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### Editors

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### From the President's Desk

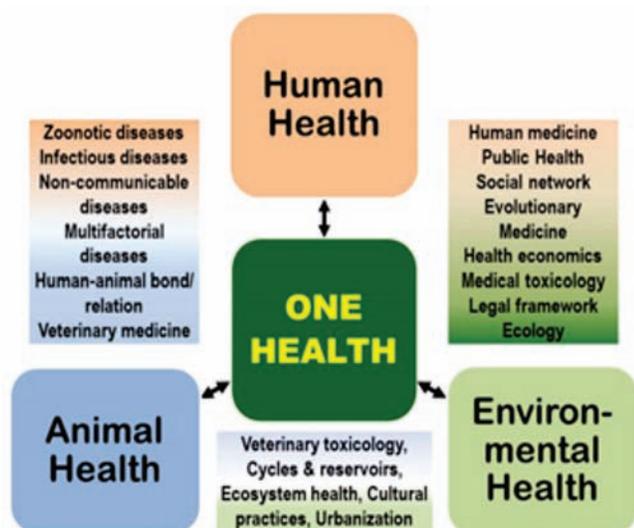
## One Health Policy: The Need for a Healthy Planet



The concept of *One Health*, which recognises the interlinkages of human health, animal health and environment, is gaining importance as several of the contagious diseases affecting humans are zoonotic (*from animals to humans*) in nature. The human health risks of

zoonotic diseases have become more apparent in the past few decades due to successive outbreaks of several zoonotic diseases like the avian influenza, SARS, Ebola and on-going pandemic of Covid-19. These epidemics have exposed the weaknesses of the human health infrastructure and service delivery systems world-wide, especially in the developing countries. However, there is a growing realization that health issues at the human-animal-environment interface cannot be effectively managed by addressing one component alone, and require collaboration across all relevant sectors and disciplines. A multisectoral approach is being advocated as a meaningful strategy for timely and effective response to zoonotic disease events based on accurate and shared assessments of the situation, besides the collective action and accountability defining the specific roles and responsibilities of institutions in the collaboration. The increasing outbreaks and pandemics of some emerging and re-emerging zoonotic diseases, including the **COVID-19**, are posing significant threats to human health and socio-economic fabric throughout the world. Nonetheless, such pandemics also create opportunities for global communities, including scientists, health workers, administrators and politicians to increasingly cooperate and collaborate to prevent disease spread, save lives of people and minimize casualties by focusing on development of novel, rapid, cost-effective, easy-to-perform and scalable diagnostic tests, effective vaccines, state-of the-art technologies and safe therapeutic regimens.

The *One Health* concept can be traced back to the middle of the nineteenth century when a German physician Rudolf Virchow recognised the link between animal and human medicine, and coined the term *Zoonosis* to describe diseases that can be transmitted from animals to humans and



advocated the concept of one medicine. This concept transited to the concept of *One World, One Health* and eventually to *One Health* in the beginning of the twenty-first century when the world encountered several outbreaks of deadly diseases like Ebola, severe acute respiratory syndrome (SARS) and highly pathogenic avian influenza (H5N1). The SARS was a novel and first readily transmissible disease outbreak that triggered the realization that a previously unknown pathogen could emerge from an animal or wildlife source at any time and place without forewarning, and may threaten the human health and societal well-being. This recognition clearly renewed the thrust on the need for global capability and capacity to maintain an effective alert and response system to detect and quickly react to the outbreaks of international concern following the basic principles enshrined in the concept of *One Health*.

As defined by US Centers for Disease Control and Prevention and the One Health Commission, *One Health* connotes a collaborative, multisectoral, and transdisciplinary approach—working at local, regional, national, and global levels—with an aim of achieving optimal health outcomes by recognizing and understanding the interconnection between people, animals, plants, and their shared environment, and preventing risks and limiting infectious agents and their vectors to their natural habitats and sources. Three international organizations viz., WHO - World Health Organization, OIE - World Organization for Animal Health, and FAO - Food and Agriculture Organization, joined hands to develop tools and global strategies to ensure a consistent and harmonized approach to coordinate human, animal and environmental health policies at the national and international levels. They published a **Tripartite Concept Note** in 2010, describing

collaborations and strategies for prevention and control of health risks along the human–animal–ecosystem interface. The major activities included an early detection of emergence of animal and human diseases, besides a swift and targeted response to control disease outbreaks and prevent their further spread. Rabies, animal influenza, antimicrobial resistance (AMR) are the three priorities set for the Tripartite Alliance.

