industry has played a vital role in safeguarding the animal husbandry interests of the nation. The Indian animal healthcare market is estimated to be around Rs. 5,500 crores (2020). The species share in AH market is 51% of livestock, 35% of poultry, 8% of companion animals, 5% of Aqua and rest 1% for other remaining animals. There are nearly >50 major companies operating in Animal health market in India though the market is dominated by top 10 players. Bayer CropScience Limited, Boehringer Ingelheim Animal Health, Cargill India Pvt. Ltd., Merck, Ceva Sante Animale, Elanco India Private Limited, and Virbac Animal Health India Pvt Ltd., etc., are some important players.

The regulation of Animal health products in India is under the control of Veterinary Cell of CDSCO (Central Drug Standard Control Organisation). The technical review for veterinary products for

registration is done by Department of Animal Husbandry and Dairying for the farm and companion animal products and Department of Fisheries for the Aqua products. The Biologicals are studied and evaluated by Indian Institute of Veterinary Science (IVRI). Department of AYUSH is responsible for bringing regulations for herbal and contemporary medicines meant for animal use.

Animal Husbandry in India has undergone magnificent changes over the years, thanks to the adoption of innovative technologies used for prevention and cure of farm and companion animals. There has been a paradigm shift in the business approach of Animal health companies that have evolved from therapeutics to preventive to productivity enhancement and now to overall healthcare of the animals.

Through new approaches and paradigm, the animal health industry has evolved and propelled the animal husbandry to new heights of glory. India's surge to the top of milk and egg production reinforces the significance of Animal Health Industry. The Animal health industry is working together and strengthening the Animal Husbandry in the country.

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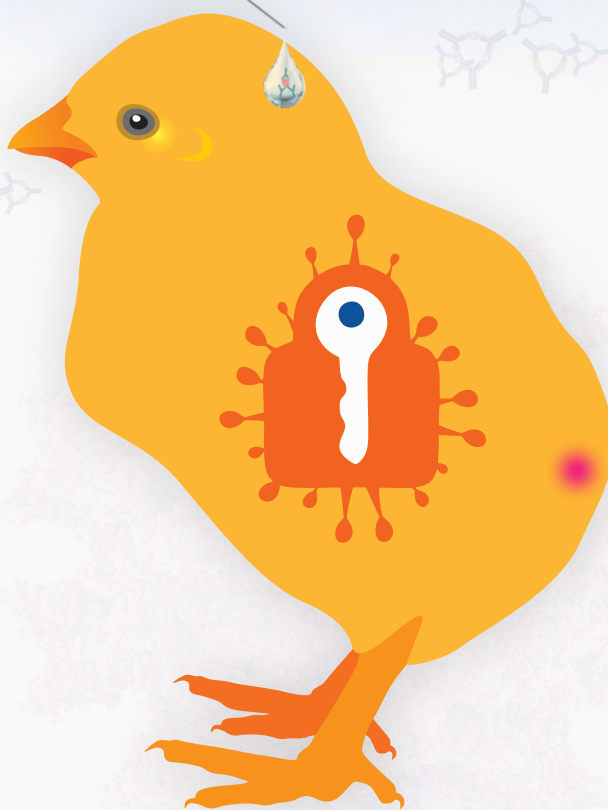
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HUSBANDRY OF ANIMALS

DYNAMIC PATH TO PROSPERITY

Why do we associate husbandry with animals, but not crops or other production systems?

Domestication of plants, and more importantly animals marked a major and dramatic turning point for humans: the beginning of an agricultural way of life, resultantly a stable civilization. The domesticated creatures also became integrated into the social and cultural fabric. All across civilisations and religions, domesticated animals came to symbolize order as opposed to the chaos of the untamed world.

Husbands, as yet, had not become hen-pecked. They were robust men of the soil – farmers. Husband originally meant a male

head of a household, and subsequently husbandry did not mean a husband, but referred to farming, livestock farming to be precise. Portia, the rich and beautiful protagonist in Shakespeare's popular play *The Merchant of Venice* meaningfully says, "*Lorenzo, I commit into your hands / The husbandry and manage of my house.*"

Globally more than a billion people depend on livestock

value chains for their livelihoods.

Global

demand for

livestock

products is

expected to

increase by

up to 50

percent

by

2050, creating further economic opportunities.

Against this background, is it not intriguing that in spite of being one of the fastest growing sectors of our economy at a compound annual growth rate (CAGR) of 8.2% over the past several years, at par with manufacturing and much higher than agriculture, lack of even a basic awareness and recognition have plagued the sector? The sector has generally remained low in political and governance priorities, ever struggling for public investment and affordable access to capital.

From another perspective this public and governance apathy has spurred the sector and its stakeholders to develop a strong entrepreneurial and competitive environment.

Global Leader In Milk Production

We are the global leader in milk production, by a great distance, and have been retaining the leadership position for decades now, and should continue to remain the leader for times to come. The second positioned USA's production is half of ours. In fact, we add more milk each year to our milk pail than what the entire Europe does. Growing steadily at an annual rate of about 6.5%, dairying provides livelihood to nearly nine crore rural households and contributes about 25% to our agriculture and allied sectors' GDP.

The total value of our dairy produce in 2018-19 is estimated at Rs 7,72,705 crore. The combined value

About the AUTHOR

Dr. Tarun Shridhar is former Secretary, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India



of wheat and paddy in the corresponding period was Rs 4,99,653 crore. The biggest strength of the sector is that more than 60% of the end value of the output flows back to the primary milk producer viz. the farmer. Could we make this claim about any other agricultural product?

Strong Poultry and Aquaculture Sectors

Poultry and Aquaculture stand out in the agriculture sector in general and animal husbandry in particular. It is because they stand on their own feet. They too have been at the margins of political and government attention, and compared to agriculture, dairy etc. close to being ignored. Yet they have consistently, over the years, registered growth so impressive as to leave other sub-sectors of Agriculture and Animal Husbandry trailing far behind. Being low on the political and governance agenda has perhaps been a blessing as it has spurred entrepreneurship and the resultant competitive spirit.

The Indian poultry market, consisting mainly of broilers and eggs, was worth Rs 1,75,000 crore in 2018. It is projected to reach Rs 4,34,000 crore by 2024, growing at a CAGR of above 16%. The growth rates during the last few years for eggs and poultry meat are averaging more than 6% and 9% per annum respectively, in spite of major setbacks due to the corona pandemic forced shutdowns and the later bird-flu outbreaks.

Both these extreme events caused disproportionately high and undeserving setbacks to the poultry industry, but the bounce back has been impressive and exemplary. This was made possible by the largely organised and integrated

structure of the industry which has given it an inherent resilience.

The sector's dependence upon the government to bail it out was much less compared to many other sectors of the economy. In fact, the challenge posed by Covid was converted into an opportunity by the poultry business, spurring new business and market models to reach out to the consumers through delivery of value added products. And it was on account of the innovativeness and entrepreneurship of the industry rather than any hand holding by the government.

**fun
FACT**



Dr Shridhar is a voracious reader and a keen spectator. He often livens up his writings on the serious subjects of agriculture with references to literature, Bollywood and popular culture



Phenomenal Growth of Indian Poultry Sector

A look at the following performance figures over the past two decades of the century beginning 2000s would illustrate the comparative performance of poultry against other subsets of agriculture. Since the year 2000 onwards till the current year, the food grains production, the primary focus of our agriculture and the resultant infusion of government investment, registered a growth of 56%. During the same period, poultry has grown nearly 500%.

India has emerged as one of the fastest growing poultry markets in the world. Poultry has organised and integrated itself into an industry; and hence has grown from a primary farming activity into a business enterprise. Our

We are either at the top or near the top in production of almost all the major agriculture and livestock commodities. In absolute terms we are huge, but low productivity plagues us

unorganised and backyard poultry sector is one of the potent tools for subsidiary income generation for many landless/marginal farmers, besides providing nutritional security to the rural poor. This too finds integration into the larger production and supply chain; even the relatively sophisticated transition from live birds to chilled and frozen products. In many stand alone models, backyard poultry is the source of supply of high value free range eggs and organically produced chicken.

Second-Largest Fish Producing Nation

Contributing 7.58% to the global production, India is the second largest fish producing country in the world. The fishery sector contributes 1.24% to our nation's Gross Value Added (GVA) and 7.28% (2018-19) to the agricultural GVA. Fisheries and aquaculture continue to be an important source of food, nutrition, income and livelihood to millions of people. This largely unsung sector has been registering an impressive annual growth rate hovering between 8 to 12% over the past decade. Fish, including fishery products, is the single most valuable agricultural export commodity growing consistently at around 10% in recent times; the total value of our annual exports being about Rs 47,000 crore, equivalent to approximately US\$ 6.75 billion.

Shrimp Farming

Within Fishery and Aquaculture, Shrimp farming has decisively demonstrated that aquaculture can profitably graduate from livelihood farming to a flourishing business. A decade back we were producing just over one lakh tonnes of shrimp. Today our production is about 9 lakh tonnes. There hardly would be any other examples of such a spectacular growth. Within this decade from being a global nobody, we have emerged as the world leader in shrimp exports, having captured 26% of global trade. It is robust and effective policy, infrastructure support and creation of an enabling environment

ANIMAL HEALTH



Control Zoonotic Diseases

The relationship between animal and human health is inextricable. Covid pandemic is a glaring example. According to WHO and World Animal Health Organisation, 60% of existing human infectious diseases are zoonotic - transmitted to humans from animals. 75% of emerging infectious human diseases have an animal origin. Of the five new human diseases appearing every year, three originate in animals. 80% biological agents with potential bio-terrorist use are zoonotic pathogens. Zoonotic diseases account for nearly two billion cases per year resulting in more than two million deaths – more than HIV/AIDS and diarrhea combined. One fifth of premature deaths in poor countries are attributed to zoonotic diseases. Hence the strong case for strengthening veterinary institutions and services.

The most effective and economic approach to protecting human health is to control zoonotic pathogens at their source. This would require close institutionalized and harmonized collaboration at local, regional and global level between the veterinary, health and environmental governance. Higher levels of investment, both in financial allocations and policy priorities, in animal health infrastructure would be a sine qua non. Developing countries like ours have much greater stakes in strong One Health systems on account of small agricultural holdings and mixed farming systems resulting in uncomfortably close proximity of animals and humans.

OIE definition of One Health states “human health and animal health are interdependent and bound to the health of the ecosystems in which they exist”. This calls for a strong case for health and disease surveillance to incorporate domestic animals, livestock and poultry too. Humans require a regular diet of animal protein from milk, eggs, meat etc., and protein deficiency is a public health concern. Thus loss of food animals on account of poor health or disease also becomes a public health issue even though there may be no direct disease transmission; and we lose 20% of our animals this way.

The global burden of animal diseases is huge. It leads to a burden of human diseases, impacts food security and dents the economy

Animal Diseases Impact Economy, Livelihood

In the face of demographic challenges, increased international trade and the effects of climate change, animal health is more fundamental than ever to the development and well-being of human populations around the world. Livestock constitutes 40% of the value of global agriculture, and supports the income and livelihoods of one fifth of the global population, mostly in developing countries. Obviously, animal diseases can significantly impact the economy and livelihood of a vast multitude.

The global burden of animal diseases, though difficult to measure, is huge. It quite evidently leads to a burden of human diseases, impacts food security, dents the economy etc. Covid has demonstrated it also strikes at the basic fabric of society and its lifestyles. A zoonotic micro pathogen brought the entire mankind on its knees and forced it into a self imposed lock-up.



The size of our human and livestock, including poultry populations, is almost the same. A network of nearly two lakh health institutions across different levels in the government sector form the backbone of health governance, further supported by a large number of private health facilities ranging from village medical practitioners to multi-speciality hospitals. On the other hand only 65,000 veterinary institutions tend to the health needs of 130 plus crore animals. This figure includes 28,000 mobile dispensaries and first aid centres i.e. institutions having bare minimum facilities.

Private sector presence in the veterinary services in the country is negligible; close to being non-existent. Unlike a physician, a veterinarian is always on a house call on account of the logistic challenge of transporting the livestock to the hospital. There could not be a stronger case for expanding and reinventing the entire veterinary services sector to aim at reaching each and every livestock farmer, not only for treatment of animal diseases but for prevention, control and surveillance to minimize the threat to human health. Early detection of diseases and infections at animal source can prevent their transmission to humans and also prevent introduction of pathogens into the food chain. So a robust animal health system is the first and a crucial step in human health.



that have made it possible, and certainly not government subsidies.

We are either at the top or near the top in production of almost all the major agriculture and livestock commodities. But we owe this position to our sheer numbers rather than efficient production systems. In absolute terms we are huge, but low productivity plagues us; half the country's population is engaged in agriculture but contributes a meagre less than 16% to the national GDP. This simple fact itself gives a clear idea of how low our productivity is, and what a lost opportunity it amounts to.

The time is more than opportune to reorient our perspective of Animal Husbandry from being a primary livelihood activity to a viable business vocation; accord it recognition as a prime engine of economic growth and prosperity, and not just a food production system. In any case we produce more than we need, so why should we carry the burden of low value food surpluses. It is important to differentiate between food and animal husbandry, and agriculture too. While food is one of the biggest items of household expenditure, the money flows more to value addition rather than livestock and agriculture. The primary producer generally stays marginalised. Agriculture and Animal Husbandry could do well through a paradigm shift in approach from production to value, from quantity to quality; a model already demonstrated effectively by the poultry and the shrimp farming sectors.

IDF World Dairy Summit, Delhi, September 2022

The Dairy World is coming to India

After two years of pause, the International Dairy Federation World Dairy Summit will be held in Delhi, in September 12-15, 2022. Dairy interested parties from around the world will join in India. It is a unique opportunity for dairy farmers, leaders, experts, scientists, academic and professionals from several countries to learn, connect and get inspired with the latest sciences and trends on dairy.

Since the Summit is a window to the world, India will showcase its dairy sector and learn from world colleagues. India will share its success story and explain how dairy has been and is still an engine for development and women empowerment.

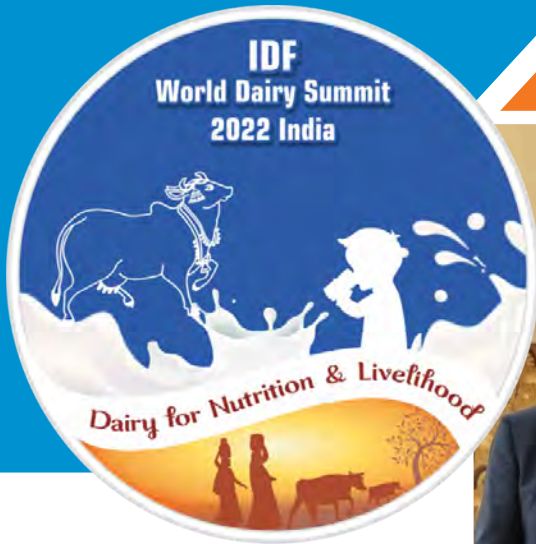
In my opinion, the Summit will demonstrate the singularity of dairy in India both in term of the role of cooperative movement in the dairy sector in India and



Ms Emond with some local women at the Mujkuva Sakhi Khad Sahakari Mandli on May 18



Ms Caroline Emond was appointed Director General of the International Dairy Federation in February 2018. She is a lawyer, has been a diplomat and has 25 years' experience in senior executive and public affairs roles in private, public and the not-for-profit sectors



the importance of dairy in Indian economy and culture. It will also demonstrate the contribution of animal health and welfare in improving productivity and reducing input on environment while increasing revenues to farmers.

Under the theme 'Dairy for Nutrition and Livelihood', speakers will provide insights on the importance of dairy in nutrition and livelihood as well as additional topics such as sustainability, innovation, technologies, farm management and animal care, food safety, school milk programs, and contribution of dairy to the UN SDGs. We hope to see meet you there.

IDF is the global dairy expertise since 1903. It is composed of 39 countries representing 74% of the milk production. www.fil-idf.org

About IDF

The International Dairy Federation (IDF) represents the global dairy sector and ensures the best scientific expertise is used to support high quality milk and nutritious, safe and sustainable dairy products. IDF is the leading source of scientific and technical expertise for all stakeholders of the dairy chain. Since 1903, IDF's network of dairy experts has provided a mechanism for the dairy sector to reach global consensus on how to help feed the world with safe and sustainable dairy products.

A recognised international authority in the development of science-based standards for the dairy sector, IDF has



Ms Caroline Emond With Ms Mamta Jain, CEO and Editor of The Agriculture Today Group and Mr Piercristiano Brazzale, President of International Dairy Federation

an important role to play in ensuring the right policies, standards, practices and regulations are in place to ensure the world's dairy products are safe and sustainable.

With over 1,200 highly qualified dairy experts in 43 member countries around the world, IDF represents 75% of global milk production and provides a permanent

source of authoritative scientific and technical information relevant to the dairy sector.

IDF Mission

To nourish the world with safe and sustainable dairy. IDF is the only organization representing the entire dairy value chain at a global level.

tête-à-tête with Anjana

INDIA'S Milk Titan

Dr Rupinder Singh Sodhi is the man who converted Gujarat Cooperative Milk Marketing Federation (GCMMF), a farmers' cooperative in Gujarat, to the most successful cooperative globally. Amul, the flagship brand of GCMMF, is one of the best recognized brand names in India.

The transformation of Amul from a localised milk cooperative to The Taste of India is the story of grit and determination, led by Dr Sodhi. The soft-spoken Dr Sodhi is among India's tallest and most respected corporate leaders. He has been instrumental in reinforcing the brand through expansion of Amul's product portfolio marked by inspiring launches of several innovative and

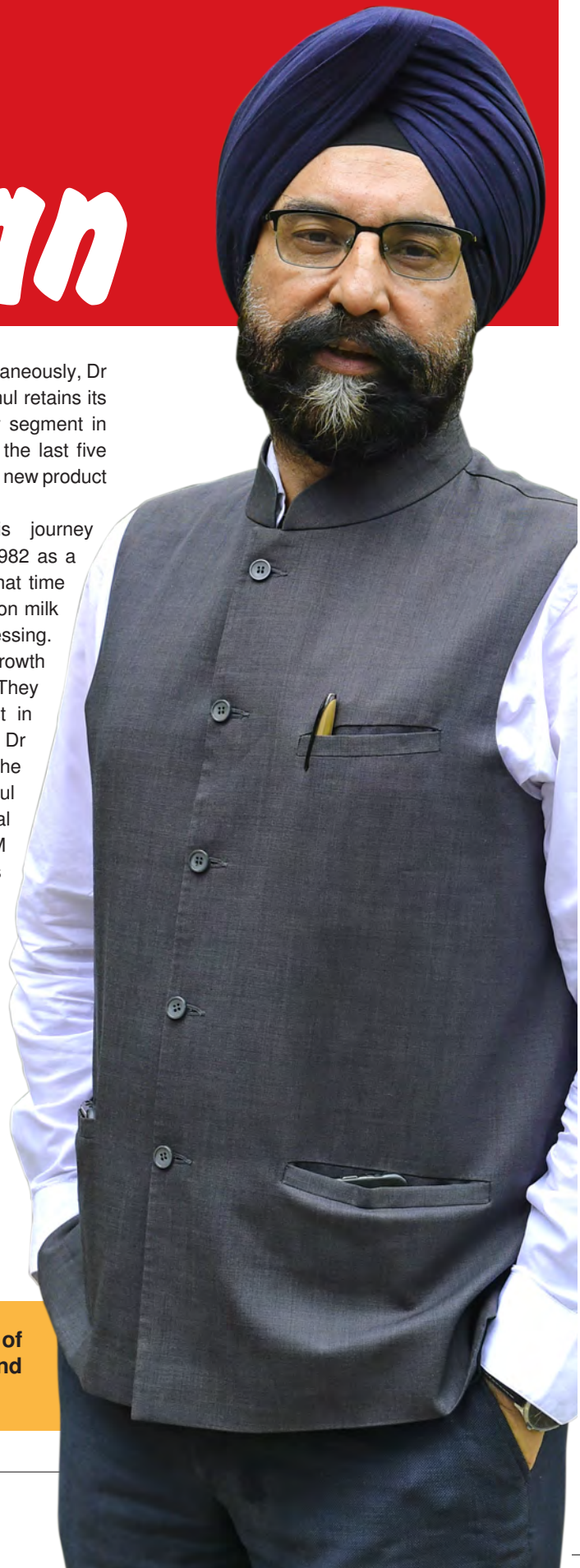
pioneering products. Simultaneously, Dr Sodhi has ensured that Amul retains its leadership in almost every segment in which it operates. During the last five years, Amul has launched a new product every 15 days!