These organizations released their second **Tripartite Strategic Document** in the year 2017 to enlarge the scope of collaboration by embracing the *One Health* approach. While retaining the focus on AMR, rabies and zoonotic influenza, the enlarged collaboration focuses on: a) reinforcement of national services in human health, animal health and food safety; b) strengthening and modernization of early warning and surveillance/monitoring systems; c) foresight, preparedness and response to emerging, re-emerging and neglected infectious diseases; d) encouragement and promotion of coordinated research and development to achieve a common understanding of the high priority zoonotic diseases; and e) challenge that represents food safety requiring a multi-sector approach in the context of reinforcing the food security concerns.

Further, building upon previous collaborations, the FAO, WHO and OIE signed a **Memorandum of Understanding** in May 2018, agreeing to intensify joint actions to combat health threats associated with the interactions between humans, animals and the environment. It emphasized that the knowledge, insights and technical capabilities in human and animal health as well as food and agriculture together can create synergies for more robust, effective and cost-efficient solutions to the complex human health problems facing the world today. The joint activities include implementation of the **Global Action Plan on AMR** by reinforcing the national and regional human health, animal health and food safety services, addressing the food safety challenges, promoting the coordinated research and development for high priority zoonotic diseases among others.

The *One Health* initiative is being implemented by the OIE as a collaborative global approach towards understanding risks to human, animal and ecosystem health. In addition to strengthening national veterinary services, the OIE also collaborates synergistically with more than 70 other international organizations, which play a key role in the human–animal–ecosystems interface. The animal origin diseases that transmit to humans include rabies, *Salmonella* infection, West Nile virus infection, Rift Valley fever, Q fever (*Coxiella burnetii*), anthrax, brucellosis, Lyme disease, ringworm,

ebola, avian influenza, and these pose significant global risk to public health. Other diseases spreading from human to human all also circulate in animals or have an animal reservoir and can cause serious health crises like the recent epidemics of SARS, MERS and Ebola. Such risks aggravate with increasing globalization, climate change and changes in human behaviour that provide the pathogens an opportunity to colonize new territories and evolve into new forms. Drug-resistant microbes can be transmitted between animals and humans, and therefore hence need a well-coordinated approach to effectively contain the transmission. Hence, it is imperative to develop global strategies to prevent and control pathogens to protect the public health. In this context, the **Tripartite Zoonotic Guide (TZG)** developed by FAO, OIE and WHO, reflect a longstanding and successful partnership to address the on-going challenges to public health. Further, this guide is flexible enough to be used for other health threats along the human-animal-environment interface, including the food safety and antimicrobial resistance.

Indian subcontinent is at a high risk of emerging and re-emerging infectious diseases because of very high densities of human and animal populations and significant interactions between the two, in terms of their shared environments and habitats and interdependence for food and feed. Importantly, these interactions are becoming stronger on account of ever-increasing population, changes in environment and climate, depletion of forest cover, shrinkage of agricultural land, and loss of biodiversity. As a result, various infectious and vector-borne diseases and their causative organisms in domestic and wild animals are *spilling-over* to humans. Rabies, Japanese encephalitis, tuberculosis, leptospirosis, brucellosis, bird flu, swine flu, scrub typhus and typhoid are some commonly prevalent deadly zoonotic diseases in the subcontinent. These diseases are spreading rapidly through the movement of infected humans and animals.

Several countries run surveillance programs. There are three such programmes in India ; two of them are exclusively for animal health and one for human health. These include the *National Animal Disease Reporting System (NADRS)*, the *National Animal Disease Referral Expert System (NADRES)* and the *Integrated Disease Surveillance Project (IDSP)*. These programmes need to work in tandem to develop a roadmap for a unified surveillance mechanism and strategic research partnership to understand the role of pathogens in the human-animal-ecosystem interface.

The research on zoonotic diseases is carried out in several of the animal science institutes of the Indian

Council of Agricultural Research (ICAR) and the State Agricultural and Animal Sciences Universities. The ICAR-Indian Veterinary Research Institute is engaged in basic and applied research on prevention and control of zoonotic diseases. The surveillance of exotic animal diseases, including the zoonotic ones like HPAI, swine flu and COVID-19, is undertaken by the ICAR-National Institute on High Security Animal Disease along with the ICAR-Indian Veterinary Research Institute, the ICAR-National Institute of Veterinary Epidemiology and Disease Informatics and the ICAR-National Research Centre on Equines.

India, in response to the global call by the FAO-OIE-WHO evolved its National Action Plan on AMR in 2017 that incorporated several of the activities related to animal health. An important area identified includes the surveillance of AMR in livestock and fish because of the alleged irrational massive use of antibiotics. The ICAR initiated an Indian Network for Fishery and Animals Antimicrobial Resistance (INFAAR) to gain insights into the AMR. It also works closely with the several institutions like the WHO, FAO, ILRI-International Livestock Research Institute, USAID-United States Aid for International Development, and the ICMR-Indian Council of Medical Research among others.

The ICAR operates an outreach program on Zoonotic Diseases involving 18 research entities including the State Agricultural and Animal Sciences Universities and the ICMR. This programme is now being re-oriented as a *One Health* program emphasizing on strengthening of the disease surveillance through greater collaboration with the institutions engaged in research on human health, environment and wildlife.

India must develop a stand-alone **One Health** policy encompassing multisectoral collaborations, not confined to the national borders, but with other countries to contain the threats of transboundary disease transmission. A strategic and comprehensive policy must be developed to ensure that different governments play a proactive role to gain mutual access to scientific resources and innovations for better management of public health. The current pandemic **COVID-19** compels forging a global alliance to realize the vision of *One Health*. It is expected that the emerging synergies between human, animal and ecosystem health at local, national and global levels, will contribute towards better public health outcomes.

  
(T. Mohapatra)  
President

## 112<sup>th</sup> Executive Council Meeting

The Academy held its 112<sup>th</sup> Executive Council (EC) Meeting online on June 19, 2020 under the chairmanship of Dr T. Mohapatra, President, NAAS. The meeting was attended by 20 members of the Council, besides Prof Anupam Varma, Editor-in-Chief, Agricultural Research Journal, Prof Ramesh Chand, Director, Institute of Agricultural Sciences, BHU, Varanasi & Organizing Secretary, XV Agricultural Science Congress and Prof Rakesh Singh, Head, Department of Agricultural Economics, BHU, Varanasi & Nodal Officer for XV Agricultural Science Congress as special invitees. A one-minute silence was observed to pay homage to Dr V.L. Chopra, Dr Paul Thomas, Dr P.K. Chhonkar and Dr P.N. Bhat, the distinguished fellows of the Academy.

Dr T. Mohapatra in his opening remarks referred to the disruptions caused by the Covid-19 pandemic. He highlighted the role of agriculture in meeting the requirements of essential food commodities during the lockdown. He pointed out that despite the labour shortage and post-harvest losses, the rabi production was not affected much and the kharif sown area was higher over the same period in the last year. He touched upon the challenges that needs to be tackled in fulfilling the SDGs by 2030. He expressed exigency to address the problems being faced by the displaced migrant workers and also to make significant contribution towards *Atmanirbhar Bhharat mission* of the Government of India through agricultural research and development. He complimented timely interventions by the Academy by forwarding its suggestions in framing the Pesticide Management Bill, Seed Bill, Gene Editing guidelines and Direct Benefit Transfer in Fertilizer.