Dr Sodhi started his journey with Amul on March 30, 1982 as a humble Sales Officer. At that time Amul concentrated mainly on milk procurement and processing. Dr Sodhi's and Amul's growth have been synonymous. They both brought out the best in each other. Since 1994, Dr Sodhi has been part of the leadership team at Amul which spearheaded Total Quality Management. TQM helped to transform Amul's

Today, Amul accounts for 27% of the organized dairy industry within India. It occupies the eighth position among the top milk processors globally because of the stellar leadership and vision of Dr Sodhi



Dr RS Sodhi, Managing Director since June 2010 of GCMMF Ltd (AMUL), India's biggest food and dairy brand having annual turnover of \$8.8 billion or Rs 61000 crore



organizational culture, equipping it with the means to meeting the challenges of liberalization.

Early Years In Punjab

Dr Sodhi was born on December 8, 1958 in a village called Ratta Khera in Ferozepur, Punjab, to Sohan Singh and Tej Kaur Sodhi. He did his schooling in the Municipality School in R K Puram, Sector 1, New Delhi. Following the advice of his friend Sanjay Mehta, young Rupinder applied for admission to College of Technology and Agricultural Engineering (CTAE) at Udaipur in Rajasthan, and graduated B.E. (Agricultural Engineering). He later earned his Post Graduate Diploma in Rural Management from Institute of Rural Management, Anand (IRMA), Gujarat. He was among the first batch of students to pass out from IRMA.

Meteoric Rise

Today, Amul accounts for 27% of the organized dairy industry within India. It occupies the eighth position among the top milk processors globally because of the stellar leadership and vision of Dr Sodhi. Since Dr Sodhi took over as National Head of Marketing, Sales & Distribution in 1993, the business turnover of Amul has grown 47 fold from Rs 980 crore in 1994-95 to Rs 46,550 in 2021-22. During 2020-21, the group turnover of Amul exceeded Rs 61,000 crores.

Dr Sodhi's magnanimous vision for Amul needed solid backing from dairy farmers in the form of higher milk supply. He made sure that milk flowed to Amul uninterrupted. Under his leadership, Amul was able to collect higher quantity of milk from more number of farmers. This enabled the

tête-à-tête with Anjana



cooperative to double its membership base from 17 lakhs farmer-members in 1993 to 36.3 lakhs farmer-members in 2022, and number of villages from 8900 to 18600 societies in 2022. Through remunerative prices and technological support, Dr Sodhi encouraged the farmers of Amul to increase milk procurement. It

is a testimony to his untiring efforts that Amul's milk procurement jumped by 194% in the last 11 years.

Stellar Growth

Dr Sodhi took over as Managing Director of GCMF in 2010. He has increased the milk procurement price paid by Amul



Honours And Awards

- Honorary Degree of Doctor of Science by Gujarat Governor and Chancellor of Anand Agriculture University Shri O P Kohli in December 2018
- Asia Pacific productivity Champion by Asian Productivity Organization (APO), Tokyo, Japan
- Life time achievement award by the President on behalf of the All India Food Processors Association
- 'Innovating For A Better Tomorrow' By CNN-IBN & CNBC-Tv18.
- All India Management Association (AIMA) Public Service Excellence Award
- "Marketer Of The Year" By International Advertising Association Of India
- IMC Distinguished Alumnus Award 2015
- Lifetime Achievement Award By The Agriculture Today Group, 2021
- Bhamashah Award By CAIT



to farmers by 140% in the last 10 years, from Rs 337 per Kg-fat in 2009-10 to Rs 835 per Kg-Fat in 2021-22.

Over the years, Dr Sodhi has helped to expand GCMMF's cooperative network within the state and across India. GCMMF, through its constituent Member Unions, procures milk from several other states including Haryana, Punjab, Rajasthan, Goa, Chhattisgarh, Maharashtra, West Bengal, Bihar, Madhya Pradesh, Uttar Pradesh, Assam, Andhra Pradesh and Jammu & Kashmir. This has ensured that the benefits of Amul's cooperative movement have reached farmers across India. Dr Sodhi has played a pivotal role in the revival of the dairy industry of Jammu and Kashmir.

GCMMF's involvement is just not restricted to milk procurement. It

Distribution Highways For GCMMF

Dr Sodhi has helped create four unique and distinct distribution highways for GCMMF based on temperature requirements for storage and transportation. GCMMF is the only organization in India to successfully manage the four distribution highways. Through these distribution highways, Amul products manufactured at 94 dairy plants are supplied to 130 warehouses and then to 10,000 distributors and 1 million retail shops all over India.

has percolated to sectors that have direct bearing on milk production and collection. Dr Sodhi is a strong believer in tech power. He has made sure that the cooperatives are technology driven.

Tech Power

During the last 11 years, the number of bulk milk coolers deployed at village level has gone up almost four times from 1802 to 7000. The number of villages with automatic milk collection systems has increased by 95% in last 10 years. Dr Sodhi has also initiated the Strategic Productivity Enhancement Programme in Amul. Under this programme, initiatives like artificial insemination, pure breeding, calf rearing, vaccination, deworming, supply of sexed semen doses etc. is carried out to improve productivity of milk animals. To provide nutritionally



balanced Total Milk Ration at lower cost for better milk productivity and animal health, GCMMF is encouraging its member unions to initiate Total Mixed Ration project.

To improve animal fertility, GCMMF has initiated the Fertility Improvement Programme (FIP). As part of this initiative, teams of dedicated and experienced veterinary doctors conduct animal camps in selected villages. To provide balanced nutrition to the animals owned by milk producer members, the member unions of GCMMF supply around 10,000 MTs of cattle feed daily to more than 18,600 villages at no-profit no-loss business policy.

Dr Sodhi is keen on employing Information technology to integrate all business processes at GCMMF. He championed the implementation of the first ERP at GCMMF in 2000. He also steered the implementation of SAP across GCMMF in 2011 and across its district-level constituent Member Unions in the last 11 years.

Dr Sodhi is deeply committed to the welfare of farmers. During 2019, to safeguard the interest of millions of milk producer members of India against the consequences of Regional



Dr Sodhi is deeply committed to the welfare of farmers. During 2019, to safeguard the interest of millions of milk producer members of India against the consequences of Regional Comprehensive Economic Partnership (RCEP), Dr Sodhi led the battle and convinced policy makers not to include dairy in the agreement

Comprehensive Economic Partnership (RCEP), Dr Sodhi led the battle and convinced policy makers not to include dairy in the agreement.

Trained under the direct guidance and mentorship of the legendary Dr Verghese Kurien, Dr Sodhi has ensured that values cherished by Dr Kurien, such as integrity, dedication, courage, honesty, commitment to farmers and to consumers, remain deeply ingrained in the culture of GCMMF.

Dr Sodhi credits the success of Amul to the unshakeable faith of farmers. Amul has given crores of farmers identity and strength. Dr Sodhi speaks of the time when about 10000 widows from Banaskantha told him that Amul gave them identity and livelihood. Amul's success is also because of the rapport it has developed with the consumers. Dr Sodhi holds on to the advice of Dr Kurien, "Never try to short-change the consumer. They are always smarter than you."

A proud *dhoodhwala*, Dr Sodhi believes that success has no short cuts. It is all about hard work, perseverance and passion. And he has proven every bit of it.

GATEWAY TO PROSPERITY

SOCIO-ECONOMIC RELEVANCE

WHITE REVOLUTION



About the AUTHOR

Shri Meenesh Shah is Chairman, National Dairy Development Board (NDDB). He is also the Chairman of Mother Dairy Fruit & Vegetable Pvt Ltd, Indian Immunologicals Ltd., IDMC Limited, NDDB Dairy Services, Pristine Biologicals (NZ) Ltd., Anandalaya Education Society and Animal Breeding Research Organisation

Dairying in India is more about livelihoods than a business and has an intricate relationship with various facets of the rural economy. The landless, marginal or small holder dairy farmers are the quintessential milk producers in our country, with each owning only 1-2 milch animals, but adding up to a whopping eighty five percent of the total dairy animals. Only 5% of the milk producers in India own more than five animals. Even with this sparse distribution, milk production has been growing at an annual rate of about 6% in India when the global growth has only been around 2% annually. The per capita availability of milk in our country has also increased significantly from 124 gms per day in 1950-51 to 427 gms per day in 2020-21.

Even though dairying in our country is an ancillary agriculture activity and is crop residue based, milk is the single largest agricultural commodity in terms of value – larger than the value of rice, wheat and sugarcane put together, which are India's principal crops. This in itself is testimony to the importance of dairying in our rural economy. India's small holder dairy system has



contributed substantially to the national milk production in the last four decades. The value of milk accounts for 67% of the livestock output and is about 20% of the total output from agriculture and allied sectors.

Integral Part of Rural Fabric

Dairying generates 5-6% of total rural employment, especially for women and contributes about 12% of the rural household income. It is an instrument of rural prosperity and change with gender inclusiveness, providing the necessary succor to farmers to help them tide over difficult times like seasonal calamities or crop failures.

India also has the largest population of bovines in the world, with above 300 million Cattle, Buffaloes, Mithun and Yak. The low milk production of the bovines in the country often has a negative connotation. But dairying in India is not only about milk production. A large part of the rural economy is still dependent on the draft power provided by the bullocks for tilling land and transportation. Cow dung is still being used as a fuel source in many villages in our country, either by direct burning of dried dung pats or through household biogas units.

Dairying in our country would be incomplete without considering these offshoots which are equally contributing to the rural economy. These animals are also a source of liquidity for the farmers to meet their emergency needs like marriage of children, hospital

Challenges

It may be noted that out of the total marketable surplus available in the country, less than 35% is procured by both dairy cooperatives and private entities in the organized sector, with the remaining 65% still in the unorganized sector where the farmers, more often than not, are exploited and do not get a fair price for their produce. Unlike many other produces that can be stored, milk is such a perishable commodity that the farmer does not have a choice but to sell it at whatever price offered to him/her or risk losing the milk value.

Once the challenges like transport & cold chain infrastructure, quality maintenance, market access etc. are addressed, larger markets can be explored that will give even better returns to our small and marginal dairy farmers.

expenses and so on.

Success of Milk Cooperative Networks

India is also the largest producer of milk in the world with an annual production of about 210 million tons in 2020-21. The increase in productivity of animals resulting from various breed improvement programmes and increase in Artificial Insemination (AI) coverage has definitely contributed to

this milk production increase.

But more so, it has been due to proper milk aggregation and upward linkages that have been created—from procurement to processing to marketing, that has enabled even a small and marginal farmer to sell whatever excess milk s/he has in his home stead, twice a day through the milk cooperative system that was created across the country as a part of the Operation Flood (OF) programme.

The milk cooperative network, which links more than 18 million farmers to about 221 thousand dairy cooperative societies (DCS) at the village level, which in turn federate to 231 dairy cooperative unions and, 22 state level federations and apex bodies, has contributed significantly in the growth of the domestic dairy sector to make it the largest milk producer in the world. NDDDB is proud to have played a significant role in achieving this by implementing the OF programme which has been touted as one of the largest successful rural development programmes in the world by the World Bank.

This cycle of creation of milk cooperatives and lately, milk producer companies, has continued through the years, enabling India to become the largest milk producer in the world in 1998 and has maintained the position till date. It is also noteworthy that unlike many other businesses, where the middlemen take the major cut of the profits, the milk producing institutions, be it a cooperative or a producer company, gives back more than 75% of the selling price to the farmer, making it probably a unique business model that eliminates intermediaries. Some dairy cooperatives also provide other input services like veterinary aid, cattle feed supply, cattle insurance, cattle loans etc., at subsidized rates so that the farmers are not burdened with the overheads. They are also provided with an easy payment option of debiting small amounts from the milk bill to ease payment load.

ANIMAL HUSBANDRY IN INDIA GOI THRUST ON GROWTH



About the
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Dr Praveen Malik
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Commissioner, Department
of Animal Husbandry and
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Since decades, livestock is an important secondary source of income for landless and marginal farmers and plays an important role in national economy, especially rural economy. About 20.5 million people are solely dependent upon livestock for their livelihood, providing livelihood to about two-third of rural community. It also provides employment to about 8.8 % of the India's population.

Livestock Sector has continuously been growing at Compound Annual Growth Rate (CAGR) of 7.93% (at constant price) from 2014-15 to 2020-21, which is comparable to CAGR of manufacturing at 4.93 % (at constant price) and Services at 4.82% (at constant price) and in contrast to Agriculture (Crop Sector) CAGR of 2.05% (at constant price). This CAGR is higher than other sectors like manufacturing, Services, and crop sectors. Agriculture (crop sector) contributed 8.96 % (at constant prices) of total GVA, whereas livestock sector contributed 4.90% (at constant prices) of total GVA in 2020-21.

Agriculture diversification through animal husbandry is one of the primary drivers of growth in rural incomes and higher public investment in livestock sector is need of the hour for enhancing the farmers' income and bringing prosperity to smallholder farmers. Animal husbandry occupation is considered not only a solution for poverty alleviation. It is rather a mode for wealth creation and prosperity of rural community. Food produced from farm animals is source for nutritional security to even the poorest people and communities and sale of products as source of income. Also, animals

are considered as assets that provide insurance and saving mechanisms in settings where people have little access to alternative source of incomes.

The farmers in India maintain mixed farming system i.e., a combination of crop and livestock where the output of one enterprise becomes the input of another enterprise thereby realize the resource efficiency. Also, this provides a cushion to smallholder farmers to bear losses, leading to reduced number of suicide cases among farmers with livestock.

Revision, Realignment Of GOI Schemes

To further boost growth in livestock sector and thereby making animal husbandry more remunerative to 10 crore farmers engaged in the animal husbandry sector, recently the Government has revised and realigned various components of Government of India's schemes for next five years starting from 2021-22 with the outlay of Rs 9,800 crore over for leveraging total investment of Rs 54,618 crore for five years.

With the aim to boost productivity, the department has realigned various schemes to promote breed improvement. Rashtriya Gokul Mission (RGM) is crucial



Dr Malik is fond of sports and of travelling

for development and conservation of indigenous breeds and enhancing milk production and productivity to meet growing demand of milk, making dairying more remunerative to the rural farmers of the country. Besides, Animal Husbandry

Rashtriya Gokul Mission (RGM) is crucial for development and conservation of indigenous breeds and enhancing milk production and productivity to meet growing demand of milk, making dairying more remunerative to the rural farmers of the country

Infrastructure Development Fund would support to the value addition and milk/meat processing, veterinary drugs & vaccines industry, and waste to wealth by managing agri-livestock waste. Recently, the activities for Breed Multiplication farm and Accelerator Breed Improvement Technology have been included in the DAHD schemes.

The realigned National Programme for Dairy Development (NPDD) scheme aims to enhance quality of milk, milk products and increase share of organized milk procurement. Component 'A' of the scheme focuses on milk procurement, processing, marketing and quality of milk and milk products and component 'B' will avail financial assistance from Japan International Cooperation Agency (JICA) as per project agreement already signed with them and will create strengthened or fresh infrastructure in 4500 villages.

Emphasis On Quality, Food Safety

To improve consumer confidence in dairy products manufactured and retailed in India and ensure consistency in implementation of food safety across the dairies, Department of Animal Husbandry and Dairying undertook initiatives for demonstrating quality and food-safety



in the dairy sector by bringing about process improvement and a Unified Dairy Mark developed and notified by the Bureau of Indian Standards (BIS) with the help of National Dairy Development Board (NDDB) under the Conformity Assessment Scheme (CAS) of milk products, which was launched by Hon'ble Prime Minister Shri Narendra Modi.

Under Dairy Processing and Infrastructure Development Fund, NDDB has also been allowed to provide loan directly to the Eligible End Borrower/ End Implementing Agency. In addition to Dairy Co-operative, Multi state dairy Cooperative, Milk Producer Companies, SHGs and FPOs registered under cooperative, and companies act also eligible under DIDF for avail assistance.

The department has been promoting entrepreneurship to implement technological interventions at the field level and making the livestock sector more sustainable. Some of the start-ups focusing on animal health management, animal breeding and food safety are as follows.

- Use of health tracking devices and artificial intelligence as one point of management
- Use of artificial intelligence to monitoring the breeding programs and tracking progress of the livestock
- Product traceability tools to ensure food safety from farm to fork.

However, there is there is need for increased private sector investment through PPP model to adopt the technological tools and reap the benefit for the increased outputs. The current start-ups and technology revolution will need to transform the resolution to adapt modernisation thus pushing the nano-steps towards achieving the "Second White Revolution" in the country.

National Livestock Mission

DAHD in collaboration with BMGF is piloting the one health interventions to develop a National One Health framework for the country. The framework is aimed at improving national and state-level resource allocation and policies

We have not yet fully tapped into the potential of the livestock sector. There have been various gaps like limited animal identification, limited participation of private sector and limited knowledge to farmers on government schemes among other challenges



ecosystem on One Health and early prediction, detection and diagnosis of zoonotic diseases through increased quality, availability and utility of data evidence.

National Digital Livestock Mission

There have been various national and state programs and schemes. But we have not yet fully tapped into the potential of all aspects of the livestock sector to lift millions of farmers' livelihood across the whole country. There have been various gaps like limited animal identification, limited participation of private sector and limited knowledge to farmers on the government schemes among other challenges.

To address these issues comprehensively, DAHD is working towards development digital architecture under "National Digital Livestock Mission". The framework focuses on integrating multiple databases/ digital programmes of national & state government under one umbrella and transforming the reporting mechanisms to paper-less. This shall help in educating farmers on

all the schemes and reaping benefit for the development, enhance transparency of activities among national & state government and data analysis to future use.

The Department has also been working to boost trade & facilitate step for "Ease of Doing Business" and also working to ease out the drugs or vaccines regulatory approval processes.

Having completed 75 years of Independence and entry into Amrit Kal, India is now headed towards becoming a centennial in 2047. With the rapidly increasing population, futuristic goals can be set-up for next 25 years with focus the productivity enhancement and making India Atma Nirbhar to ensure food-nutritional security and economic growth.

The roadmap for the next 25 years could be to enhance animal productivity, animal health management systems and prepare for any futuristic pandemics, digitizing the records keeping and reporting mechanisms, promote private sector investment for economic development through PPP model and ease out regulatory approval processes.

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Creating Enterprise India

SIX DECADES OF NI-MSME JOURNEY AND BEYOND....

National Institute for MSME (ni-msme), a pioneer institute under the aegis of Ministry of MSME, GOI, is playing a major role in the field of Entrepreneurship and Skill Development and for providing a pro-business environment to foster the progress of MSMEs towards success and prosperity. The mandate of ni-msme is to assist the government in formulating policies for development of MSMEs. ni-msme provides a host of services like training, research, consultancy, information, education and extension for Union/ State Governments and all MSME

**1962-2022 – The Journey Goes On
– Till India Is Atmanirbhar
ni-msme is working
towards Doubling of Women
Entrepreneurs, Developing One
Entrepreneur from One Village,
imparting digital-financial
literacy and implementation of
Industry 4.0: The Smart/Future
Technologies**

stakeholders including practicing and potential entrepreneurs.

Set up in 1962, ni-msme has made valuable contributions by creating an impressive record of achievements beyond the Indian shores, enabling other developing countries to get the benefit of the Institute's facilities and expertise. The Institute is associated with prestigious world bodies such as UNIDO, UNDP, DCAC, UNESCO, ILO, CFTC, UNICEF, AARDO and GIZ.

ni-msme's intellectual activities are pursued by its four Schools of Excellence, viz., School of Enterprise Development (SED), School of Enterprise Management (SEM), School of Entrepreneurship & Extension (SEE) and School of Enterprise Information & Communication (SEIC).



About the **AUTHOR**

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www.nimsme.org



Wide Umbrella of Services

ni-msme has established a theme-based Centers of Excellence viz., National Resource Centre for Cluster Development (NRCDC) to help MSMEs through the Cluster Development Approach. NRCDC has contributed to the development of more than 150 clusters.

The institute is implementing around 50 Rural/Artisan/Industry clusters and also supporting KVIC/Coir Board/NBCFDC/NSFDC. It has supported various State Governments/UTs for development of Handloom/Handicraft/Agro-Food Processing/Textile clusters.

The institute's Intellectual Property Facilitation Centre (IPFC) provides IP advisory services to Research and Academic Institutions, Clusters, SMEs, Start-ups and Individual Innovators. Over 150 SMEs and Start-ups have benefited from IP registrations such as Trademarks, Patents and Industrial Designs. GST Cell provides GST registrations and tax compliances.