Prof Ramesh Chand, Organizing Secretary, XV ASC requested to reschedule the dates of ASC considering that not much progress could be made due to the lockdown. He conveyed the assurance of the Vice-Chancellor, BHU to

extend full support for successfully organizing the proposed event. Keeping in view the likely Covid-19 situation and availability of accommodation for delegates, the Organizing Secretary was advised to explore possibility of re-scheduling the Congress during second/third week of November 2021. The EC thanked Prof Ramesh Chand and Dr Rakesh Singh for their inputs.

The EC was informed about the postponement of AGM/ Foundation Day programme scheduled for June 4-5, 2020 at NASC, New Delhi due to unprecedented COVID-19 situation. However, an online panel discussion on *COVID 19: Impacts and New Normal in Agriculture* was successfully organized on June 5, 2020 under the co-chairmanship of Dr T. Mohapatra and Dr Mangala Rai with Dr P.K. Joshi and Dr Pratap S. Birthal as conveners.

The Executive Council deliberated on alternate ways and means to organize AGM 2020 and recommended the proposal to organize presentations of newly elected Fellows through WEBINARS from June 22 to June 25, 2020, and convene AGM online preferably in August 2020. It was also decided to confer the Fellowship Certificates online.

The Executive Council approved the proposal to invite suggestions from the Fellowship for filling up 1/3<sup>rd</sup> of the Executive Council Members and Office Bearers due to fall vacant after December 31, 2020, and the appointment of Auditors for 2020-21. The EC also reviewed the status of Annual Report and Audited Statement of Accounts of the Academy for the year 2019-20, NAAS scoring of journals, Fellowship/Associateship Nominations received for the year 2020, activities of the Academy planned for 2020 and other relevant issues and stressed the need for further stepping up of the activities.

## NAAS Programmes

### Panel Discussion on Covid-19: Impact and New Normal in Agriculture (Conveners: Drs P.K. Joshi and Pratap S. Birthal)

On the occasion of its Foundation Day on June 5, 2020, the National Academy of Agricultural Sciences (NAAS) organized a virtual panel discussion on the consequences of the Covid-19 crisis on agriculture and the technological and policy solutions for sustaining post-pandemic agricultural growth. The panel discussion was convened by Dr P. K. Joshi and Dr P.S. Birthal. It was co-chaired by Dr Trilochan Mohapatra, President NAAS and Dr Mangala Rai, former President, NAAS.

There was a consensus that the Covid-19 pandemic has severely affected the lives and livelihoods of millions of poor

throughout the world. The whole world has been battling to contain its human-to-human transmission through preventive



means, including self-sanitization, face-mask and social-distancing in the absence of any proven medical solution. Further, most countries have imposed lockdowns and severe restrictions on the mobility of people, goods and services to slow down its spread. This led to almost a complete cessation of the economic activities. India imposed lockdown on March 25, 2020 that lasted up to May 31, 2020. Although India has rolled out a three phase un-lock plan from June 1 onwards, the Indian economy is still reeling under the stress of COVID-19 induced slowdown. As a consequence, the economy is predicted to shrink between 3-5% in 2020-21. It was opined that agricultural sector, the lifeline of the country, is unlikely to be affected much and predicted to grow at its historical rate of about 3%. In general, agriculture and agri-businesses are expected to confront new challenges or norms related to technologies, support services, marketing, trade, financing, governance, consumer preferences, etc. The eminent panelists discussed the issues confronting Indian agriculture, and the response and mitigation measures to overcome the crisis to ensure a sustainable food system in the post-crisis period. The key recommendations that emerged from the panel discussion are summarized below:

- The lockdown spurred a large-scale exodus of migrant workers back to their villages, and disequilibrium in regional rural markets will be a new normal post-pandemic. States, like Punjab and Haryana will face severe labour shortage, but it is an opportunity for the state governments to incentivize cultivation of less-labour and water-intensive crops in place of paddy. Contrarily, states like Bihar, Odisha and eastern Uttar Pradesh will face excessive employment pressure due to reverse migration. Such states should promote labour-intensive high-value wellness crops.
- An enabling agri-business environment needs to be created for attracting investment and participation of private sector in agriculture. New opportunities are to be mapped and accordingly, public-private partnership is to be developed for need-based agri-infrastructure and value chains. The existing food based MSMEs need to be modernized and linked with farmers for raw material. Their branding, packaging and effective supply chains will transform them to a new normal.
- The reverse migration will put tremendous employment pressure on agriculture in the regions to which the workers return to. Although, the MGNREGA provides employment opportunities, it is not adequate. The need is to create special income-generating schemes for the reverse migrants. Further, to prevent reverse migration the Government should immediately implement the *One-Nation, One Ration Card* scheme that ensures food security to workers anywhere in the country.
- Shift research focus from merely increasing production to multiple goals, namely enhancing income, improving nutrition, preserving ecology, and conserving environment. The goal should be to make agriculture

a lucrative profession without compromising natural resources and environment.

- Reprioritize agricultural research agenda to meet the future demand for food, feed and fodder. Role of Artificial Intelligence, agro-robotics, nano science, cloning, and drone analytics will expand multifold in agricultural research for future agro-advisory, disease/pest monitoring and surveillance. Similarly, role of plant genomics and genome editing will become important tools for future research. Genetically Modified (GM) foods and bio-fortification will be new normal to breed varieties/hybrids for developing immunity against various virus.
- Promote concept of *One Health* that takes into account interaction among humans, animals and plants in their shared environment. Agricultural research should integrate itself with *One Health* concept focusing on breeding for nutrition and health, and stress management. There should be greater collaboration of crop sciences with animal and medical sciences. Develop common research platforms involving private sector for pooling and sharing human and financial resources, skills, and knowledge.
- Attract private sector to market oriented agricultural extension services for making effective backward and forward flow of information and leveraging the power of ICT for timely transmission and diffusion of information, services and technologies.

## Presentation of Newly Elected Fellows

The newly elected Fellows of the Academy made their presentations online during June 22-25, 2020 in four sessions. The presentations of Elected Fellows from Crop Sciences, Horticultural Sciences, Animal Sciences and Fisheries Sciences were chaired by Dr A.K. Srivastava, Vice President and co-chaired by Dr A.K. Singh, Secretary, NAAS. The elected fellows from Natural Resources Management, Plant Protection, Agricultural Engineering and Technology,



and Social Sciences made their presentations under the chairmanship of Dr J.C. Katyal, Vice President and co-chairmanship of Dr P.K. Joshi, Secretary, NAAS.

## Strategy Workshop on Potential of Non-Bovine Milk (Convener: Dr M.S. Chauhan)

The non-bovine milk and its products are gaining importance in the diets of the people because of their contended nutritional and health benefits. The Academy organized an online Brain Storming Session (BSS) on *Potential of Non-bovine Milk* on June 29, 2020 to retrospect on its nutritional and health attributes and provide insight for a sustainable increase in non-bovine milk production. The session, convened by Dr M.S. Chauhan, Director, NDRI under the chairmanship of Dr Trilochan Mohapatra, President, NAAS was attended by a number of key officials of ICAR, SAUs, Ministry of Dairying, Animal Husbandry and Fisheries and Dairy Industry.



Dr M.S. Chauhan provided the overview of the emerging nutritional and economic importance of non-bovine milk. Dr Mohapatra in his opening remarks emphasized on the need to undertake research to ascertain breed differences in the quality attributes of milk from bovine and non-bovine species and characterisation of bio-actives claimed to provide human health benefits. Dr A.K. Srivastava, Vice President, NAAS flagged off the discussion on the values of non-bovine milk of sheep, goat, donkey and camel. The BSS covered various

aspects, right from potential production to nutritional and health attributes of non-bovine milk. Some key recommendations emerged from the discussion are:

- Non-bovine dairy production systems range from a traditional extensive low-input and high-mobility, to a highly intensive stall-fed production system. Improvements in productivity for non-bovine dairy species, better milking hygiene, and diversification of dairy products are the important challenges for this sector, which need to be addressed.
- The way animals are housed, fed and managed has a profound effect on the quantity and quality of milk production. Feeding, housing and management systems should, therefore, be adapted to specific conditions to produce quality dairy products, maximize productive herd efficiency, protect animal health, and respect animal welfare.
- Non-bovine milk is considered a potential source to produce dairy products with unique characteristics, for example camel milk is used in manufacturing of medicines; goat milk to boost immunity; and donkey milk for producing hypo-allergic milk for infants. Each of these species has a unique milk composition that provides exceptional opportunities to exploit it for human benefits. However, because the immune system is species-specific, there is a need to increase knowledge of the factors influencing milk quality of non-bovine species.
- The documented effects of consumption of non-bovine milk or milk products on human health need scientific validation. Systematic scientific studies need to be undertaken to determine the potential of non-bovine milk for human health and nutrition.
- Detailed studies should be carried out to understand the nutritional and health benefits of specific metabolites, biopeptides and bio-active compounds in the milk of non-bovine species.
- As the demand of the products from non-bovine milk is increasing in the national and international markets, sustainable production and processing methodology should be developed for production of export quality products with a prolonged self-life.

## Activities organized by the Regional Chapters

### Hyderabad Chapter

A virtual meeting of NAAS Associates based in Telangana and Andhra Pradesh was held in a virtual mode on June 24, 2020 to review the on-going activities of the Chapter, and plan for future activities. Dr Ch. Srinivasa Rao, Convener, NAAS-Hyderabad Chapter chaired the meeting. Dr Srinivasa Rao urged the Fellows and Associates affiliated to the Regional Chapter to encourage their colleagues in respective Institutes/Universities/Organizations to apply for the Fellowship,

Associateship and Awards of the Academy. He informed that under the umbrella of the Regional Chapter, a brainstorming session on *Soil carbon status and climate change* will be conducted in August, 2020. A guest lecture on *How to attract best talent in agriculture* by Dr J.C. Katyal was planned for the next meeting of the Regional Chapter along with guest lectures by other eminent speakers. Dr Srinivasa Rao informed about the preparation of an informative brochure/booklet highlighting the details and contributions of Fellows and Associates based in Telangana and AP States, which will



be sent to various departments of these two states for soliciting their expertise for development of state level programmes and policies for betterment of farmers. He urged the Associates to sensitize the students of high school and higher secondary school about various opportunities in agricultural education and research. He also requested the participants to deliberate on the course of activities to be undertaken to bring more visibility to the Regional Chapter and attract the attention of policy makers.

Some of the key programmes proposed are:

- a meeting/interaction with rice millers to bridge the gap

between rice farmers and consumers,

- a meeting/lecture series on agriculture as a business opportunity,
- an online debate/essay competition for students of the University of Veterinary and Animal Sciences in Telangana and Andhra Pradesh on *Animals in Agriculture*,
- a panel discussion of eminent experts from field and horticultural crops, veterinary and animal sciences, and fisheries sciences to deliberate on future direction of research.
- a virtual competition for students of Agriculture, Veterinary and Animal Sciences to conceptualize and develop a project/model on the topic *Digital Agriculture in post-Covid era*.
- organize training courses for faculty of various Agricultural and Veterinary Universities on “*How to effectively organize online classes and deliver e-lectures*” in the light of restrictions due to Covid-19.
- highlight the ongoing/future activities and achievements of the Regional Chapter in Social Media and Academy’s website.

## Science Technology and Spectrum

### Fish for food and nutritional security

A balanced diet comprising the macronutrients like carbohydrates, proteins and fats and the micronutrients like minerals and vitamins, besides water, is essential for good health. As per FAO of the United Nations, food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. India is self-sufficient in a number of food crops and there is enough food to meet the demand. Despite this, millions of Indians have poor nutritional health. India has been successful in ensuring access to food for its population, but it has failed to ensure that it includes the necessary diversity in the types of food available. Various indicators of nutrition in India suggest that adequate level of food security is yet to be achieved. One-third of the children under the age of five are underweight and 21 percent are wasted. Micro-nutrient deficiencies are common in India, with majority of the population (~ 75%) not getting enough from their food intake.