Entrepreneur Development Cell (EDC), Livelihood Business Incubator (LBI) and Start-up Incubation Center (StIC) provide mentoring and handholding services to start-ups/entrepreneurs. Small Enterprises National Documentation

Centre (SENDOC) accumulates and disseminates information that helps entrepreneurs and stakeholders in understanding the intricacies of business.

The Institute has been publishing the Small Enterprise Development and Management Extension (SEDM) Journal since 1974 with national and international contributions. Journal of Innovation, Entrepreneurship, Management and Skill Development (JIEMS) is an online platform which publishes quality research with its open access policy and pubtech services.

Skill Training For Large Number Of Students

The Institute has trained 5,48,815 persons by organizing 16,198 programs for officials from various Ministries of GOI and state governments. ni-msme has also imparted skill training to 1,78,443 educated unemployed youth by conducting 6096 Entrepreneurship and Skill Development Programs (ESDPs). The Institute has implemented the ITEC Scheme of Ministry of External Affairs, GOI, since 1967. It has trained more than 10,600 International executives representing 145 developing countries. ni-msme





has also completed more than 949 research and consultancy projects.

The management of ni-msme rests with the Governing Council (GC) appointed by GOI. Shri Narayan Tatu Raneji, Hon'ble Union Minister for MSME, GOI is the Chairman and Shri Bhanu Pratap Singh Vermaji, Hon'ble Minister of State (MoS) for MSME is Co-Chairman of GC. Shri BB Swain, IAS, Secretary, MoMSME, GOI is Vice Chairman and Chairman of the Executive Committee. Ms. Mercy Epao is the Joint Secretary (SME), MoMSME, GOI.

Diamond Jubilee Celebrations

ni-msme is celebrating its Diamond Jubilee with pride and prestige for having served the nation in general and MSMEs in particular for long. Popularly known as nisiet, the institute reached almost every section of the population by chanting the mantra of entrepreneurship.

The institute started with the world-famous Kakinada Experiment. This offered a remarkable formula of Achievement Motivation, the foundation for Entrepreneurship.

Undoubtedly, ni-msme is the trend setter for spreading the entrepreneurship culture overseas. About 150 developing nations are the preferred partner for Ministry of

External Affairs, GOI. ni-msme is one of the pioneering institutes in organizing Executive Entrepreneurship courses to officers of several departments and select cadres.

Since a decade, ni-msme has partnered with Department of Science & Technology (DST) towards building techno-preneurial community. ni-msme contributed largely for the development of rural entrepreneurship by strengthening artisans and farmers across the length and breadth of the country.

ni-msme has rigorously spread the message of entrepreneurship among the stakeholders of agriculture, horticulture, fisheries, and allied sectors. The institute has consistently demonstrated sensitivity towards the environment while organizing EDPs on renewable energy sources, recycling options and re-usable avenues.

ni-msme is continuing the exclusive Women Entrepreneurship Program starting from SHGs to Scientists, having understood the potential of women power.

To reap the benefits of the demographic dividend, ni-msme is focusing on the skilling of youth blending with entrepreneurship training for employment generation. It is promoting social entrepreneurship among civil societies to see the desired

change in our country.

ni-msme is also encouraging intra-preneurship among working professionals and practitioners to ensure optimum resource utilization, wealth creation and attain of global standards.

ni-msme takes pride in supporting, mentoring and handholding budding entrepreneurs, would-be entrepreneurs and start-ups to promote innovation and entrepreneurship. ni-msme has contributed effectively for the welfare of the SC-ST community, backward classes and minorities by conducting entrepreneurship and skill development programs.

ni-msme is extending infrastructure and campus facilities to all the associates for training and development of MSMEs. ni-msme has added to its glorious achievements through the Small Enterprise Development, Management and Extension (SEDME) Journal. This features five decades of documentation and research publications on entrepreneurship to benefit from the research acumen of the academia.

ni-msme has demonstrated entrepreneurship in letter and spirit. It has emerged as a self-financing and self-sustaining institute by sailing through the pandemic.



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ANIMAL HUSBANDRY

DRIVER OF

Rural Growth

The major challenges faced by India's huge livestock sector are animal health and low productivity, particularly in indigenous cattle. The average annual milk yield of indigenous cattle is 1172 kgm which is about 50% of global average. In spite of our strides of development, animal health in India is highly vulnerable. Diseases like FMD, Brucellosis, Black Quarters, Anthrax and Tuberculosis are prevalent even after massive vaccination programmes.

Diversion of feed and fodder ingredients for industrial use is another challenge of this sector. The importance of livestock as source of draught power has declined due to use of tractors for agronomic practices. During "Green Revolution", the use of dung manure got substantially replaced by chemical fertilizers. With the introduction of exotic cattle breeds and cross breeding programme during White Revolution, per animal productivity of local indigenous cattle breeds was affected negatively.

Presently, there are 14 Veterinary and Animal Sciences Universities and

54 recognized Veterinary Colleges in the country. In order to achieve the goal of generating adequate human resource trained in veterinary and animal sciences, some of the states have taken steps toward opening private veterinary colleges, affiliated to state veterinary universities with the approval of VCI. Presently, there are five private veterinary colleges in Rajasthan, one in Haryana and one in Punjab. There are around 65000 veterinary hospitals/mobile dispensaries/stockmen centres across the country. More than 69000 veterinarians are registered with VCI at present. This trained human resource is not adequate, and there is a urgent need of increasing this number.

ICAR Initiatives

In tandem with these developments, species specific Research Institutes

were established in different geographical areas of country by ICAR. The AICRP and Net Work programmes on animal health, particularly FMD control program, zoonotic diseases and parasitic diseases were initiated by ICAR. Under these programmes facilities and infrastructure were created to develop diagnostics against major livestock diseases including poultry. Thus, animal health started to get the attention of central as well as state governments with production of indigenous vaccines against all major diseases of livestock and poultry. Today, the country is self-sufficient in vaccines, diagnostics and therapeutics for most diseases.

New Programs

After 2014, animal husbandry received a major thrust. For the first time, it was



accorded a proper place in the priorities of national planning. The Department of Animal Husbandry and Dairying (AH&D) was renamed as Department of Animal Husbandry, Dairying and Fisheries (DADF) under a separate Ministry in 2019 with increased budget allocation.

For harnessing the expected productivity performance of animals and its role in doubling farmer's income, PM Shri Narendra Modi launched the National Animal Disease Control Programme (NACDP) in September 2019 to control and eradicate FMD and Brucellosis by vaccinating 100% cattle, buffalo, sheep, goat and pig population with total out lay of Rs 13,343 crore for five years (2019-2024). This is the highest budget allocation to Animal Husbandry Sector after independence to promote animal health. Evidently, GOI is aware of the importance and intends to strengthen the economy of livestock owners.

To boost animal productivity and animal health, GOI has launched many new schemes in last seven years like National Livestock Mission (NLM), Animal Husbandry Infrastructure Development Fund, Rashtriya Gokul Mission, National Programmes for Dairy Development, Dairy Processing and Infrastructure Development Fund, Livestock Health and Disease Control programme.

'One Health' programme has been launched by Department of Animal Husbandry & Dairying with multi-sectoral approach of human health, animal health and environment by working together with ICAR, ICMR, DBT, state veterinary universities and wild life agencies. This programme

The average annual milk yield of indigenous cattle is about half of global average. In spite of our strides of development, animal health in India is highly vulnerable. Diseases like FMD, Brucellosis, Black Quarters, Anthrax and Tuberculosis are prevalent even after massive vaccination programs



I manage my stress by my faith in the Supreme Power, and by sharing my problems with my wife Sunita. I am like an open book, at least to my wife. In this way, I could surmount that which appeared formidably insurmountable at times

envisages carrying out surveillance of important bacterial, viral and parasitic diseases of zoonotic as well as transboundary pathogens.

Rapid Adoption of New Technologies By Farmers

To produce more female calves, sex sorting technology (use of sexed semen) and embryo transfer technology (ETT) have been launched. The farmers are

adopting these technologies rapidly. Round-the-clock mobile veterinary services have been launched in different states for the treatment of animals.

For sustained growth in animal health sector and to enhance productivity, further innovations are required to be implemented at a larger scale. The major challenge in the coming years is to how to feed growing human population and how to keep large population of livestock healthy. Climate change, emergence of new zoonotic diseases, antimicrobial resistance (AMR) due to indiscriminate use of antibiotics either at higher dosage or at lower dosage, infertility and higher cost of feed and fodder are the major obstacle to achieve these goals.

The conflict between man-animal for the land and food will be of great concern in the coming times. It may challenge animal health as well as their sustainable production.

The average annual growth rate of the animal husbandry sector is more than the crop sector. This is pointing toward a paradigm shift that animal health and productivity are no more an allied component, and are poised to become a driver of growth in rural economy.

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Prof (Dr) KML Pathak is former DDG (AS), ICAR and Ex Vice-Chancellor, DUVASU, Mathura. Presently, he is working as Chairman, ICFA Working Group on Animal Health





NUTRITION AND HEALTH CARE



Animal healthcare has gained significant importance in the past few decades. The main reason is the increased awareness amongst farmers and the paradigm shift to intensive farming practices for mass production. Adoption of such practices has increased the demand for quality medicines, animal feed additives, hygiene management products, vaccines etc.

The increased adoption of innovative technologies for prevention and cure of various diseases of farm and companion animals has accelerated the pace of the growth of the industry.

There are more than 50 major companies operating in the animal health market in In-

dia, apart from hundreds of regional and local companies. The current Indian veterinary pharmaceutical market is estimated to be around INR 6000 Cr plus. India has low cost of the veterinary products despite usage in comparatively large volumes. Ruminants dominate the AH market contributing more than 55% of the market share followed by poultry 33%, companion animal 8% and the rest constitute 4% of market share.

Industry Trends

Among therapeutic segments, Nutrition constitutes the largest category with 39% market share followed by Anti-parasitic with 19%, Anti-microbial 18%, 14% for Biological, and 10% from other categories. For the last few years, the industry is witnessing encouraging growth. This is expected to continue. The indus-

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try has tremendous potential for growth with improvement in veterinary care infrastructure and awareness and can be a significant global player.

The global animal healthcare market is estimated to be 34.9* billion US\$ in 2021 (imrac). The Indian animal healthcare market is estimated to be amongst top five in the world in volume terms, and the 12th largest in value terms. The industry is estimated to be steadily growing at around 8-10% annually, as against the figures of 2-3% globally over the last five years.

Role Of INFAH

Animal Healthcare industry association INFAH (Indian Federation of Animal Health Companies) was established in 2012. Its member companies contribute more than 85% of India's veterinary pharmaceutical business. INFAH has become the voice of the industry. It has been working towards the common goal of raising the standards of animal healthcare in India, and has been able to build consensus among all stakeholders on various issues.

INFAH has taken up significant initiatives since its inception to address the industry's concerns. It has worked in tandem with concerned authorities for appropriate animal welfare, adequate healthcare therapeutics and nutrition.

Outlook and Way-Forward

Animal Husbandry contributes significantly to the national economy as well as the socio-development. Considering the growing demand for animal products and the huge untapped production potential, the animal husbandry sector will continue to flourish. GOI has taken many initiatives to provide all possible support for the betterment of the sector.

Animal healthcare industry plays a significant role in disease mitigation, health and nutrition of animals and improving productivity. The Indian animal health industry has good progress. With significant investment in veterinary products manufacturing, the industry is able to provide suitable veterinary solutions

Infrastructure Challenges

Some key challenges faced by the sector are inadequate veterinary care, poor farm management, frequent disease outbreaks and other known challenges. Inadequate infrastructure is an important issue to provide required support services to the huge livestock population. Currently, India has over 65,000 veterinary hospitals/dispensaries/first-aid centers run by various state governments. There are approximately 67000 registered veterinarians, 23 state veterinary diagnostic labs and 47 veterinary colleges. The limited healthcare infrastructure and coverage have severely affected immunization and disease control programs in many parts of the country. The gap existing in terms of institutes as well as facilities at work place needs to be improved for effective livestock service delivery and improved livestock sector performance.



to the large livestock population.

The industry is highly dependent on import of Veterinary Active Pharmaceutical Ingredients (API) due to cost implications and technology advantages. To become globally competitive, it needs lot of support and investments for establishing manufacturing capabilities for veterinary specific APIs.

The global veterinary active pharmaceutical ingredients manufacturing market size was estimated at USD 6.3 billion in 2020. It is expected to grow at a CAGR of approximately 7 per cent for the next five years. There is tremendous potential of veterinary APIs not only for domestic consumption but also for the international market. The world is looking for alternate sourcing of APIs. India is in a very good position to emerge as a significant global supplier.

Regulatory landscape of veterinary pharmaceuticals is positive. With the creation of a separate Veterinary Cell at CDSCO, various reforms are undertaken

with greater focus on safety and quality of products considering the veterinary needs. The animal healthcare industry is closely working with the regulators to formulate regulatory guidelines specific to veterinary pharmaceuticals and biologicals, regulatory harmonization to enhance export and to streamline regulatory requirements especially for new product approval by establishing an integrated regulatory system of single window approval.

There is urgent need for infrastructure development and capacity building of veterinary service, diagnostics for improvement of livestock sector performance. There is also need to strengthen extension services to create awareness about proper livestock nutrition, health care and farm hygiene.

Animal healthcare companies are making continued efforts to bring in more advanced and innovative products to ensure optimum health and productivity of animals. Given the vast spread of India's rural population, and the fact that modern animal husbandry concepts are not uniformly present, the industry still has long strides to make.

The growing consolidation and professionalization of the dairy, poultry and other related sectors coupled with the government's ambitious aim of doubling farm income, and the increasing trend of pet-ownership, indicates the upward growth journey of the livestock sector.

Food and Nutritional Security

AQUACULTURE FOR PROSPERITY

Fish and shellfish have been recognized as critically important constituents of the human diet and have good nutrition with high protein, micronutrients, and essential fatty acids. They are often the most frequently consumed low-priced source of animal protein in developing nations. Globally more than 4.5 billion people get at least 15% of their average per capita intake of animal protein through consumption of fish and fish-related products. Fish provides indirect food security to more than 10% of the world population.

Important Functional Food

Fish protein is known to be easily digestible compared with other terrestrial animal and plant proteins. Fish is endowed with unique lipid composition, having Long Chain Poly Unsaturated Fatty Acid (LC-PUFAs) with many beneficial effects for child development and adult health. Small pelagic species such as anchovy and sardine are the richest sources of LC-

PUFAs and comparatively inexpensive when compared with large freshwater fish such as carp and tilapia.

The LC-PUFAs provide protection against certain medical conditions such as stroke, high blood pressure, or coronary heart disease. In human nutrition, Omega-3



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(n-3) fatty acids such as docosahexaenoic acids (DHA) and eicosapentaenoic acid (EPA) are considered as essential elements. The primary source of DHA and EPA are fatty fish oils that can be easily obtained from the tissues of fishes. Omega-3 fatty acids, in particular, DHA and EPA from fish and fish oil, play an essential role in human development and help in the prevention of many common human disorders.

Apart from the fatty acid content, fishes are also an important source of essential micronutrients-vitamins D and B and minerals. It was found that lipid-rich fish are also rich in vitamin A. Some small fishes like sardines, sea bass, pilchards, anchovy, and tilapia contain a higher quantity of minerals such as calcium, phosphorus, iodine, zinc, iron, and selenium, which are lower in other foods. Thus, even in small quantities, fish contributes to overcoming multiple micronutrient deficiencies. The high level of iodine present in fish can prevent iodine deficiency which is known to cause cretinism (stunted growth and mental retardation).

Challenges, Opportunities

According to FAO (2020), global production of fish is around 179 million tons (Mt). The capture fisheries contribute around 97 Mt, while aquaculture to about 82 Mt. Global food fish consumption has increased at an average annual rate of 3.1 percent from 1961 to 2017, which is higher than that of all other dietary animal proteins (meat, dairy, milk, etc.). In contrast, the consumption of other dietary animal proteins has increased by 2.1 percent per year. Per capita food fish



Mr Pandey loves to listen to Hindi songs

consumption increased from 9.0 kg (live weight equivalent) in 1961 to 20.5 kg in 2018, which is about 1.5 percent per year. The data on fish consumed as animal protein indicates that the consumption of fish as animal protein contributes to more than 10% in North America and Europe, 17% in Africa, 22% in China, and 26% in Asia.

In India, fish production has increased by around 269% in the last three decades (1990-2020). The total fish production of India is 14.16 Mt, in which inland fish production contributes around 10.43 Mt while marine capture fisheries account for 3.72 Mt. India ranks second in global fish production with 8.5 Mt of fish produced by means of aquaculture. The targeted fish production of India for 2024-25 has been fixed as 22.0 Mt to meet the growing demand for fish both in domestic and global markets. It is projected that the targeted per capita fish consumption must increase from the current 9 kg to 12 kg.

Aquaculture to Aquatech

Increasing global demand and rapid growth in fish production have increased its exploitation. It is estimated that humans have impacted almost 90% of the global ocean surface, and marine fish

abundances have declined by 38% in the last three decades.

By means of aquaculture, opportunities for fish production have gained momentum to meet global demand. The contribution of world aquaculture to global fish production has gone up from 25.7 percent in 2000 to 46.0 percent in 2018 (FAO, 2020). Aquaculture has become more integrated into the global food system with adequate support from the transformation in feed ingredients, production technologies, farm management and value chain. Further increase in fish production to meet global demand requires both system and species diversification.

Recent Technological Advancements

Recent technological advancements have provided tremendous opportunities to shape fish production and trade in the global food industry. Some examples of technological advancements are open sea cage farming using drones, AI, intensive fish farming through re-circulatory aquaculture system (RAS), disease management by means of therapeutics, genetically improved fish and shellfish strains having better traits, improved feed and feeding methods.

There is increased use of block chain in aquaculture – a digital platform for keeping incorruptible record of fish's origin, history, harvest, processing and delivery. This produces a transparent and verifiable origin of each aquaculture product.

Species diversity is the biggest challenge for the aquaculture industry. Global fish production data indicates that only 22 of all 425 species farmed worldwide in 2017 (5%) contributed to over 75 percent of global live weight production. There is tremendous scope to bring more species into the production system through domestication and improved seed production technologies. Fisheries and aquaculture have transformed from rural livelihood endeavour to global aquatech venture. This has sparked investment opportunities for public and private sectors towards increasing fish production and providing nutritional securities.



FOOD SAFETY, ONE HEALTH

HERBALS FOR MITIGATION OF AMR

Antimicrobial resistance (AMR) is developing globally in disease-causing bacteria. It is among the major threats to human medicine. It leads to additional burden on health system, treatment failures and in worst cases, to untreatable infection or infection treated too late to save life. Overuse and misuse of antibiotics in intensive animal production is a cause of concern.

The ban on AGPs led to the need for a change in feed formulations. Today, there is greater knowledge on the use of alternatives growth promoters from phyto-genic sources with proven scientific rationale. Due to increase in awareness amongst consumers, farmers have started to produce antibiotic free chicken eggs and milk, fetching higher profits and ensuring better health for all.

Antibiotics have three roles in animal production.

a) Treat individual animals with bacterial infections



- b) Prevent infections
- c) Promote growth.

The third role, growth promotion, has no counterpart in human antibiotic use. It accounts for the majority of use in animals and is the focus of most legal and regulatory efforts to reduce antibiotic consumption in livestock and poultry. Since the hygiene factors are low or the challenge of getting bacterial infections are high, the manufacturer or the farmer has observed growth promotion with low doses of antibiotics mixed with feed.

Concerns

As global demand for animal protein grows, antibiotics are increasingly used to raise food-producing animals in intensive production – mostly to promote growth rather than treat disease. The result is an increasing prevalence of antibiotic resistant bacteria in livestock, poultry and aquaculture, with spillover that impacts



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human health. To an estimate, 80% of all antibiotics consumed in United States are used in food animals (US FDA 2010).

The projected increase in antibiotic use in food animals is a result of an increase in human population, from 7 billion today to an expected 10 billion by 2050, and increasing global prosperity. According to FAO, meat consumption will increase by 73% and dairy consumption by 58% over 2011 levels (FAO 2011).

Global antibiotic consumption in livestock was conservatively estimated at 63,200 tons in 2010, accounting for nearly two-thirds of the estimated 100,000 tons of antibiotics produced annually worldwide. By 2030, consumption is projected to rise by two-thirds, to 105,600 tons. Two-thirds of the increase is due to increase in the number of animals, and the remaining one third is due to the shift from extensive to intensive farming.

Due to increase in awareness amongst consumers, the farmers have started to produce antibiotic free chicken eggs and milk, fetching higher profits for themselves and yet taking care of their own and others health

Economic Impact of Bacterial Resistance

The U.S. Centers for Disease Control and Prevention (CDC) estimates that antibiotic resistance is responsible for more than 2 million infections and 23,000 deaths each year in the US, at a direct cost of \$20 billion and additional productivity losses of \$35 billion (CDC 2013). In Europe, an estimated 25,000 deaths are attributable to antibiotic-resistant infections, costing €1.5 billion annually in direct and indirect costs. It is estimated that 58,000 neonatal sepsis deaths are attributable to drug resistant infections in India alone.

Ayurved has produced solutions to reduce/eliminated antibiotic usage. These solutions are clinically evaluated worldwide and are imparting benefits to farming community. Solutions to replace specific antibiotics gut acting, upper respiratory tract acting and general growth promotion effects are available for farm usage. These solutions can be used as feed additives



Measures to Reduce Antibiotic Resistance

To reduce antibiotic Resistance and improve food safety, it is imperative that we move to alternatives to antibiotic growth promoters. Many scientific explorations and validations suggest that phytogetic solutions can help to grow friendly microflora and reduce pathogenic strains, giving proper integrity to gut wall. References are available that usage of antibiotics as growth promoter can be eliminated without compromising with productivity. There are many phytogetic ingredients in nature that have known action against harmful microbes and also help in growth promotion without producing antibiotic resistance.

and enhance value of animal food production tremendously.

Prohost Holistic Approach To Replace Antibiotics

There are many herbs available which provide solution to reduce pathogenic load in intestine, respiratory system or other vital organs. This approach to enhance host immunity through the usage of scientifically proven herbals has gained momentum as an alternative to AGPs. This strategy is effective to produce antibiotic free milk, meat, eggs and other animal proteins.

AGPs (Antibiotic Growth Promoter)

Nbiotic is scientifically evaluated globally and a commercialised product of Ayurved, and is combination of herbs and essential oils. It can replace antibiotic growth promoters partially to improve production in animals. It has antibacterial (static) and antiviral in function along with powerful healing action of gut epithelium. It also has strong antioxidant property to reduce damaging effect of free radicals. It is tested against Tetracycline, Salinomycin, Enramycin, Bacitracin Methyl Salicylate, Roxarsone and many other popular alternative growth promoters with great

success.

Gut Acting Antibiotics

Salcochek Pro is powerful synergistic combination of herbal extracts and essential oils. The herbs present in Salcocheck Pro adsorb and inactivate Enterotoxins, have antibacterial and antiviral activities. It protects the Gastro-Intestinal mucosa and helps to maintain healthy gut with greatly improved surface area.

Upper Respiratory Tract Acting Antibiotics

Respzz is a herbal product which helps in improving respiratory distress. Ingredients herbs and essential oils have antiviral and antibacterial effects and build immunity locally. Robust action of cilia and mucus producing defence mechanism helps animal/bird to fight with respiratory infection without lowering of productivity. It can be effectively used with antibiotics also in chronic condition where respiratory disease has already causing mortality. Benefit of using Respzz alone or in combination is that production is not lowered during the therapy and relapse of disease is delayed.

VETS THE UNSUNG HEROES

The veterinarian has a social role in contributing to food security, and a technical role in ensuring animal welfare and production of safe wholesome livestock products. Veterinarians play a vital role in safeguarding both human and animal

The best way to understand the significance of Veterinarians is to start thinking of a world without the welfare of animals and birds

health by securing an adequate supply of safe food and protecting humans and animals from the spread of zoonotic diseases. They are also vital to improving the productivity of livestock for the benefit of producers in particular and for the wider population in general.

Theservicesprovidedbyveterinarians are not duly recognized, mainly because society is not aware of their actual contributions. This has resulted in the thinking that veterinarians have a role only for people who own farm animals, dogs or poultry. In fact, by serving the clients/ farmers, veterinarians are protecting the society and strengthening the health of a nation. If we have less disease outbreaks affecting livestock, there is increased milk production. Similarly veterinarians must take the credit for lowered incidence of deadly diseases like Bird Flu, Swine flu, Rabies, Tuberculosis, and other zoonotic diseases. The country has more than 65,000 registered veterinarians. Field veterinarians are the only ways and means to deliver desired outcomes to end users and are the unsung hero of the



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Dr Umesh Chandra Sharma
is President, Veterinary
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President, Indian
Veterinary Association



animal husbandry sector.

During Covid outbreaks, veterinary services were declared as essential services. Veterinary service literally mean the difference between life and death not only for animals but also for humans, as majority of our poor population depends on animals for food, income, social status or cultural identification, companionship and security. Veterinarians also take daily risks. Many are exposed to different degrees of zoonotic infections.

The Significance of Veterinarians

The best way to understand the significance of Veterinarians is to start thinking of a world without the welfare of animals and birds. Nature has created soil, water, air, plants, animals and humans - all coexisting. The synergy and symbiosis among these and welfare of animals define a sustainable future for the humans. One Health issues include zoonotic diseases, antimicrobial resistance, food safety and food security, vector-borne diseases, environmental contamination, and other health threats shared by people, animals, and the environment. For example:

- Antibiotic-resistant germs can quickly spread through communities, the food supply, healthcare facilities, and the environment (soil, water), making it harder to treat certain infections in animals and people.
- Vector-borne diseases are on the rise with warmer temperatures and expanded mosquito and tick habitats.
- Diseases in food animals can threaten supplies, livelihoods, and economies.
- The human-animal bond can help improve mental well-being.
- Contamination of water used for drinking, recreation, and more can make people and animals sick.

Human health (doctors, nurses, public health practitioners, epidemiologists), Animal health (veterinarians, paraprofessionals, agricultural workers), Environment (ecologists, wildlife experts), and other areas of expertise need to collaborate and coordinate activities.



Other relevant players in a One Health approach could include law enforcement, policymakers, agriculture, communities, and even pet owners. No one person, organization, or sector can address issues at the animal-human-environment interface alone.

Veterinarians contribute in different ways. They ensure breed improvement through technology innovation, and provide technical, financial and moral support to farmers.

In the mission of doubling the farmer's income by 2022, the veterinary fraternity has huge role to play. Without the active participation of veterinarian, India can't think of accomplishing this herculean task.

Major Roles

1. Providing basic health care facilities to livestock and pets, which includes camps and door step services
2. Preventive services like vaccinations (FMD, HS, BQ, Anthrax, PPR, Rabies, DHPPi, Corona, RD, Merks Diseases etc)
3. Emergency Services including tackling outbreaks.
4. Implementation of different schemes of Central and state Governments to increase the income of farmers and livelihood of the farmer's related to animal husbandry like NLM etc
5. Genetic Improvement through Artificial Insemination.
6. Extension activities like Camps, TV shows, Talk Shows etc.
7. Disease Reporting at different platforms, both online and offline
8. Animal Census, Breed Survey

9. One Health, Zoonotic Diseases, Disease Surveillance and sampling
10. Animal Welfare, ABC, Post Mortem
11. Dedicated involvement in any disaster management work.

It is beyond any doubt that the field veterinarians are the backbone of our system and need much more appreciation for their continuous contribution to animals and society as a whole. However, there is a need to strengthen our field veterinarians. Minimum standards of veterinary practice regulation (MSVPR) will provide them the much needed platform to demand for minimum facilities needed to provide quality services at the field level.

There is a critical need to involve field veterinarians in decision or policy making bodies so that their concerns and ideas can be incorporated. They are a component of the delivery system of tangible and intangible goods to the end users of the society. In order to recognize the role of a veterinarian, one must take a comprehensive view of all the spheres of activities where their services are required.

The present regulations pertain to the veterinary services rendered by Registered Veterinary Practitioners in respect of disease diagnosis; medical, surgical, gynecological treatment and reproductive aid to animals and animal production and management of animals. Regulatory bodies like Veterinary Council of India, Indian Council of Agricultural Research and Animal Welfare Board of India needs to be strengthened and work with coordination to achieve our major goals.

BIO-FORTIFICATION

Building Resilient Food Systems



Delivering Nutrition Sustainably and Affordably

A crop breeding process called biofortification increases the density of micronutrients like vitamin A, iron, and zinc in widely consumed staple crops. Biofortified varieties replace their low-nutrient counterparts without cost. The higher micronutrient content stays in the grain after harvest.

HarvestPlus, part of CGIAR, leads this global movement to rapidly scale up production and consumption of biofortified staple crops and foods. Along with its partners, HarvestPlus has released more than 400 varieties of climate-smart biofortified wheat, rice, maize, beans, cassava, sweet potato, and pearl millet

The world is facing multiple challenges to food and nutrition security. The spike in food, fuel and fertilizer prices have brought into spotlight the fundamental vulnerabilities of our food systems. Millions of low-income households in developing countries are shifting their food consumption toward more-affordable items, notably staples, and away from more-nutritious but more

costly items such as fruits, vegetables, and animal source foods. The problem is that most staple foods – such as wheat, rice, and maize – are low in key micronutrients such as iron and zinc, which are needed to maintain good health and proper human development.

According to FAO, the number of undernourished people worldwide could increase by 8 to 13 million this year alone.

About the **AUTHOR**

Mr Ravinder Grover is the Program Lead for Harvest Plus, with more than 15 years of experience as a practitioner and advisor for the leading industry and consulting firms in the agriculture and food domain. He has led many large scale engagements with public, private and development sector in the area of supply chain optimization, route-to-market, policy advocacy and digital transformation.



in 30 countries, benefiting an estimated 64 million people by 2021. There are over 100 scientific papers published and 40 research studies proving feasibility, impact, and adoption of biofortification worldwide. The result: fewer people suffering from anemia, stunting, and other health and developmental issues linked to micronutrient deficiency.

Building Resilience to Climate Change

Farming households in the Global South are facing intensifying challenges to food production due to changing climate. Bio-fortified varieties help offset climate related losses in crops' nutrient content. Many are also bred for early maturity, drought and heat tolerance, and pest and disease resistance — traits which are critical for building climate resilience among smallholder farming households.

For example, Iron Pearl Millet is ideal for arid regions in India, with low water needs and high heat tolerance. Besides providing up to 80% of daily iron needs, this variety is bred for early maturity, reducing its vulnerability to a range of climate-related risks. Vitamin A Maize, grown and consumed in southern Africa, provides up to 50% of daily vitamin A needs, is heat tolerant up to 45°C, and early maturing.

Evidence driven transformation of food systems

The Copenhagen Consensus ranks biofortification among the highest value-for-money investments for economic development: For a \$1 invested in biofortification, \$17 of benefits are gained. Published, peer-reviewed studies have shown that young children (1-6 years) and non-pregnant, non-lactating women of reproductive age (15-49 years) who consume biofortified crops as a main part of their diets can receive up to 100% of their daily vitamin A requirement from vitamin-A biofortified crops; up to 80% of their daily iron requirement from iron-biofortified crops; up to 70% of their daily zinc requirement from zinc-biofortified crops.

OUR WORK IN INDIA

HarvestPlus has operated in India since 2011 and supported ICAR-(NARS, state agricultural universities and international agricultural research organizations such as ICRISAT, CIMMYT, and IRRI in breeding, testing and release of 9 varieties of zinc wheat, 2 varieties of zinc rice and 10 varieties of iron pearl millet amongst other crops. HarvestPlus India has over 100 partners in the public, private, NGO, and policy engagement sectors who share our mission to improve nutrition and lives of people in India. We are enabling the value chain of biofortified staples across seven states with more than 1 million farming households growing and consuming biofortified crops.

Under the Bihar Odisha Nutrition Initiative (BONI) funded by the Bill & Melinda Gates Foundation, more than 60 market actors have been engaged across zinc wheat and zinc rice value chains. Through partnership with Bihar Rural Livelihoods Promotion Society - JEEVIKA, a gender inclusive value chain approach is being used to make a significant impact on the nutritional status and livelihood of the people.

The Commercialization of Biofortified Crops Programme is catalyzing commercial markets for biofortified seeds, grains, and food products, in collaboration with Global Alliance for Improved Nutrition (GAIN). The program aims to improve the enabling environment for biofortified seeds and food products through advocacy, catalytic financing, and technology licensing services. In India, the program is working with farmers in states of Uttar Pradesh, Bihar & Punjab for Zinc Wheat and Karnataka, Maharashtra & Rajasthan for Iron Pearl Millet.



Project with Akshaya Patra

HarvestPlus has partnered with The Akshaya Patra Foundation to pilot the

integration of iron-biofortified pearl millet and zinc-biofortified wheat in their meals for schools. Akshaya Patra is currently working to understand the implications of using iron pearl millet in their recipes, in terms of amount, taste, cooking time etc. Based on the results, schools in Rajasthan and Maharashtra will be targeted in 2022.

GOI is consciously working towards amplifying the benefits of consuming biofortified crops as staple. PM Shri Narendra Modi dedicated 17 biofortified varieties of 8 crops to the nation on the 75th Anniversary of FAO. He emphasized on promoting the biofortified varieties of crops by linking them with the several government programmes to make India free from malnutrition. He stressed that this would ensure good income for the farmers along with opening new avenues of entrepreneurship for them.

Nutrient-enriched staple crops are a silver bullet for growing malnutrition risks. They are a proven, practical strategy for strengthening the nutrition resilience of the most vulnerable households. These crops are also a powerful channel for empowering women.

TOGETHER WE GROW



ONE

HEALTH

Sustainable development implies a holistic approach, fully considering the wider and future impacts of different, and often competing, needs. The relevance of good animal welfare and health for sustainable development is acknowledged by Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE).

WHO agreed in 2010 to share responsibilities and coordinate global activities to address health risks at the animal-human-ecosystems interfaces. The UN Committee on World Food Security proposed

Livestock production systems have the potential to contribute to the preservation of biodiversity and to carbon sequestration in soils and biomass

recommendations on sustainable agricultural development for food security and nutrition including the role of livestock. Recommendation “D” of Article VIII, entitled “Animal health and welfare” reads: “Improve animal welfare delivering on the five freedoms and related OIE standards and principles, including through capacity building programs, and supporting voluntary actions in the livestock sector to improve animal welfare.”

One Welfare

There are many areas where animals play an important role in the context of sustainable development. These include for instance food security, transport, employment, and livelihoods. There are also less positive effects associated with continuous growth and intensification of the animal sector. These include challenges to the environment (gaseous emissions, water and soil pollution, and ecosystem damage), issues regarding animal welfare (animal abuse and negative consequences of intensive selection and production), and animal and human health (zoonotic diseases and inappropriate use of antimicrobials and anthelmintic).

Increasingly, the interconnections between animal health and welfare, and human health and welfare as well as their relation with environmental factors (climate change, biodiversity) are being recognized, as shown by the emergence



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of the “One Welfare” concept. One Welfare extends and complements the One Health theme used for human, animal, and environmental health.

Animal health and welfare are closely linked to animal productivity. Good animal welfare has therefore a direct and indirect beneficial financial impact, helps to reduce poverty and has gender implications, as often women care for livestock. But of course including animal welfare in sustainable development is more than developing sustainable livestock production systems.

The livestock sector is a pillar of the global food system and a contributor to poverty reduction, food security and agricultural development. According to FAO, livestock contributes 40% of the global value of agricultural output and supports the livelihoods and food and nutrition security of almost 1.3 billion people.

Livestock play a major role in sustainable food systems—for example, manure is a critical source of natural fertilizer, while livestock used as draft animals can help boost productivity in regions where there is low mechanization. Livestock are important assets for vulnerable communities. In India majority of rural families rely on livestock farming for food, income, and as a store of wealth, collateral or safety net in times of need.

Preservation Of Biodiversity

Locally, livestock production systems have the potential to contribute to the preservation of biodiversity and to carbon sequestration in soils and biomass. In harsh environments, such as mountains and dry lands, livestock is often the only way to sustainably convert natural resources into food, fibre, and work power for local communities. At the same time, there is wide scope to improve livestock sector



practices so that they are more sustainable, more equitable, and pose less risk to animal and human health.

Veterinary services and animal disease surveillance is also crucial to improve animal health and welfare, reduce economic impact of animal diseases, improve food safety, and reduce risks of antimicrobial resistance. The prevention of animal diseases can limit transfer of animal pathogens to humans and control the emergence of deadly zoonotic diseases at the animal source, where action is most cost-effective. Improved livestock management is an integral part of the “One Health” approach, which seeks to optimize human, animal, and planetary health.

Animal Health companies have great role to play in securing One Health Concept in Indian perspective. These roles include making

available quality veterinary medicines to protect animal health & welfare, and impart awareness about sustainable livestock production. GOI has ambitious plan to secure animal health and thus food security by implementing mass vaccination against important livestock diseases of economic and zoonotic importance. The animal health companies in India are geared to meet the government expectations for supply of quality vaccines to make such program successful.

Addressing AMR

Another important One Health topic where animal health companies are prepared to play its role is AMR (Antimicrobial Resistance). GOI has formulated its action plan to fight against AMR and animal health industry is one of the key stakeholders. The responsibility includes recommending government authority to frame legislation or regulations, creating awareness among stakeholders for judicious use of antibiotics and investing in R&D efforts to find alternatives of antibiotics. Overall objective would be to find a balance between protecting the animal welfare (not depriving the animal for their rights to get treatment) and minimising the risk of AMR (focus on judicious use of antimicrobial and effective alternatives)

Overall the objective of sustainable livestock development should be to create an opportunity to move the livestock sector towards more sustainable development and improved contribution to human diets. Productivity levels and practices can be managed in ways that address adverse impacts on land, water, and the environment, as well as the risks posed to animal and human health. Animal Health companies are making transformational changes (both culture and science) to meet the expectations of society without compromising on animal welfare.

fun FACT

Mr Natesan likes to read and listen to music in his leisure hours

ONE HEALTH



And SDGs

Animal health systems worldwide continue to be underfunded. Inadequate staff, poor quality medicines, un-organized veterinary services and shortages in veterinary medicines and vaccines have endangered the lives of millions of people and animals. Greater support for animal health system with a focus on adequate workforce; veterinary medicines and vaccines; prompt animal disease detection, surveillance and management; collaboration for One Health; and public private partnerships is the need of the time.

Improving animal health will be useful in fighting these challenges to fulfill key Sustainable Development Goals (SDGs).

SDG 1 - No poverty: Due to increasing global population, demand for more food, water and shelter will further enhance. Control on mortality of the animals is increases the availability of milk, meat and eggs. Animals are critical asset to their owners because they support income generation both directly and indirectly in agriculture, construction, tourism and transport. In this context, more than 100 million animals support the livelihood of around 600 million people in some of the world's poorest countries.

SDG 3 - Good health and wellbeing: Over 60% of the human diseases are zoonotic in nature. Better animal health practices are likely to reduce the risk of zoonotic transmission of the diseases and

development of antimicrobial resistance. Working animals generate income which helps families pay for medical bills. In remote areas and during disasters and emergencies, animals provide the fastest and most reliable means of transport. Interaction with animals reduces stress and contributes to well-being and mental health.

SDG 4 - Quality education: The income generated by livestock keeping helps the families to pay for school fees and supplies. In remote rural areas carts driven employing horses, donkeys, bullocks etc transport children to and from school.

SDG 5 - Gender equality: A significant number of women, particularly in developing countries generate income via sale of animal and animal products which is used to pay for household essentials and can be a factor in gender

empowerment.