### Hunger and malnutrition

Protein–energy malnutrition is common in both the children and the adults causing 6 million deaths annually. It often overshadows *hidden hunger* or *micronutrient deficiency*, which affects some 2 billion people around the world. This deficiency in essential vitamins and minerals can have long-

term, irreversible adverse health effects, diminish productivity and economic growth, particularly in the low and middle-income countries. The hidden hunger due to micronutrient deficiency does not produce hunger, as we know it, but it strikes at the core of one’s health and vitality. Micronutrient deficiencies lead to low birth weight, higher mortality rate, impaired mental development and reduced learning capacity in children.

### Fish-a super food

Aquaculture can play an important role in promoting balanced nutrition. As a result, the demand for fish ‘as a nature’s super food’ is growing. It is an important source of proteins and healthy fats, including long-chain omega-3 fatty acids, iodine, vitamin D, and other micronutrients. While the marine fishes are especially rich in the heart-friendly EPA (eicosapentaenoic acid) and brain-friendly DHA (docosahexaenoic acid), the small indigenous fishes are micronutrient dense, meaning rich in minerals and vitamins. Fish is a rich source of all nutrients except carbohydrates, therefore, a combination of fish and rice or bread makes almost a complete food. For this reason, while fish is taken as an important source of omega-3 PUFA (EPA and DHA) rich oils by the affluent western population, it serves as a health food (as a major source of all nutrients proteins, oils, minerals and vitamins) for vast majority of the population in the developing and under developed countries.

Fortunately, India is a biodiversity hotspot and harbours rich fish fauna in its diverse aquatic habitats. There are a large number of food fishes available in the marine, brackish water, fresh water and cold water habitats. Additionally, dry fishes and fermented fishes are also alternate choice for the consumers depending upon their preference and affordability.

### Nutrient profiling of fishes

Since a variety of food fishes are available in India, their nutritional compositions also vary. The Indian Council of Agricultural Research, under an outreach program stretching for a period of ten years (2008-2018) involving seven fisheries research institutes, studied nutritional composition of more than 100 food fishes from different habitats across the country and generated detailed nutritional information (*gross composition, amino acid, fatty acid and micronutrient profile*) with a mission to create awareness about their utility in human nutrition.

The research findings have been published as research papers, popular articles, research bulletins, books, pamphlets, folders etc. for public awareness and also for enriching the nutritional knowledge base. The vast amount of nutritional information has led to an open-access database named NutriFishINDIA (in short *NutriFishIN*), which is freely available globally and has drawn attention and received appreciations from international agencies like the World Bank. For making it reachable to more clientele and mass use, a mobile app named NutrifishApp, freely downloadable from Google playstore, has been also developed. Thus, one can access the App at any time through mobile phone and

know species wise nutrient composition in fishes. Profiling the nutrition composition of fishes is necessary to utilize them optimally in public health nutrition programs. This would also help in prioritizing the fish rich in multiple nutrients, referred as *nutrismart* species, for breeding, culture and/or domestication and help the nutritionists and physicians in giving dietary prescriptions to malnourished subjects.

### Key highlights of the database and the App

- The database and the App provide nutritional highlights on different food fishes thus indicating their richness in specific nutrients.
- In general, small indigenous fishes (SIFs) are rich in minerals like Fe, Zn, Se, Mn, Ca, Mg, P etc and are also rich in Vitamins A, D, E and K.
- Indian major carps (IMCs) and prawns are rich in proteins.
- Marine fishes are in general rich in omega-3 PUFAs EPA and DHA.
- Hilsa (*Tenualosa ilisha*), followed by Oil sardines (*Sardinella longiceps*) are very rich in oils and omega-3 PUFAs. Pengwa (*Osteobroma belangiri*) and koi (*Anabas testudeni*) are also rich in omega-3 PUFAs.
- Coldwater fishes are also a good source of omega-3 Poly unsaturated Fatty Acids (PUFAs) .
- In general, fish is a good source of quality animal proteins (*varying from 13-22%*) and contains good amount of essential amino acids.





- As a thumb rule “1000 + 200” should be kept in mind; that means along with every purchase of 1000 g big fish (IMC like catla, rohu, mrigal or other big fish), 200 g small indigenous fish should be taken to guarantee sufficient dietary protein and micronutrients for the family.