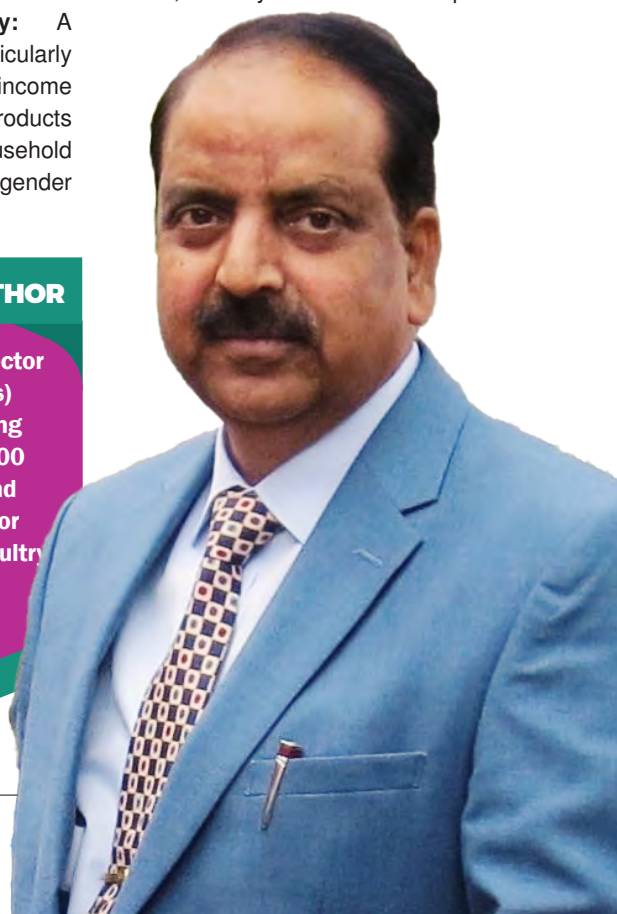
SDG 6 - Clean water and sanitation: Working animals are also critical in providing access to water for rural communities. Without their help, people, especially women/girls have to spend more time to fetch water from remote sources.

SDG 8 - Decent work and economic growth: Maintaining animal health can positively contribute the economy and can bring millions of people out of the poverty.

SDG 13 and 17 - Climate action, partnership for the goals: The use of horses, donkeys and mules empower

About the AUTHOR

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rural communities in hilly terrains during disasters. They help rural communities to collect water/food from long distances, helping them to relocate if required, besides infrastructure development.

SDG 15 - Life on land: A large number of peoples in developing countries are labourers or small/marginal farmers. Their livelihood depends of the income generated by animals. The increasing demand for donkey hide products ensures long-term income of poor families. The trade represents a growing biodiversity threat and an increased risk of disease spread if illegally transportation of animals continues across international borders.

Perspective On Achieving SDG Through Animal Health

- **Collaborations and partnerships** Focusing on One Health as its core philosophy will be essential so as to effectively tackle complex problems like health and hunger. Development of global health policy should incorporate animal and environmental considerations. It must recognize the pivotal role that animals play in disease transmission and pandemics in order to meet the SDGs by 2030. Establishing working groups/networks for surveillance of emerging zoonotic diseases under One Health is essential.

- **Develop tools in the form of**

Holistic approach of 'One Health' will help maintain and sustain the health and wellbeing of humans, animals and environment

vaccines, diagnostics, etc: We need to develop the technologies to prevent, diagnose and treat animal disease as well as improve the surveillance of transboundary animal and emerging zoonotic diseases.

- **Requirement of new innovations and practices in animal sector:** These are essential to improve diagnostics, prevention and control of animal diseases.

- **Support Animal Caretakers:** Farmers, veterinarians and pet owners need greater recognition for their role in protecting animal health. Animals are essential in our effort to accelerate SDG progress.

- **Prioritize animal health and welfare:** Strengthening the prevention, detection and treatment of animal disease assumes enormous significance. It is important not only in terms of ensuring the availability of safe, sustainably produced, healthy food for all, but also in terms of preventing disease outbreaks and transmission, both to animals and

humans.

- **Increased investments in zoonotic disease prevention:** Increased investments need to be targeted towards preventing emerging zoonosis and preventing spillover. Investments need to be in preventive approaches – veterinary infrastructure, biosecurity, vaccination, access to diagnostics and digital monitoring tools, vaccine banks, surveillance and early warning systems.

- **Focus on the biggest threats:** The primary focus should be on preventing spread of pandemic threats from zoonotic diseases. If left unchecked, several animal diseases can cause significant human and animal suffering and environmental damage. Future systems should build on the private sector's R&D, manufacturing, and distribution capacity. More flexible regulatory systems that facilitate rapid responses, including better regulatory cooperation between countries for faster approvals are needed. Diseases do not recognize borders. Interventions on prevention, preparedness and response must be global in nature with local specificities.

Holistic approach of 'One Health' will help maintain and sustain the health and wellbeing of humans, animals and environment. Comprehensive capacity development across all stakeholders is required for adoption of sustainable animal husbandry practices.

Blue World

HEALTH MANAGEMENT IN AQUACULTURE

Increasing demand for animal protein has led to the intensification of aquaculture practices and diversification of aquaculture species worldwide. However, rapid expansion, diversification and intensification of aquaculture practices have led to the loss of intricate balance between the pathogen, host and environment leading to outbreaks of a wide range of diseases of which the infectious diseases caused by bacteria, viruses and parasites are of major concern. Along with the aquaculture production, transboundary movement

of live aquatic organisms as well as aquaculture products coupled with global climatic change resulted in increased occurrence as well as rapid spread of aquatic animal diseases. Over the years, diseases have become the primary constraints in aquaculture, causing extensive economic losses impacting the development of the sector.

Economic impact of aquatic animal diseases

It has been estimated that 10% of all farmed aquatic animals are lost because

of infectious diseases and >USD 10 billion in losses annually on a global scale.

Health Management In Aquaculture

Though infectious agents play a crucial role in the disease outcome in aquatic system, it has been observed frequently that even the less virulent pathogen can play a crucial role in the disease outcome. As elimination of pathogens from aquatic environment is almost impossible. The best possible measure to deal with diseases is through the management of the health of farmed fishes.

Health management is a holistic approach taking into account various aspects of aquaculture system which includes the host, pathogen and the environment. Health management is a science-based concept which involves essential and logical steps which will lead to improved health of farmed aquatic animals. It involves a combination of interventions to prevent the occurrence of diseases as well as its spread

Though environmental and nutrition-



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al interventions are the essential components, from the perspectives of infectious diseases, accurate and early diagnosis of diseases, measures applied as prophylactic and curative treatment, screening of larval (fry/fingerlings/post-larvae) stages for potential pathogens before stocking in the grow-out system, quarantine and biosecurity measures are some of the key components of health management.

Focused Initiatives

Considering the growing importance of aquaculture and also the increased threats posed by infectious diseases, especially viral diseases coupled with other microbial co-infection, significant research and development efforts have been made in the country. The most noteworthy effort is the implementation of 'National Surveillance Programme for Aquatic Animal Diseases' involving 31 collaborating centres in 19 states, being coordinated by ICAR-NBFGR.

The programme has provided significant output in terms of establishing a network of aquatic animal health laboratories; developing diagnostic capability for detection of OIE/NACA-listed and emerging pathogens; strengthening of passive disease surveillance; operationalization of an efficient mechanism for confirmation and reporting of new diseases besides providing scientific advice to farmers. Above all, the programme enabled better understanding of disease situation in the country, meeting international disease reporting obligations. Further, large network programmes such as 'All India Network project on Fish Health' and 'Indian Network of Fisheries and Animal Antimicrobial Resistance (INFAAR)' implemented by ICAR also play a strategic role in the country's effort for improved management of aquatic animal health and sustainable development of aquaculture.

A national consortium project on 'Molecular screening, cell culture-based isolation and characterization of finfish and shellfish viruses and establishment of National Repository' has also resulted in the creation of repository of viral pathogens infecting finfish and shellfish along with diagnostic materials.

ICAR Fisheries institutes have also



A national consortium project on 'Molecular screening, cell culture-based isolation, characterization of finfish and shellfish viruses and establishment of National Repository' are important initiatives

undertaken huge effort in addressing various aspects of aquatic animal health and health management including research and development in basic and applied areas. To address the recent emergence of TiLV, a collaborative project on 'Understanding molecular basis of host-pathogen-environment interaction of Tilapia Lake Virus Disease' which employs metagenome and transcriptome tools as well as development of high throughput diagnostic assay for the detection and quantification of the virus is underway.

Efforts are also underway in developing a field-level protein-based diagnostic which can be used for surveillance of TiLV. Apart from development of diagnostics, efforts to develop prophylactic measures against viral and bacterial diseases of finfish have been made by researchers and these include the development of vaccines: ICAR-CIBA has developed a recombinant vaccine for VNN

under the commercial name Nodovac-R; ICAR-CIFE has developed a bivalent vaccine against *Edwardsiella tarda*, a bivalent vaccine against *Flavobacterium columnare* and *E. tarda*, and an inactivated vaccine against *Flavobacterium columnare*, besides an RNAi-based vaccine against WSSV infecting shrimp.

Scientific Disease Surveillance

Increasing demand for animal protein and the need for increasing the production capacity have been a challenge to the food production systems. However, sustainability in the food production system is crucial to address the needs of the current as well as future generations. Hence the techniques and practices employed in farming of aquatic animals should be of minimal environmental impact. Health management of the environment and farmed animals are of prime importance. Better management practices, adoption of quarantine strategies and use of SPF stocks of candidate species, employment of effective measures of biosecurity etc. have to be implemented for ensuring the sustainability of the sector.

Development of rapid diagnostics as well as effective prophylactic methods along with scientific disease surveillance plans play significant role in long-term disease preparedness and in aquaculture systems. Further, implementation of effective regulations in collaboration with regional, national and international agencies; emphasizing one health approach for maintaining the health of the host, pathogen and environment are crucial for maintaining the aquaculture system and production sustainable.

COMMERCIAL DAIRY INITIATIVES EMPOWERING RURAL WOMEN



India is the world's largest milk producing country and accounts more than one-fifth of global production. This wasn't the case a few years back. India used to be milk deficient and imported milk from other countries to fulfil the requirements of its growing population.

Significant capacity building happened in 1965, when the Indian government decided to establish the National Dairy Development Board (NDDB) to develop India's dairy sector. In 1970, India aimed to enhance milk production, which led to the launch of Operation flood.

The road from being a milk deficit country to becoming the world's largest milk producing nation has been extraordinary.

Dairy and Rural women

Milk and the production of value-added products are of great importance for rural economy and women play a significant role to boost the same. Without any second thought, it is an exemplary effort that women have ensured their participation in dairy and animal related activities in addition to their daily household engagements. Also, it has been observed that women spend more effort and time than men in dairy-related activities.

Women contribute majorly in the tasks involved in farming, animal husbandry and related activities. Their direct and indirect contribution at home along with farm and animal husbandry-related operations has led to significant rise in



ABOUT THE AUTHOR

Mr Radhey Shyam Dixit is the Founder and Chairman of The Ananda Group

family income.

A highly positive trend is that women equip themselves with technology to catch up with the changing scenario, utilizing their free time and enhancing existing skills for setting their own dairy enterprises.

Strengths of Dairy Sector

* Low on Investment: Dairy does not require large investments as the rural people can begin with the available cows/ buffalos or buy easily in local markets

* Low on labour requirement: Dairy farming does not demand heavy labour. Hence rural families can undertake this activity without altering their present engagements.

* Low on technology: The technology is simple and most rural people are aware of the skills.

* Best Suited for Women: Dairy business provides good opportunity for women to develop this activity as an enterprise and ensures steady cash returns throughout the year

* Low maintenance: Livestock consume agricultural by-products and in turn supply farmyard manure and biogas.

OPPORTUNITIES TO EMPOWER WOMEN

Self-employment programs

State level/district level dairy development departments must conduct skill-oriented, self-employment focused programs, so that rural people get more earning opportunities. It adds to their family revenues.

Ananda has started a mission of opening dairy retail outlets in villages. We opened two dairy retail outlets in Gajroula and Pilkhua. These are solely operated by women. The initiatives shall help women to increase household income and escape poverty.

In order to further boost the self-employment mission, we are giving the opportunity to rural women to manage VLCs (Village level Centres). This initiative shall further ensure financial stability and encourage other women to



fun FACT

Ananda enjoys the unique distinction of being the corporate giant where the Founder and Chairman is the face of the group's animation advertising blitz. In some advertisements, Mr Dixit appears with his wife

come forward. In order to make women self-employed, Ananda has also donated sewing machines in Chaubara village, Gajroula.

Health, Sanitation and Hygiene

In rural areas, women have less knowledge about appropriate menstruation management. Maintaining hygiene is an essential aspect of a woman's wellbeing. Ananda has taken an initiative to educate rural women and distributed more than 15000 sanitary pads in nearby villages of Gajroula and Siyana.

Ananda is working actively to raise awareness about sanitation related issues. We strive to provide women with education on health and disease transmission, clean toilets, sanitary pads etc. We are making efforts to enrich the lives of millions of women in India, one step at a time. Hygiene education is an essential part of sanitation projects under our activity. We inform community

members about the correct use, storage and disposal of water and general hygiene.

Micro Financing

Local banks should support rural women for dairy business through micro financing. Easy availability of short term & long term loans with reasonable interest will help especially women to generate more income from dairying.

Self help groups

Enhancing support through self-help groups (SHGs) significantly empowers rural women. Efforts of SHGs, local government and NGOs are required to fight against the bottlenecks in commercial dairy farming.

Dairying has been considered as a potential means of boosting unemployment in rural areas. As women play a key role in animal, farm and home management, dairying can be the best solution to generate family income levels.

Dairy enterprises enhance the financial independence of rural women. They assure a sustained means of income to support family earning. If all stakeholders contribute to overcome all the resistances in commercial dairying, women can become exemplary dairy entrepreneurs.

Ananda has become a torch bearer to empower women and touch multiple avenues ranging from self-employment, women health, hygiene and sanitation.

ANIMAL HEALTH FOR GLOBAL GROWTH



It has become increasingly evident with recent events that health of animals, health of people and health of environment is inter-linked and inter-dependent. The globally accepted concept is One Health where all three – people, animals, and environment are quintessential for achieving SDGs. Healthy animals are the key to sustainability.

Challenges

- 1.3 billion plus people are economically dependent on livestock and it contributes to more than 40% of agricultural GDP.
- One-fifth of the livestock is lost to various diseases and countless animals are devoid of good veterinary support. Animal diseases are double-edged sword wherein not only animals, but the family and the community suffer.
- Sick animals require more natural resources and produce much lesser than healthy animals, thus significantly pressurizing the natural resources
- Zoonotic diseases put people health at risk. Handful of zoonotic diseases affected more than 25% of the global human population.
- Animal diseases and death impact environmental footprint. Some diseases increase GHG emission by up to 24% per unit of milk.
- One of the key SDG, malnutrition in children could be worsened due to loss of livestock as there is less food on the plate affecting more than 191 million children every year

Good and accessible veterinary care with vaccines, biologicals, diagnostics, therapeutics, hygiene, biosecurity, and surveillance are the best tools to improve animal health.

- Healthy livestock improve the livelihoods, eradicate poverty, and provide nutrient-rich food to billions
- UNFAO says “animal health is necessary for sustainable livestock production” hence healthier animals



About the
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Mr Neti Patel,
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have smaller environmental footprints

- Mental well-being is inter-twined with mental health and pets can play significant role in improving mental well-being of humans

Economics

Healthy animal population is essential for economic growth, with special reference to developing region for long term sustainable growth. Studies shows that household with livestock are having better income source and access to banking credit facility. Livestock production are fastest growing sectors (2.5% per year) for developing country in last 2 decades. Thus, entrapping the opportunity for growing demand for food, healthy animal population can help to sustain the economic growth of the region. Because of diversity of work associate with this sector ranging from production to marketing of final products; employment generation is more than average. Worldwide 1 out of 6 people are associating with livestock production and contributed US\$1.27 trillion per year.

For sustainable development, it is vital to ensure the livestock contribution for economic growth at every level from farm to nation. To achieve these, animals need to be healthy and productive with effective animal health services. Thus, national livestock master plans need to support effective investment planning to optimise livestock's contribution to national economic growth. This is key to achieve sustainable development goal for the nation.



'Healthier Animals, People and Planet for Healthier Lives' is the goal for sustainable development

Environment And Natural Resources

The positive interaction of livestock with environment and natural sources uses are important for long term sustainable development. To meet world's growing need, it is important to continue focus on reducing emission and efficient usages of natural resources through improved practices.

Recent FAO report elaborates that developed nation have reduced land requirements for livestock by 20% while doubling meat production in recent decades. Similarly, Green House Gas

(GHG) emission are reduced up to 11% by milk producers, 36% by chicken producers and 71% by egg producers with last two decades. By reducing the use of water (25%) and land use (76%), the pig farmers in US have cut their carbon footprint by 7.7%. Thus, increasing the adoption of existing animal health, husbandry, feed and management technologies and best practices could lower livestock emission by as much as 30%.

Healthier Lifestyle

The core objective of sustainable development goal is Good health and Well-being for all. It is well-documented that healthy life requires healthy living practices. This is achievable through regular physical and mental exercise. Companion animals are playing important role for upholding both physical and mental health. Research increasingly shows that exposure to pet proven significantly reduce the risk of disease ailments related to overweight, cardiovascular disease, allergy, and asthma. Pets or Animal-Assisted Therapy (AAT) are proven to alleviate stress, anxiety, depression, and feelings of loneliness and social isolation. To secure our future requires healthy and active population and pet's role in our live are well-recognized. As pet population rise, it is equally important to providing necessary veterinary care to ensure their good health too.



MARINE PROSPERITY

AQUATIC ANIMAL HEALTH MANAGEMENT

DRIVER FOR SUSTAINABLE AQUACULTURE DEVELOPMENT



About the **AUTHORS**

Dr JK Jena is Deputy Director General (Fisheries Science), ICAR, New Delhi. Dr G. Rathore is Principal Scientist & Head, ICAR-National Bureau of Fish Genetic Resources (NBFGR), Lucknow

Until the early 2010s, aqua-farmers had to face difficulties in managing aquatic animal diseases. Often the mortalities remained undiagnosed and unreported resulting in huge economic losses, especially to small-scale farmers.

To safeguard the interest of the aquafarming community and to meet international disease reporting obligations for safe trade, the Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, GOI came forward in supporting the National Surveillance Programme for Aquatic Animal Diseases (NSPAAD), being implemented through 31 collaborating centres with ICAR-National Bureau of Fish Genetic Resources (NBFGR) as the lead institute.

The programme is being operated in 21 states and three union territories. The programme was effective in first-time confirmation of new diseases, sending alerts/advisories to stakeholders, and providing scientific advice to the farmers on health management.

NSPAAD helped in establishing the freedom of AHPND in shrimp farms in India, which infused confidence in Indian shrimp farmers and traders. Successful implementation of this surveillance programme has significantly improved the infrastructure on disease governance, generated awareness among the farmers, and provided them access to health specialists for any issues related to aquatic animal health in the country.

An important health management concept is the early detection of the pathogen in the aquaculture system.

In case of a sudden outbreak of diseases, to save the crops farmers tend to use different antibiotics and other drugs without knowing much about their use. This is a matter of concern



Dr Jena likes to explore new places. He likes watching TV in his leisure hours

Rapid and sensitive diagnostic assays developed by ICAR Fisheries Research Institutes are available for endemic as well as exotic pathogens including OIE-listed pathogens.

PCR-based screening tests are being extensively used in shrimp hatcheries for testing the seed for the absence of pathogens such as WSSV, etc. Farmers are able to stock disease-free seed and minimize the introduction of pathogens through seed in the crop, thereby contributing to economic sustainability.

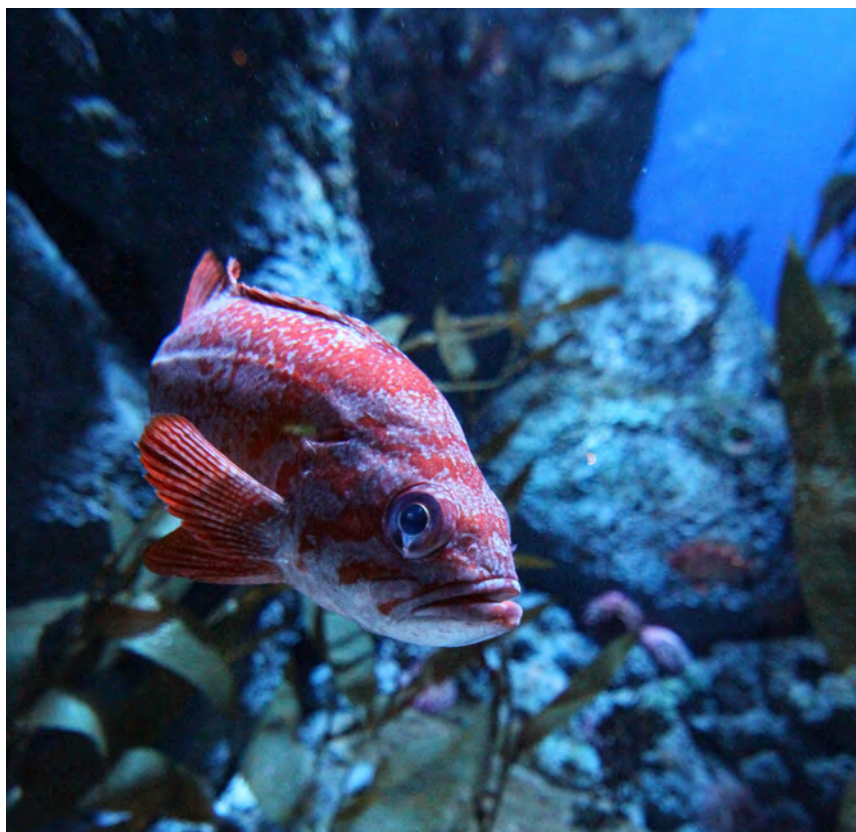
Challenges

Despite all the precautions and management measures, many times

freshwater fish farmers encounter bacterial and fungal infections during the production cycle leading to mortalities and economic losses. Therapeutic formulations developed by ICAR such as CIFAX and CIFACURE are helping the farmers in controlling common bacterial and fungal infections of freshwater fishes. Similarly, farmers are using products like CIBA-LUMIPHAGE and biofilm-based immune stimulants for the control of bacterial diseases in shrimps.

Parasitic problems are quite common in aquaculture and are associated with mostly poor growth rather than high mortalities. Anti-parasitic formulations, CIFE-ARGUNIL or CIFRI-ARGCURE are effective in managing the Argulus infestation in finfish. Similarly, CIBA-PARACIDE can be applied in the shrimp sector for managing parasitic infestations. The timely application of these formulations has saved the farmers from complete crop failures associated with aquatic animal diseases.

In case of a sudden outbreak of diseases, to save the crops the farmers





tend to use different antibiotics and other drugs without knowing much about their use. Looking at the issue of their misuse and the anticipated threat, work is being undertaken to evaluate different antibiotics with regard to their safe dose of application and withdrawal period in different cultivable species.

Looking at the increasing threat of the issue of Antimicrobial Resistance (AMR) in different sectors including aquaculture, a network programme on AMR surveillance, known as the Indian Network on Fisheries and Animal Antimicrobial Resistance (INFAAR) is being implemented by eight fisheries Research Institutes of ICAR.

Dynamic Industry

Aquaculture is a dynamic industry. There is a considerable demand for the importation of live aquatic animals and their products for higher production or diversification. However, the importation of live aquatic animals or their products involves a risk of the introduction of exotic diseases in the importing country. The introduction of exotic diseases can greatly reduce aquaculture production.

Previously, there was no structured policy or mechanism in the country to minimize the disease risks due to the importation of live aquatic animals. Two important policy documents, viz. "National Strategic Plan for Aquatic Exotics and Quarantine" and "Aquatic Exotics and Quarantine Guidelines" prepared by ICAR-NBFGR address this concern and have helped in promoting the safe introduction of exotics and the establishment of aquatic animal quarantine in our country.

Shrimp Sector

Disease outbreaks and crop failures led to a major policy shift in the shrimp sector. Till the late 2000s, India's brackishwater aquaculture was dominated by black tiger shrimp, which was prone to frequent disease outbreaks. Import of Specific Pathogen Free (SPF) broodstock of white-legged shrimp, *Litopenaeus vannamei* was permitted for introduction in the brackishwater culture system in 2009 under effective monitoring and regulations after conducting import risk analysis. Import of only SPF broodstock was permitted as it is reared in a controlled environment and

tested at regular intervals before being certified for freedom of specific pathogens by the exporting country.

Technical inputs by ICAR on National policies on the safe introduction of SPF broodstock followed by strict quarantine at the country level and biosecurity at the farm/hatchery level vastly contributed to the phenomenal growth of shrimp farming in the country. The establishment of the National Repository for Fish Cell Lines at ICAR-NBFGR possessing over 60 fish cell lines has equipped researchers of the country working on fish viruses and for the production of vaccines.

Mobile apps catering to the health management needs of the farmers, Real-time monitoring of water quality parameters, GIS-based disease mapping, or research on disease prediction modelling are some latest technological interventions which are already adopted or are likely to see large-scale adoption in the Indian aquaculture sector. These advancements enable the farmers to take timely actions against biotic and abiotic stressors in their aquafarms, yielding better production.

SOCIO-ECONOMIC RELEVANCE & IMPORTANCE OF ANIMAL HUSBANDRY IN INDIA

India has made much progress in food security and the gains in food grain production have been much highlighted. However, the livestock sector has made tremendous progress in milk, meat and egg production not just addressing the food security but going further towards assuring nutritional security. This article deals with the role of livestock sector in present food situation, challenges faced by the sector and roadmap involving technology, policy and market to make it more resilient and sustainable in coming years.

About the **AUTHOR**

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The United Nations had declared ending world hunger by 2030 as one of its Sustainable Development Goals. In recent times several challenges such as Covid-19, Russia - Ukraine conflict, changing climate, population increase, rising food prices, loss of biodiversity, degradation of natural resources and environment, and increasing use of chemicals have put new obstacles which need deeper reflection on how to better address the global food security and nutrition situation. According to FAO, the number of people suffering from hunger in the world has started climbing up as it rose up from 8.4 percent (from 2014-2019) to around 9.9 percent between 2019-2020. An estimated 118 million more people were added to those facing hunger in 2020 than in 2019. On regional basis about one in five people (21 % of the population) was facing hunger in

Africa in 2020 – more than double the proportion of any other region, followed by Latin America and the Caribbean (9.1 percent) and Asia (9.0 percent).

Current food situation in India

India has made significant progress in food production during an inspiring journey of last 50 years leading towards self-sufficiency in food production marked by the Green Revolution in food grain production and white and blue revolutions in milk and aquaculture production, respectively. Contribution of India to total global food production accounts for around 22% paddy, 13.5% wheat, 23% of milk, and 7% of eggs production in the world. Livestock Sector recorded 8.15 per cent CAGR during 2014-15 to 2019-20 (at constant prices). The contribution of livestock in total agriculture and allied sector GVA (at constant prices) has increased from 24.32 per cent (2014-15) to 29.35 per cent (2019-20) contributing 4.35% of total GVA in 2019-20. Development of livestock sector has led to improvement in per capita availability of milk (427 gram per day), eggs (91 per day) and meat (6.52 Kg per year).

Despite the achievement of national food self-sufficiency, new challenges have emerged. There are nearly 195 million undernourished people in India (a quarter of the world's hunger burden). Also, 4 out of 10 children are chronically undernourished. India ranks 71 out of 113 major countries in terms of food security index 2020 of the UN (UN-India). The government has large food security and anti-poverty programmes but there are critical gaps in terms of inclusion and exclusion errors. Women and girls still continue to be particularly disadvantaged.

Small holder farmers are the mainstay of livestock sector in India. They are resource constrained, and have limited knowledge of technology in livestock production. The majority of indigenous dairy animals are low yielders due to poor genetic potential, inadequate feeding, parasitic load, and further suffer production losses due to repeat breeding and outbreaks of infectious diseases.



On the other hand commercial farms are coming up particularly in Punjab and few other states where high yielding cross bred cattle are being reared with infusion of modern technology like fixed time artificial insemination and use of sexed semen; sensors for animal identification, monitoring and automation of records; semiautomatic milking parlours; balanced ration with use of silage/green based total mixed ration, by pass fats and proteins; and modern climate controlled housing with biosecurity.

Challenges of animal farming in India and future roadmap

Main factors responsible for low productivity per animal include the low genetic potential of dairy animals, feed shortage and lack of awareness on balanced feed rations,

and inadequate provision of veterinary services. As per DAHD Annual Report for 2019-20 the figures for average milk yield per animal per day for cattle are 11.67 Kg for exotic breeds, 7.85 Kg for cross bred, 3.85 for indigenous breeds and 2.50 for non-descript cows, whereas the figures for buffalo breeds are 6.34 kg and 4.35 for non-descript buffalo and only 0.45 kg for goat. The average milk yield per animal per day is markedly lower than those found in the United States (33 kg/day), Israel (40.08kg Day), United Kingdom (26.67 kg/day) and the European Union (25.03 Kg/day). Buffalo contributes 49 percent of milk despite being almost half the number of lactating cows, 35 % being contributed by dairy breeds of buffalo and 14% by non-descript buffaloes. Buffalo milk is characterised by a higher fat content (7-8 percent) and fetches higher market prices. The buffaloes are better adapted to Indian climatic conditions. There is no ban on buffalo slaughter and hence contribute nil to the problem of surplus & stray animals which is emerging as a major issue due to ban on cow slaughter.

NDDB has developed chips INDUSCHIP for cattle and BUFFCHIP for buffalo for estimation of genomic breeding values of young bull calves and heifers and their production potential for early selection. NDDB has proposed to distribute bulls for semen production at different semen stations in the country on



Dr Misra is one of the pivots of the literary circles of Chandigarh and always encourages budding writers and artistes towards excellence. She loves to read and sketch in her leisure time

the basis of genetic merit. Buffalo breeds of Mehsana, Murrah and Jaffrabadi have been included in this programme in addition to well-known Indian breeds of cattle. Technology for more accurate estimation of Genomic Breeding Value needs to be developed based on records of genotype and performance of animals including milk production capacity, fat, SNF & protein content of milk, reproduction regularity of animals, disease incidence, and phenotypic characters/ animal's body type. NDDDB has signed an MoU with GCMMF (Amul) to implement this project which will fast-track genetic progress in cattle and buffaloes for their milk production, reproduction traits, disease resistance and improved body scores.

Feed and Fodder availability is a major constraint, the Indian Grassland and Fodder Research Institute has reported to a deficit of up to 23.4 per cent in the availability of dry fodder, 11.24 per cent in that of green fodder, and 28.9 per cent for concentrates. While about 14-17% of land should be devoted to raising fodder, only 4% is currently under fodder cultivation in India. Infusion of technology in fodder production and processing along with policy support to promote contract farming, release of molasses for straw treatment, harvesting and baling of straw and promoting rational use of paddy straw in animal feeding as 60% of paddy straw is burnt in the fields causing scarcity of dry fodder and problems of air pollution. Promotion of bioethanol industry will impact the availability of maize grain for poultry feeding. By products from starch industry and grain based ethanol industry need to be protected from moulds so that they are free from mycotoxins to be safely included in animal feed formulations. Advancements in production and processing of groundnut to provide aflatoxin free groundnut cake can pave way for its utilisation in different feed formulations. We are importing GM soybean meal and I would advocate permission to go for cultivation of GM Soybean in India as the genetic manipulations are restricted to impart resistance to herbicides and insect population is spared as against the case



of BT cotton. Popularisation of balanced ration, mineral mixture, bypass fat and bypass protein, silage & hay making and improved fodder varieties can go a long way in addressing the feed and fodder shortage.

Diagnosis and control of zoonotic diseases will reduce risks to human health. Vaccination, improved biosecurity good production practices, strong awareness & motivation can reduce the risk of diseases. National Disease Control Programme targeted at FMD and Brucellosis is being run throughout the country by the central Government. Mastitis and haemoprotozoan parasites, PPR, classical swine fever and metabolic syndromes can be managed through good practices and awareness.

Improvements in nutrition and health will address most of the issues related to reproductive performance. Anoestrous, repeat breeding and care before and after calving are also important issues. Oestrous synchronisation and fixed time artificial insemination are being adopted

by commercial farms. Improvement in access and quality of artificial insemination services at the door step of small holder farmers is of paramount importance. One missed AI eventually results in one month of extra care and feeding for a non-productive animal.

Future lies with demographic dividend therefore, engagement of youth is the key to success. The sector has to be modernized with political will, policy and institutional environment. Precision farming, use of digital technology including IoT devices & applications, connecting with markets and improvement of informal markets, incentives for environmental sustainability are needed to continue the transition. Growing demand for quality milk, meat and eggs due to increasing incomes, increasing population and increasing urbanization will drive the growth within the country and as seen in recent months there is potential to increase our exports by addressing the quality improvement and food safety measures, and reforming our trade policies.

LIVESTOCK PRODUCTION IN INDIA

CHALLENGES, OPPORTUNITIES

According to estimates of the Central Statistics Office (2019), the value of India's livestock sector output was about Rs 9.18 crores at current prices during 2016-17. This is about 31.25 percent of the value of output from agricultural and allied sectors. At constant prices, the value of output from livestock sector was about 31.11 percent of the total value of output in agricultural sector.

During 2017-18, the contribution of livestock sector to GDP/GVA was 4.10 percent. The value of export of livestock and livestock products during 2017-18 was Rs 457.76 billion while value of import was Rs 104.24 billion. India's livestock sector is one of the largest in the world. As per the 20th livestock census of Department of Animal Husbandry and Dairying (DAHD) held in 2019, the total livestock population in India was 535.82 million, which include 192.52 million cattle, 109.85 million buffaloes, 74.26 million sheep, 148.88 million goats, about 9.06 million pigs, 851.81 million poultry population and 0.85 million other livestock population.

Livestock Production Statistics

The Indian animal husbandry market reached a value of INR 930 Billion in 2020. IMARC Group expects the Indian animal husbandry market to grow at a CAGR of 6.6% during 2021-2026.

India is blessed with vast livestock resources in the form of varieties of livestock breeds which include 43 indigenous cattle, 16 buffaloes, 34 goat and 43 sheep breeds (DARE, 2019). The total milk production in the country grew at 6.50 percent and reached 187.75 million tons in 2018-19, which was more than double the growth of world



milk production. This record production improved the per capita availability of milk to 394 gm per day per person, considerably higher than recommended by Indian Council of Medical Research i.e. 280 gm per day per person.



About the AUTHOR

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Milk

Uttar Pradesh, Rajasthan, Madhya Pradesh, Andhra Pradesh and Gujarat are the top five milk producing states, constituting 53.10 percent of the total milk production in the country. Nearly 35 percent of the milk production is contributed by indigenous buffaloes followed by 26 percent by crossbred cattle.

Meat

Out of the total meat production, contribution of poultry meat is 50

percent (4.06 million tons) followed by buffalo meat (19.50 percent). Poultry meat production registered a growth rate of 7.80 percent. Uttar Pradesh, Maharashtra, West Bengal, Andhra Pradesh and Telangana are the top five meat producing states, constituting 56.90 percent of the total meat production in country.

Eggs

In 2018-19, egg production reached 103.32 billion with annual growth rate of 8.50 per cent. The per capita availability of eggs is around 79 eggs per person per year, which is far below



the recommended level i.e. 180 eggs per person per year by ICMR. Andhra Pradesh, Tamil Nadu, Telangana, West Bengal and Haryana together contributed 65 percent of the total egg production in the country and are the top five eggs producing states.

Wool

The total wool production in the year 2018-19 reached 40.42 million kgs, which declined by 2.50 percent as compared to previous year. Rajasthan, Jammu and Kashmir, Telangana, Karnataka and Gujarat are the top five



Rank Parameters

- 1st Total Livestock Population, Milk Production, Cattle Population, Buffalo Population, Carabeef Production, Goat Milk Production, Total Bovine Population
- 2nd Goat Population, Bristle Production (pig industry by-product), Fish Production
- 3rd Sheep Production, Egg Production
- 4th Chicken Production 5th Poultry Meat Production, Poultry Production, Meat production
- 8th Duck Production
- 9th Camel Population, Wool Production

fun FACT

Dr Shukla likes to cycle, ride horses and go for long drives in his leisure hours

wool producing states. They together contributed 78.50 percent of the total wool production in country.

Veterinary Support

The key factor for growth of animal husbandry sector is infrastructure. It acts as a catalyst for accelerated growth of livestock sector. In 2018-19, India had 65,815 veterinary institutions: 25,571 veterinary dispensaries; 28,168 veterinary aid centers; 12,076 veterinary hospitals in country (DAHD, 2019). In 2015, India reported 70,767 veterinarians out of which only 3,116 (4.40 percent) are private veterinarians as compared to 87 percent in USA and 60 percent in Europe.

Major Challenges of Livestock Sector

Low Productivity: The productivity of ruminants has been extremely low, turning this precious asset of the poor into a liability.

High economic losses due to animal diseases: Inadequate coverage of vaccination is continuously resulting into economic losses due to various animal diseases.

Inadequate infrastructure and human resources: It is reported that there are 67,651 veterinarians in India. The estimated requirement is between 1.1-1.2 lakh.

Shortage of feed and fodder: According to ICAR-Indian Grassland and Fodder Research Institute (IGFRI), there is a deficit of 23.40 percent in the availability of dry fodder, 11.24 percent in green fodder and 28.90 percent for concentrates in India

Inadequate public/financial institutions support: The livestock sector received only about 12 percent of the total public expenditure on agriculture and allied sectors, which is disproportionately lesser than its contribution to agricultural GDP.

Research and development issues: There is lack of participatory and systems approaches to livestock development and research.

Welfare issues: Now productivity issues of animals are linked as welfare issues, putting pressure on the animal husbandry system of our country.

Climate change: Livestock production systems will be affected in various ways by climate change. Increasing climate variability will increase livestock production risks and reduce the ability of farmers to manage these risks.



DIRECTED BREEDING

WHITE REVOLUTION 2.0

Department of Animal Husbandry (DAHD) and National Dairy Development Board (NDDB) have announced setting up of Breed Multiplication Farms (BMF) across India. The 27% exotic and crossbreds produce more milk than their indigenous counterparts. But as climate extremes hit them, their performance shall decline.

As compared to Jersey, Holstein Friesian and their crossbreds,

indigenous cattle breeds survive extreme temperatures and adjust well. For a Rathi and Tharparkar cow, a tree is sufficient protection in the harsh climate of Rajasthan. Indigenous breeds are known for their resistance to tropical diseases including endemics of FMD and rarely suffer from blood protozoan diseases. Exotic and crossbreds will suffer severely from metabolic disorders consequent to climate change compared to indigenous cattle.

All these news are a challenge for a policy change in genetic restructuring of Indian cattle population and its implementation with latest breeding tools and techniques available in India.

Highlights of 20th livestock survey as compared to 19th survey:

- * Decline of 5.5% of indigenous cattle population
- * Sharp decline in population of pure Haryana breed
- * Decline in population of Tharparkar

and Rathi breeds

- * Increase in Exotic and crossbred population by 29%

Policy to Restructure Cattle Population

The policy should be reoriented to use nondescript heifers as surrogate mothers and create a population of known breeds of cows.

Aims:

- * Reduce number of low-producing nondescript cattle
- * Increase population of known indigenous breeds of cattle
- * Use nondescript fertile young heifers as surrogate mothers implanted with frozen embryos
- * Each surrogate mother to produce at least three female heifers over four years

Restructuring Breed Multiplication Farms (BMF) Project of NDDB

BMFs should be used as a base for execution of this policy. NDDB should prepare model detailed project report for BMF, prepare protocol and implement the policy. BMFs will have basic stock of 200 unidentified (not of recognized breeds) young fertile heifers. These heifers should be preferably purchased locally where the BMF is located. This will reduce cost of breeding stock.

NDDB has announced that it intends to incentivize private individuals, entrepreneurs, FPOs, SHGs, JLGs, and Section 8 companies to establish BMFs. Entrepreneurs interested in taking up



About the AUTHOR

Dr R S Khanna is an international dairy consultant



BRAZILIAN MODEL OF CATTLE BREEDING

Brazilian farms practiced crossbreeding with European breeds to increase their yield of milk and beef. Most crossbreds suffered from tropical diseases, leading to losses. The Brazilians found that Indian breeds of cattle were resistant to diseases and climatic variation. They imported cattle from India and practiced directed breeding. The result: farmers improved milk and meat production and reduced expenses on medicines, healthcare and problems in farm management.

dairy farming are facing difficulties in sourcing disease free high-yielding heifers or cows. Establishing BMFs will overcome this difficulty. BMFs are proposed to be set up through PPP model wherein 50% capital subsidy (limited to Rs 2 crore) will be provided by NDDB/DAHD. BMF entrepreneurs will produce elite heifers that are free of TB, JD, Brucellosis, by using sexed semen or IVF technology. BMF are mandated to sell 80% of the heifers to trained farmers.

NDDB has stated that BMF can be established with known breed of cattle, crossbred cattle or known breed of buffaloes. This provision should be modified. The BMFs shall purchase nondescript local cattle or buffalo heifers that are tested for fertility, particularly a healthy uterus to implant an embryo through IVF technic.

NDDB should discourage the creation of BMF with crossbred of exotic breeds and purebred exotic breed of

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Dr Khanna is a voracious reader, particularly interested in Indian philosophy, heritage and culture, and agro economy. He loves playing board games with his grandsons, especially chess

heifers.

NDDB has a subsidiary that produces and sells frozen semen, frozen sexed semen, frozen embryos, etc. NDDB has standardized complete scientific protocols of IVF technology to support for building new high genetic merit herds. At each BMF, NDDB should provide a full time IVF expert located at the farm, along with required treatment apparatus, hormones, and

medicines.

Until the exiting stock of nondescript heifers is replaced by young generation of known breed of heifers, the BMF should not sell the heifers. The new crop of heifers would be bred with frozen sexed semen and sell the home grown heifers as is provided in the existing project.

Strengthening IVF Infrastructure

* NDDB will need to expand its farms that produce frozen semen, sexed semen and embryos of known breed of indigenous cows and buffaloes

* NDDB will need to train a large number of IVF experts

* NDDB will need to strengthen facilities required for IVF such as treatment instruments, hormones and medicines

Most large and modern dairy farms that are housing exotic breeds or their crossbreds have invested in facilities that keep animals cool during summers. Exotic breed and their crossbreds need far more veterinary healthcare facilities and preventive medications compared to Indian cattle breeds.

In India, the process of cattlebreeding has at best been random and left to the farmers than the scientific community. Take for example the structure of cow and buffalo populations in Punjab and Haryana. Punjab has 85% cows, mostly exotic and exotic crossbreds. Haryana has 85% buffaloes. Can scientists identify any policy that led to these reversals, though farming culture in both the states is similar?

Today, India is advanced in technics and tools of genetic engineering. DAHD believes in providing free flow of funds as long as dairy farming can be advanced fast and in the right direction. NDDB is fully loaded with infrastructure and is capable of creating facilities that can quickly support building Indian breeds of cattle. Let us create a White Revolution 2.0.





THE BEE FACTOR

FMC India's Project Madhu Shakti is supporting rural women earn additional income, helping bees and benefiting the environment

Bees pollinate 70 of the top 100 crops consumed by humans. Together these crops provide 90% of the world's nutrition. But evidence that bee populations are under pressure is ample. With constructive steps, bee population can return to healthy levels and provide a multitude of benefits. These include additional income

for rural women, increased earnings for farmers through better crop productivity, enriching the country's biodiversity and providing a wealth of knowledge having applications in agriculture. Project Madhu Shakti is such an initiative.

Madhu Shakti is the brainchild of FMC Corporation and is supported by GB Pant University, Pantnagar. It is aimed at combining the power of rural women and beekeeping in an entrepreneurial manner. The three-year project has recently been launched in Uttarakhand.

By teaching rural women how to become beekeepers, Madhu Shakti will increase the size of bee colonies, help rural women earn additional income, help flora thrive, inspire more women to be entrepreneurs and educate farmers about using pesticides efficaciously.

Despite its rich flora, Uttarakhand

produces just 12,500 metric tonnes of honey annually. Under a project like Madhu Shakti, this figure is expected to grow significantly.

In the first phase of the project, three groups of 25 women farmers from Sitarganj, Kotabagh, and the towns of Almora and Ranikhet were selected and trained for two weeks in beekeeping at the GB Pant University. They were taught the nitty-gritty of beekeeping and agricultural production.

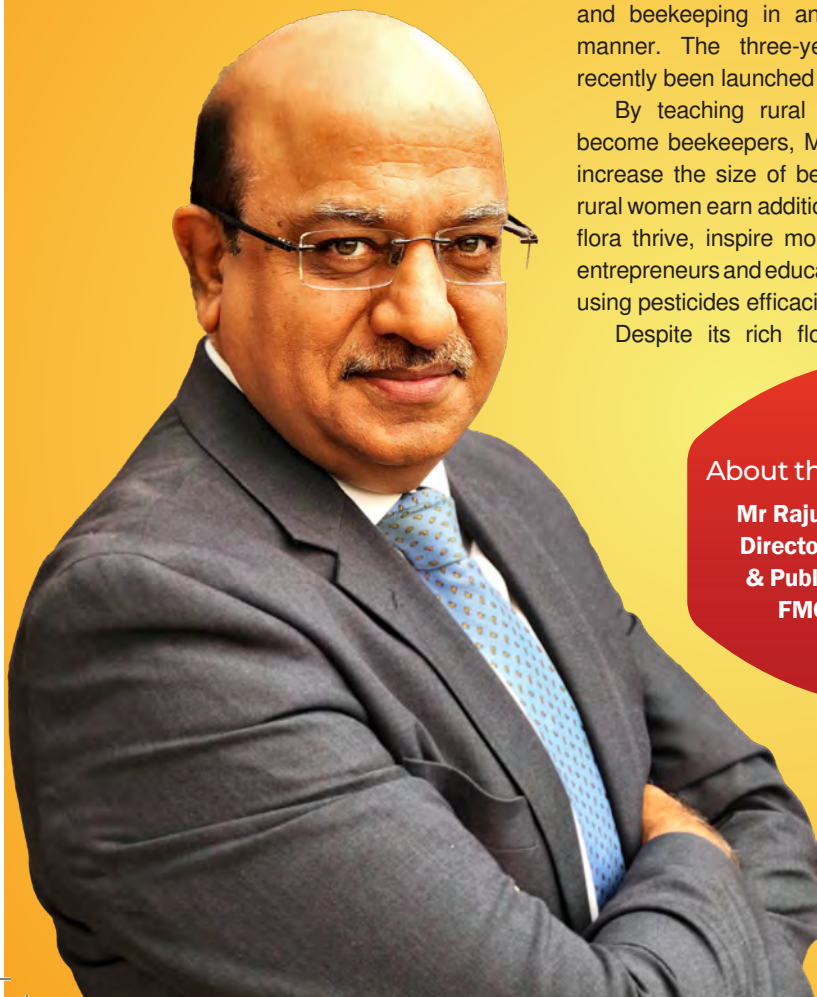
The project uses beehives of the Apis Mellifera variety of bees. These hives have been sourced from authentic sources and the better performing colonies are being maintained and multiplied at Honey Bee Research and Training Centre (HBRTC), GB Pant University. The stock culture will continuously be maintained and multiplied to ensure a ready supply of beehives for farmers.

Entrepreneurship Development

Since being trained as Master Trainers, the 75 women have been given beehives. They have returned with them to their villages. The number of bees in the villages where the hives are placed has increased. As a single bee colony can pollinate 300 million flowers a day, the flora in the vast stretches where the hives are feeling the impact of project Madhu Shakti. The bees are producing honey and helping the women beekeepers earn additional income.

About the AUTHOR

**Mr Raju Kapoor is
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Project Madhu Shakti will provide an opportunity to formulate mechanisms around how pesticides can be safely used on commercially important crops without harming benign pollinators including bees. Trials will be conducted in farmers' fields to demonstrate how to use pesticides safely



The beekeepers will earn money when the produce from their beehives is aggregated at the GB Pant University. After the quality of the honey is checked, payment will be made to the beekeepers.

The Joint Director of HBRTC will establish and maintain a revolving fund to facilitate payment to farmers and market their products. To fetch a premium price, the product will be branded with GB Pant University's name. Hence, GB Pant University's honey brand will be inextricably linked to the women trained under project Madhu Shakti. The product sold under this brand will be traceable and therefore, will enjoy all the advantages a brand has over an unbranded competitor.

The women trained as beekeepers will train other women in the villages. This will result in many other individuals becoming beekeepers.

Inspiring Farmers

The project's success is expected to result in encouraging more farmers to become beekeepers for additional income. An enhanced number of bee colonies will significantly increase the rate of pollination in Uttarakhand. Not only will farmers who rely on cross-pollination benefit from this, but so will horticulturalists, as horticulture is a major profession in the state. Farmers' outputs and incomes across the region will

increase considerably and sustainable farming will get a big shot in the arm.

Notably, the project's success will be replicable in any other region that has sufficient biodiversity as well.

Expanding Farmers' Knowledge

In addition to increasing the number of bees, and supporting rural women become financially secure and independent, the project will also provide an opportunity to demonstrate to farmers how pollination works. This will make them better farmers and increase their income.

For instance, in subtropical and tropical regions, the role of pollinators is not well understood by most farmers. Project Madhu Shakti will generate scientific knowledge through multiple trials that quantify the effect of pollinators on commercially

important crops such as fruits, mustard, cucurbits, litchi, amongst others. Such demonstrations will help farmers understand the role of pollination in the context of quality and yield enhancement in cross-pollinated crops.

Project Madhu Shakti will also generate knowledge on how pollinators can safely coexist in agricultural farms with judicious and scientific use of pesticides to minimize crop losses to pests. Project Madhu Shakti will provide an opportunity to formulate mechanisms around how pesticides can be safely used on commercially important crops without harming benign pollinators including bees. Such trials will be conducted in farmers' fields to demonstrate first-hand to farmers how best to use pesticides safely. This endeavor will go a long way in ensuring that the bee population remains out of danger.

The nascent project will significantly increase the number of bees in Uttarakhand, improve the lives of rural women, and make Uttarakhand's flora even lusher. Educating farmers about pollination and pesticides will result in them adopting sustainable farming practices. Consequently, the threat posed by the indiscriminate use of pesticides will abate. The result will be a big win-win for rural women, farmers, bees and the planet.



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FACT**

In his creative and leisure space, Mr Kapoor likes to define himself as a photographer, spiritualist and philanthropist

ANIMAL HUSBANDRY ROADMAP TO GROWTH

Animal Husbandry is an integral part of mixed farming systems that characterize Indian agriculture and plays a significant role in the rural economy. The animal husbandry sector did not get due recognition and focus at national level until after the formation of Modi-II government when a separate Ministry of Fisheries, AH and Dairying was carved out of the Ministry of Agriculture and Farmers Welfare.

Soon thereafter, in September 2019, two ambitious projects for the control of dreaded diseases like FMD and Brucellosis – NADCP with an outlay of Rs 13,343 crores, and for improving genetics of our cattle and buffaloes – NAIP, were launched across the country. In addition, Animal Husbandry Infrastructure Development Fund to the tune of Rs 15000 crores was launched in 2020.

These initiatives are in line with increasing contribution of the AH sector to the national economy. The share of livestock sector's contribution to national economy increased from 4.4% during



About the **AUTHOR**

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2014-15 to 5.2% in 2020-21, witnessing a CAGR of 8.15% over the five years ending 2019-20. In view of the increasing importance of allied sectors, the Committee on Doubling Farmers' Income had recommended a focused policy with a concomitant support system for dairying, livestock, poultry and fisheries.

Since 1998, India is ranked first in milk production, currently contributing 23% of global milk production. Milk production in the country witnessed a compounded annual growth rate of 6.2% to clock 209.96 million tonnes in 2020-21 from 146.31 million tonnes in 2014-15, ensuring daily per capita availability of 427 grams. Post-Covid, the dairy industry witnessed a growth of 9-11 percent in 2021-22. Dairy emerges as the single largest agricultural commodity, contributing Rs 8.5 lakh crores to national economy. Egg and meat production have also increased with growth rate of 10.19% and 5.98% respectively. Employment generation is high in the AH sector, especially for women farmers and rural youth or resource poor families.





Low Allocation A Challenge

FAO has reported the return on investment (ROI) of livestock sector to be 1:4.7. In India too, it is reported to be 1:4, which is higher than the manufacturing and service sectors. Regrettably, allocation to AH sector - of total allocations to the Agriculture sector, has remained as low as 2.27 % (2020-21) and 2.52% (2021-22). The first ever quantum increase of 40.45% in 2022-23 budgetary allocations (Rs. 4288.84 cr) vis-à-vis previous year (3053.75 cr) i.e. 3.23% of allocations to agriculture, also appears far too small for full realisation of the potential of the AH sector.

In states also, the budgetary allocations to the sector remain unimpressive, except in more recent years in Bihar, Andhra Pradesh and Telangana, which witnessed impressive growth as well. In Punjab, the contribution of livestock sector to state agriculture and allied GDP increased from Rs. 19231.8 cr (30.14%) in 2010-11 to Rs 53,157.70 crore (40.6%) during 2019-20, without commensurate infusion of funds. Dairy is contributing 82% to AH sector output in Punjab, as compared to 66.8% contribution of dairy in AH output at national level. Other AH ventures like goatery, piggery and poultry also have huge potential not only for growth but also for employment of the poorest in peasantry.

No MSP Or Government Procurement

In case of livestock products there is no minimum support price or government

fun FACT

Dr Inderjeet loves teasing kids with concocted stories!

procurement, except in some states where milk and egg are logically included in mid-day meal scheme for school children. Unorganized farmers are left at the mercy of the market forces, except in cooperative sector wherever it is performing appropriately.

While declaring the minimum procurement price for milk by cooperatives also, the cost of milk production is rarely taken into consideration. In the last two years post COVID, the prices of major ingredients used in concentrate feed like Maize, Soybean, Cotton Seed, Mustard Cake, Bypass Fat, DCP, have risen by as much as 25 to 170% from April, 2020 to March, 2022. This has resulted

There is need to consolidate AH to larger family farm and commercial level ventures with infusion of generous funds, together with capacity building amongst rural youth

in approximately 25 percent increase in concentrate feed cost for livestock.

Prices of dry roughages like wheat straw have also gone north, pushing extra cost on milk production. Labour and diesel expenses have also risen steeply in recent months. Commensurate increase in market price of milk is invisible. Realising the gravity of the situation, some states have come to the rescue of the milk producers by giving bonus on milk procurement.

Resilience Of The Livestock Sector

Resilience of the livestock sector, depicting consistent growth of around 5 per cent over the last 5 decades, in the face of the paltry allocations testifies its huge untapped potential, which is actually the engine for increasing farmers' incomes. Understandably, most of the success stories of DFI revolve around AH sector. There is need to consolidate AH to larger family farm and commercial level ventures with infusion of generous funds together with capacity building amongst rural youth. Greater investment is required for mechanisation in livestock sector for increased efficiency, reduced drudgery, improved quality and safety of produce, social and health benefits for workers as well as improved animal health and welfare.

In the endeavour of the GOI for doubling farmers' income, development of livestock and fisheries sector will not only make the farmers more prosperous, but also help curb the farmer's suicides in the days to come.



Poultry Health and Diseases

Consumer perspectives on the quality and safety of poultry products are a continuous issue for the poultry industry and its strategic future. Many foodborne diseases can be transferred through the food chain. In addition, public health concerns on the development of resistant bacteria due to the abuse of antibiotics as growth promoters and drugs are emerging public health challenges. Controlling zoonotic diseases and foodborne pathogens involves a deep understanding of how microbial pathogens invade and colonize, as well as the circumstances that encourage or stop growth for each strain of organism.

The costs of poultry diseases

There is little information on the economic consequences of poultry diseases. As per the polished reports the total economic costs of disease (including vaccines and condemnations) were about 10% of the gross value of production (GVP) and about two times the cost of losses from mortality. The current GVP of Indian poultry sector is Rs.1,77,000 crores and 10% of this GVP is Rs.17,000 crores. Further, it

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can be calculated that for each Rs.1000 loss due to mortalities, another Rs.2000 is lost elsewhere owing to depressed productivity resulting from disease.

Gut Health

Gastrointestinal tract health is an important component of bird health and productivity. Even subtle non-specific changes to gut health and physiology can have a significant bearing on flock health and performance. It is important for the clinician to have a very good understanding of normal gut morphology and physiology in order to detect mild pathological changes or altered intestinal contents.

Antibiotic Resistance and Related Problems

Fortunately, alternatives to Antibiotic Growth Promoters (AGP) have become more refined with specific mode of action. Issues of gut health need to be taken care in absence of AGPs. Reduction in therapeutic antibiotics need to be tackled through quality chicks, quality feed, quality management, good biosecurity and targeted vaccination program. Implementation of animal

welfare guidelines and production of antibiotic free chicken products will have a major impact on the disease scenario.

Food-Borne And Zoonotic Diseases

Consumer perspectives on the quality and safety of poultry products are a continuous issue for the poultry industry and its strategic future. Many foodborne diseases can be transferred through the food chain. In the available literature, *Salmonella* serovars (*S. typhimurium* and *S. enteritidis*) and *Campylobacter* spp. are the poultry bacteria more often responsible for human foodborne diseases. In addition, public health concerns on the development of resistant bacteria due to the abuse of antibiotics as growth promoters and drugs are emerging public health challenges. Controlling zoonotic diseases and foodborne pathogens involves a deep understanding of how microbial pathogens invade and colonize, as well as the circumstances that encourage or stop growth for each strain of organism.

Bio Security

Poultry medicine focuses on prevention through bio-security, vaccination, medication, and harmonizing the environment. Each disease control strategy requires a financial investment with an expectation of a financial return on investment. The function of a health program is not necessarily to eradicate or completely eliminate a disease, but to find a level that will optimize return on investment.

Bio-security is critical from start to



Industry and Government Coordination

India does not have national policy for control of most poultry diseases except for HPAI. There should be better coordination between industry and the government in surveillance to identify the prevailing pathogens and their variants for making available needed vaccines and upgrading existing vaccines. Without involvement of government, control of diseases like HPAI, LPAI, ILT, etc., seem impossible. In the context of poultry health and disease control, the government must put in place competent field and veterinary laboratory capacity for the diagnosis of poultry diseases. There is a strong need for close collaboration between the public and private sectors in achieving this important goal.

Bio-security is critical from start to finish of a flock and should be in place on every farm. Farms with poor bio-security are vulnerable to diseases, which have the potential to ruin an entire flock

finish of a flock and should be in place on every farm. Farms with poor bio-security are vulnerable to diseases, which have the potential to ruin an entire flock. In recent years, the number of backyard poultry has been on the rise in India. Bio-security practices are highly variable

among flocks. Pathogen spillover events between backyard chickens and wild birds are becoming more commonly reported. Backyard flocks are implicated in maintaining of two critically important RNA viruses, NDV and HPAIV. This is largely due to essential differences in the bio-security of backyard flocks and commercial flocks. For instance, while the commercial industry practices high containment and mass immunization against NDV, only 3% to 10% of backyard flocks are immunized for common poultry pathogens. Backyard flocks are also often subject to little to no bio-security regulations, where bio-security protocols and vaccination serve as the essential management practices that mitigate the transfer of infectious agents into and from the flock.



Dr Chatterjee loves to listen to music in his leisure hours

Nutrition And Health

SMALL INDIGENOUS FISH ARE POWER BANKS

The small fish is an important food item as animal protein source in the diet of rural community. Though Indian

aquaculture system is carps-based, rural people often consume locally available small fish. These small indigenous fish (SIF), having length of about 25 cm, is available in the local water resources and is affordable.

Fish culture is one of the recognized sectors for food production and provides nutritional security to humans. Fish constitute the third major source of dietary protein after cereals and milk for human all over the

world. SIFs provide better nutrition as it is generally eaten whole including head, bone, and eyes. So all available nutrients including micronutrients get utilized.

The fresh water system is endowed with a large number of small indigenous fish. It contributes significantly to the nutritional as well as livelihood security of the rural people. SIFs are an important source of nutrients in human health and nutrition. They are well known as a rich source of proteins, fatty acids, vitamins and minerals. It is reported that vitamins and minerals available in one kg of SIFs are equal to those available in



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approx 50 kg of big fishes, such as major Indian carps.

Some species such as *Amblypharyngodon mola*, *Osteobrama cotio* and *Esomus danricus* contain micronutrients, minerals and high amount of vitamin A. *Esomus danricus* and *E. longimanus* also contain high iron content. SIFs play important role in preventing malnutrition due to protein-calorie and more specifically the micronutrient deficiency.

Global Need For Better Nutrition

About 250 million children worldwide are at risk of vitamin A deficiency, 200 million people have goitre, 20 million are retarded as a result of iodine deficiency and nearly 2 billion people are iron deficient. Majority of the Indian rural women face nutritional deprivation since their childhood. This is the major cause of malnutrition and under-nourishment of the women.

Consumption of SIF may be a simple and easy way to meet the vitamin-A deficiency and may be used as in curing the night blindness. Small fish are very rich in Zinc compared to food from other animal sources. Calcium absorption from small fish is comparable that from skimmed milk. These fish may represent a good source of Ca.

SIF can serve as natural supplements for combating and preventing micronutrient deficiency as well as protein-calorie malnutrition. The local communities have knowledge about the therapeutic value of fish viz. *Puntius* sp. with some herbs is used by tribal communities to cure gastric problems.



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FACT**

Dr Sinha likes to cook innovative non-vegetarian dishes for family and friends, and loves to experiment with spices in cooking

The successful linking of human nutrition and fisheries to address micronutrient deficiencies has relevance for other countries with rich fisheries resources, such as Cambodia and countries in the Lake Victoria region of Africa.

Major Health Benefits

Extensive carp culture along with small indigenous species is a source of additional income and dietary protein for rural families. It incurs no additional cost

and is environment friendly. Indigenous knowledge of traditional communities reported the health benefits by consuming of these species.

Commonly found SIF, mola (*Amblypharyngodon mola*) in East and North East India, is often included in the diet of pregnant and lactating mothers for its recuperative importance. The role of SIF in providing micronutrients is critical, especially where micronutrient deficiency is a big problem. Therefore, diversification of aquaculture with high nutritive valued small fish species of regional importance holds great promise.

To make full use of this potential of small fish species for improving nutrition, further data on the consumption, nutrient analyses, cleaning, processing and cooking methods of small fish are needed. The availability of SIFs in the market is far below the demand and there is no specific marketing chain. Most of the freshwater SIFs are consumed locally. The price is increasing day by day in comparison of other cultivable carps.

There is a great seasonal and regional variation in the supply and type of SIFs. However, there is lack of the marketing infrastructure. The peak harvest season of riverine SIFs is November-December. SIFs from the floodplain comes to the markets between May and December with a peak in October-December. SIFs from other water bodies are harvested between January and April. Fish price depended on size, season, availability and quality.

Need To Popularize Consumption Of SIF

Advocacy, awareness and nutrition education of the role small fish can play in increasing diet diversity and micronutrient intakes must be strengthened. Also, measures to develop and implement sustainable, low-cost technologies for management, conservation, production and accessibility of small fish must be undertaken. Sensitizing the community to include SIFs in their diet shall attract small scale entrepreneurs to culture the fish for their nutritional security and livelihood. Proper attention is not given to such species in the statistics, policies and programmes of inland water fisheries in India, both at state and national level. Public awareness is essential for conservation of indigenous fish diversity. The wise management of habitats needs to be created through mass media.

GLOBAL AGTECH INNOVATOR!

The last two years have been difficult for the Indian economy as was the case across the world on account of the COVID-19 pandemic. Multiple waves of infection, repetitive restrictions on mobility and hence trade, lead to supply-chain disruptions, falling employment or quality of employment, and, more recently, inflation is creating an environment of uncertainty and lead-

ing to challenging times for businesses (especially marginal, small, and medium businesses), policy-makers, and the general public at large.

As the world melted, India did comparatively very well when it comes to mitigating the impact of COVID both on the health and the economic front. Advance estimates suggest that the Indian economy is expected to witness a real GDP expansion of 9.2 % in 2021-22 after contracting 6.6% in 2020-21. The overall economic activity has recovered to the pre-pandemic levels.

Advance estimates suggest that while the other two sectors (Industry and Services) struggled during pandemic, the bright spot was the Agriculture sector. The sector has experienced buoyant growth in the past two years. The sector, which is the largest employer of the workforce, accounted for a sizeable 18.8 % of Gross Value Added (GVA) of the country in 2021-22,

registering a growth of 3.6 % in 2020-21 and 3.9 % in 2021-22. Growth in allied sectors including livestock, dairying, and fisheries has been the major driver of overall growth in the sector. Allied sectors are steadily emerging to be high-growth sectors. The livestock sector has grown at a CAGR of 8.15 % over the last five years ending 2019-20. As revealed by the latest Situation Assessment of Agricultural Households Survey (SAS), the sector has been a stable source of income across groups of agricultural households accounting for about 15 % of their average monthly income.

The SAS, 2021 reveals that the average monthly income per agricultural household, as per the paid-out expenses approach, works out to be ₹ 10218. The average monthly income per agricultural household was ₹ 6426 as per the last SAS Report of 2014 estimated by the same approach. One



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of the reason for enhanced incomes of rural households is the progressive policy of government to adopt modern technology in agriculture and promote adoption of the same through various direct programs/schemes and indirect policy intervention.

Technology Innovations and Digitization in Indian Agriculture

The emergence of the Indian AgTech sector has been one big trend seen over the past decade in Indian Agriculture.

While the seeds of digital initiatives in agriculture in India were sown through the National Policy for farmers with a focus on ICTs in 2007. Further, National Telecom Policy which was launched in 2012, had a focus on broadband connectivity and mobile penetration. This is the reason we saw many companies as discussed in this article were founded in the period between 2010-2014. However, the pace was slow, and the drivers for these neo-agriculture players were the reduction in the cost of technology, advancement in technologies like Big Data Analytics, Artificial Intelligence, and the Internet of Things, and their widespread adoption in other domains. Subsequently, post-2014 there was a more focused effort by the Government, Private Sector, and fast-emerging Startup ecosystem to solve some of the inherent challenges of Indian agriculture.

The conducive environment through indirect efforts through the Government of India's Startup India and Digital India created a very favorable environment for some of the top AgTech companies in India which are now becoming world leaders. The rise of most of these companies has been nothing less than stellar in the past six or seven years with some of them becoming minicorns and one becoming a unicorn. Various notable initiatives by the union government have catalyzed the AgTech sector in India.

The National Agriculture Market scheme (e-NAM) envisaged the initiation of an e-marketing platform at the national level and supported the creation of infrastructure to enable e-marketing in regulated markets across the country. This innovative market process is revolutionizing Agricultural markets by ensuring better price discovery, bringing in transparency and competition to enable farmers to get improved remuneration for their produce in moving towards 'One Nation One Market'. Today e-NAM connects 17.3 million farmers and 222 thousand traders across more than a thousand markets in 18 states and 3 Union Territories in India.

The Unified Farmer Service Platform (UFSP) is a combination of Core Infrastructure, Data, Applications, and Tools that enable seamless interoperability of various public and private IT systems in the agriculture ecosystem



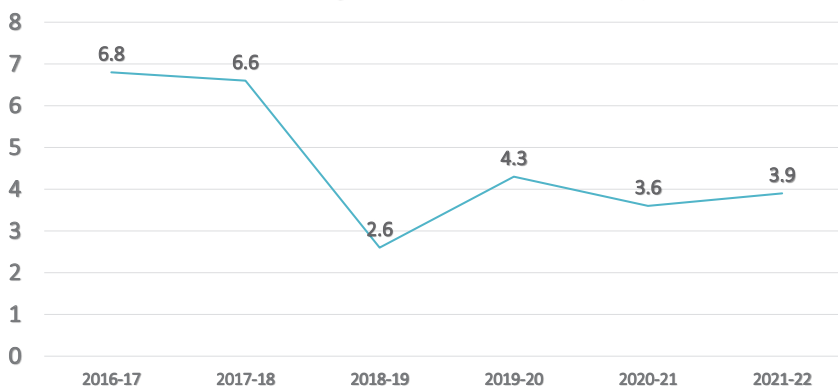
fun FACT

Cooking and playing with my dog are my favorite de-stressing activities

across the country. UFSP aims to create a land-linked Federated Database of farmers across the country, around which Government Schemes can be anchored, and socio-economic benefits can be delivered to farmers. UFSP is envisaged to play the role of acting as a central agency in the agriculture ecosystem, acting as a repository of all the applicable standards, API's (Application Programming Interface) and formats, and acting as a medium of data exchange amongst various schemes and services to enable comprehensive delivery of services to the farmer. UFSP is used to capture farmer details so that the benefits (incentives, insurance, advisory etc.) can be delivered in a targeted manner to farmers with improvised accuracy and efficiency. Currently, 111.9 million farmers and 45.6 linked land parcels are part of this Federated Database.

The AgriStack is an evolution of UFSP. On April 13, 2021, the Department of Agriculture, Cooperation and Farmers Welfare entered into a Memorandum of Understanding (MoU) with Microsoft Corporation which set in motion the ministry's plan of creating 'AgriStack' (a collection of technology-based interventions in agriculture), on which everything else will be built. On the same day, the government published a consultation paper called The India Digital Ecosystem of Agriculture (IDEA), laying out a proposed framework for 'AgriStack'. The intention is to help more and more AgTech players participate in building better solutions

Growth of Agriculture and Allied Sectors (%)



Source: First Advance Estimates Of National Income, 2021-22

for the farmers.

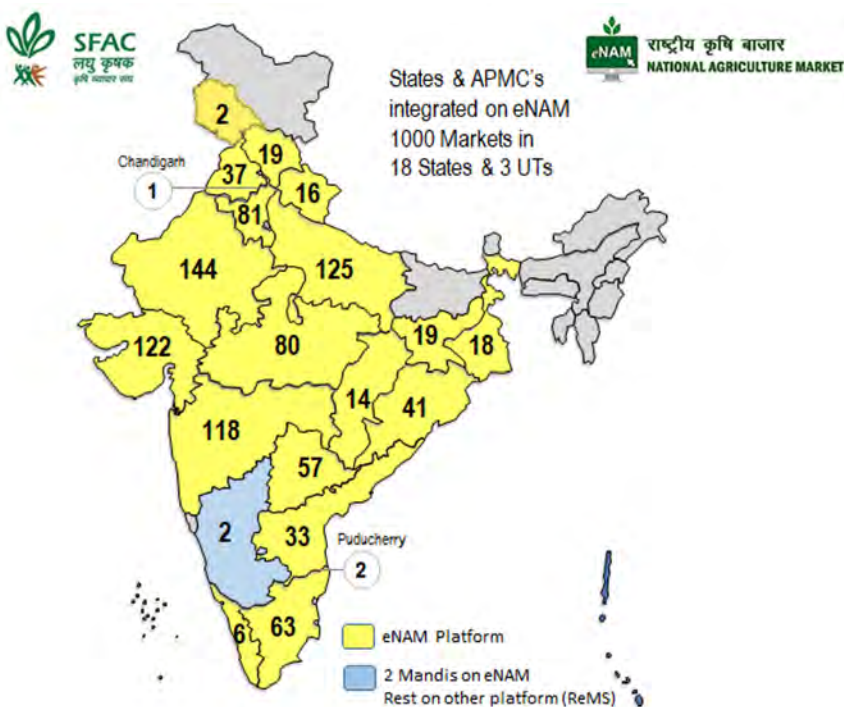
All these initiatives of the government are at the core of building a next-generation innovation ecosystem for agriculture.

Indian AgTech Players Leap Frog to Global Scale

The Indian AgTech ecosystem has been growing at the fastest pace ever with some of the top names in the sector like Absolute Foods, AgroStar, CropIn, Dehaat, Ninjacart, and Stellapps gaining from the Government of India's push for innovation to solve challenges of Indian agriculture.

Absolute Foods

Absolute Foods is a path breaking plant biotech company re-imagining agriculture to radically and sustainably improve agriculture performance, around the world. Developed by some of the world's finest scientists, Absolute Foods spent 6 years intersecting phytology, microbiology, omics, molecular biology, epigenetics, and AI to build India's largest microbial & Biomolecule discovery cum optimization platform. Absolute Foods has developed the world's first universal Farm Operating System with precision farming IP for more than 60 different crops. The company is also building the world's largest precision farm network spread over 100,000 acres. democratizing access to agriculture innovations, inputs, advisory & markets across its network. Absolute Foods' solution comes at a time when even the most rural farmer is now online, it deploys IoT devices to monitor farm conditions and provide specific instructions to farmers on every step of the crop lifecycle. They've managed to increase farmer yields by up to 20% by increasing the quality of the produce while decreasing reliance – and spending – on synthetic inputs and chemical fertilizers. Absolute Foods currently operates across 10+ countries and in India they currently serve 12 Indian states. Absolute Foods is fast scaling up by working with Farmer Producer Organisations (FPOs), or cooperatives,



instead of individual farmers.

AgroStar

AgroStar is India's foremost AgTech company with a mission of "Helping Farmers Win". AgroStar was started with a vision to solve two of the biggest problems in Indian agriculture - Lack of guidance for scientific/sustainable farming and limited access to great quality farm inputs. Today, AgroStar serves millions of farmers across five Indian states via an omni-channel approach. Along the journey, AgroStar has built India's largest agronomy advisory center, a highly engaged digital farmer network with over 5 million users, and a retail network of more than 15 hundred stores. These channels, powered by technology, work in tandem to enable us to solve the problems faced by farmers at scale. AgroStar's solutions create a significant impact on the lives of farmers by helping them in increasing their crop yield, reduce their input expenditure, help grow better quality output, and access global and domestic markets to fetch the best rate for their output. AgroStar currently operates in the states of Gujarat, Maharashtra,

Rajasthan, Madhya Pradesh, and Uttar Pradesh. AgroStar is rapidly growing its agri-input platform and making strategic investments to solve other large farmer problems like market linkages and access to credit.

CropIn

CropIn is an Earth Observation & AI-led AgTech organization that empowers the farming community to 'Re-imagine Agriculture with Data'. CropIn is focused on helping the world's ag-ecosystem players to sustainably "maximize their per-acre value" by combining pixel-level data derived from satellite imagery, in combination with IoT and field intelligence. CropIn is engaging in a multi-disciplinary approach towards AI, Earth Observation, Agriculture, Meteorology, and Computer Sciences, all collaborating to bring meaningful insight to improve the ag-ecosystem and impact the livelihood of a farmer. CropIn provides SaaS solutions to agribusinesses, governments, and non-government organizations present in over 56 countries benefiting 7 million farmers with digital intervention over 16 million acres of land covering nearly 10 thousand crop

varieties. CropIn thus enables businesses to leverage technology to effectively drive their initiatives around Digitization, Compliance, Predictability, Sustainability, and Traceability. CropIn's product suite enables data-driven farming by connecting all the stakeholders in the Ag-ecosystem. The portfolio of CropIn has products targeted toward different ecosystem players.

DeHaat

DeHaat is one of the fastest-growing start-ups in the Agri Tech sector and one of the very few companies providing end-to-end solutions and services to the farming community in India. The company is building AI-enabled technologies to revolutionize the supply chain and production efficiency in the farm sector. Currently, it is operating in the Indian states of Bihar, UP, Odisha, and West Bengal with 65,000+ farmers in its service network with a goal to bring its services to 5 million farmers by 2024. DeHaat is growing at a rate of 3-4x annually with phenomenal impact at the grassroots level. DeHaat is expanding with its flagship centers, a one-stop shop for full-stack agricultural services. Farmer gets access to quality material inputs, coordinates the sale of their produce to institutional buyers, and receives science-based farming advisory in a timely manner, often personalized based on their specific farming conditions. The chain of De-

The conducive environment through indirect efforts through the Government of India's Startup India and Digital India created a very favorable environment for some of the top AgTech companies in India which are now becoming world leaders. The rise of most of these companies has been nothing less than stellar in the past six or seven years with some of them becoming minicorns and one becoming a unicorn

Haat Centres is dotting the countryside with most of them operated by the local franchise owners, also known as DeHaat Micro-Entrepreneur or DeHaat Coordinators. They are the reliable and friendly "human interface" on the ground who build trust with farmers and are an essential part of Last Mile Access that makes true differences in the overall value chain of our operations.

Ninjacart

Ninjacart is India's largest Fresh Produce Supply Chain platform. They are pioneers in solving one of the toughest supply chain problems in the world by leveraging innovative technology. The company's platform connects producers of food directly with retailers, restaurants, and service providers using in-house applications that drive end-to-end operations. Currently, Ninjacart's supply chain is equipped to move vegetables and fruits from farmers to retailers and businesses across 7 cities, every day in less than 12 hours. Ninjacart has eliminated intermediaries by taking control of the supply chain by using technology and analytics. They

have built a reliable, cost-effective, and high-speed logistics and infrastructure to solve inefficiencies and reduce food wastage in the Supply Chain. On one end, farmers get better prices and consistent demand, and on the other end, retailers receive fresh produce at competitive prices that are delivered to their doorstep. Ninjacart's high-quality and hygienically handled fresh produce ensures healthy food for consumers.

Stellapps

Stellapps is the first of its kind startup in India working towards the digitization of the dairy supply chain. It is an Internet of Things (IoT) startup with a primary focus on data acquisition and machine learning. Stellapps work for the largest crop on this planet, Milk, as there is a strong need for technological interventions, especially in the emerging markets where the yield per animal is low, traceability is inadequate and quality is not up to the mark. Digitization of the Agri-Dairy supply chain in the emerging markets is where Stellapps help unlock unprecedented value on a very large scale. The company digitizes & optimizes Milk Production, Milk Procurement & Coldchain Management through its SmartMoo platform (Full Stack IoT solution) which helps dairy farmers and cooperatives maximize profits while minimizing effort. Currently, the SmartMoo platform & suite of apps touch over two billion liters of milk annually. This platform is the first step toward creating measurable value for all stakeholders including farmers and provides measurable data for cattle insurance. Stellapps is supporting data arising out of tens of millions of liters of milk through the milk production, procurement, and cold chain flow across millions of farmers.



Source: Based on data from the Department of Agriculture & Farmer Welfare (DAFW).
*As per 1st Advance Estimates of National Income, 2021-22

INNOVATIVE WAY TO CONSERVE VALUABLE SPECIES

STATE FISH



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India is a big nation with several states. The variable climatic circumstances have diverse distribution of fish in the country. People also have various cultural and personal attachments to various fish species.

The ICAR-National Bureau of Fish Genetic Resource, Lucknow, has conceptualized the “state fish” approach as a means of conserving fish species because it sees an opportunity to take advantages. Based on the threat level for a particular species, the International Union for Conservation of Nature and Natural Resources

(IUCN) established the benchmark for conservation efforts and species listed. In order to raise public awareness and encourage policymakers to take action to prevent extinction of species, the IUCN Red List communicates the urgency and scope of conservation challenges.

India contributes to about 7.7% of global fish diversity, of which, 1,668 species are marine, and 1,027 are freshwater. The loss of native fish species and their germ-plasm has been attributed to overexploitation of the fishes with high demand and price, habitat destruction by constructing



dams on rivers and distorting their natural habitat, introduction of invasive species such as tilapia which prey on our native fish species for food and space, and pollution.

Fresh water, brackish water and marine water are main resource of fish flora and fauna. A total of 3,231 fish species are found in India. Sadly, their numbers are declining due to various threats such as habitat loss, pollution, overexploitation, human activities etc.

ICAR- National Bureau of Fish Genetic Resource, Lucknow, has conceptualised the 'State Fish' concept as a method to conserve fish species. Different states of India have declared their state fish based on the abundance, preference and importance in the day to day life of the people. A total of 21 states have declared their state fish. These include Andhra Pradesh, Arunachal Pradesh, Bihar, Goa, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Lakshadweep, Madhya Pradesh, Manipur, Mizoram, Nagaland, Odisha, Telangana, Tripura, Uttar Pradesh, Uttarakhand, Sikkim and West Bengal. This move will help in conserving the biodiversity of India's fish.

Important Step For Sustainability

State fish concept is an innovative step to make people understand and take care of species that are related to the everyday life of the people. It leads to the conservation of resources and helps to maintain sustainability in fisheries activities. It is "easy to lose a species but impossible to create

There is immediate need to conserve aqua bio-diversity. The states which do not have their state fish must come forward and conserve the fish species by developing the seed production technology and culture technology of that fish

one". This concept of encouraging region specific conservation method will bring more awareness in people for biodiversity conservation and sustainable livelihoods.

In addition to the state fishes adopted by some states, many other fish are struggling to sustain. They have poor conservation status. Some may go extinct, some are endangered, some are venerable and some are threatened. There is immediate need to conserve aqua bio-diversity. The states which do not have their state fish must come forward and adopt one of this fish and conserve the fish species by developing the seed production technology and culture technology of that fish.

Fish are a particularly nutritious food source. They need to be preserved for food security. Millions of people rely on fishing for their food and livelihood. In many regions, local population livelihoods are reliant on a certain

species, which frequently effects in overexploitation. Educating people about the need to protect species is crucial for striking a balance between livelihoods and sustainability.

Various Indian states have designated their state fishes based on their abundance, popularity, and significance in the daily lives of the people. This will protect the species through conservation, breeding and culture, and support biodiversity preservation.

The protection and conservation of biodiversity is crucial for the survival of species as well as for preserving local interest and culture to particular species. Many species from India are designated as endangered, threatened, and other categories which depends on their natural presence. A few of these have actually gone extinct.

The primary goal of state fish is to create strategies for the enhancement and conservation. Effective management measures for biodiversity conservation are also essential. The innovative approach to fish conservation by NBFGR, Lucknow, involves integration of the key stakeholders in the conservation plan. A total of 21 states of our country are partners with NBFGR in developing strategies for management and enhancement of their selected state fish to achieve real time conservation success. The protection and management of our aqua biodiversity is highly important. The fisheries sector is a sunrise sector. It plays the most important role in the food security of future generations.

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