### Epilogue

In rural India, especially in the Eastern and North Eastern States, where backyard family/ community ponds are plenty, fish could be an important dietary constituent and can be harvested routinely to manage the family needs. Further, the small-scale fisheries from the backyard ponds supply the much-needed proteins and micronutrients to mitigate maternal anaemia, mortality rates, birth defects, pre-term delivery, etc.

With a view to enhancing enrolment, retention and attendance and simultaneously improving nutritional levels among school children, provision of fish in the *Mid-day meal* may provide

an opportunity for protein and micronutrient supplementation to fight malnutrition. Oil-rich species like hilsa, oil sardines, koi, pengwa, marine fishes and cold-water fishes may be periodically provided depending upon availability for supplementing the w-3 PUFAs (EPA and DHA) as healthy alternatives to *DHA Horlicks* or such products. Dietary intake of rice and fish together provides carbohydrates, proteins, oils and micronutrients. Further, adding some leafy vegetables grown in kitchen gardens or in the backyard makes the diet balanced and complete with minerals and fibers.

“*Let food be thy medicine*” the statement of Hippocrates, must always be kept in mind. There is no other choice except to take nutrients either through food or has to be taken as medicine/ food supplements.

**Dr B.P. Mohanty, NAAS Fellow**

## Forthcoming Programmes

- Strategy workshop on Bio-fortification (Dr U.S. Singh)
- Brain storming session on Food, Agriculture and Income Policy for the Five Trillion Economy (Dr Suresh Pal)
- Strategies for Enhancing Soil Organic Carbon for Food Security and Climate Action (Dr Ch Srinivasa Rao and Dr Anil K. Singh)
- Strategy workshop on Emergency Preparedness for Prevention of Trans-boundary Infectious Diseases in Indian Livestock and Poultry (Dr Parimal Roy and Dr V.P. Singh)
- Strategy workshop on Wastewater Utilisation in Urban and Peri-Urban Agriculture (Dr J.C. Dagar)
- Strategy workshop on Innovations in Potato Seed Production and its Adoption (Dr S.K. Chakrabarti)
- Strategy workshop on Need for Breeding Tomatoes Suitable for Processing in India (Dr A.T. Sadashiva)
- Brain storming session on Sugarcane based Ethanol Production for Sustainable Fuel Ethanol Blending Programme (Dr Bakshi Ram)
- Brain storming session on Ethano-medicine (Dr P.L. Gautam)
- Strategy workshop on Anti-microbial Resistance (Dr A.K. Srivastava)

## Fellows Views

### Looking at new opportunities post-Covid-19

The coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is a beta-coronavirus whose genome is a single 30 kb strand of RNA. To put that in the context, a human genome, which is more complex, has the total length of over 3 billion base pairs. Pandemic caused by nano sized Covid-19 has stalled normal functioning of humankind. This has resulted in unprecedented loss of life and livelihood of people all around the world. The Covid-19 pandemic is global crisis and certainly has a dark side, but this pandemic has also provided several opportunities:

1. Innovative delivery modes including increased awareness about online agricultural education, conducting Webinars and online meetings. The real opportunity here is to make systematic changes so that online teaching, webinars and meetings will be more effective, even after the crisis.
2. Excellent opportunity for those people who can work from home. They have recognised their way of day-to-day lives and daily working, even for the long time as well as they have to commute less. Another opportunity is to reorganise daily lives in a way that has less or no adverse impact on our environment and the nature.
3. Creating new opportunities for resource poor communities who were initially involved in farming and migrated to cities, now they have gone back to their villages. They can be encouraged and provided support to undertake integrated farming in their villages. They can be imparted training on entrepreneurship development, improved technologies in Integrated Crop-Livestock-Fish farming system, high-yielding dairying, disease-resistant goatry, backyard poultry, kitchen gardening of dragon fruits, and also the direct marketing of farm products.
4. Domestic consumption of freshwater and brackishwater shrimp may be promoted as a source of protein.

5. The COVID-19 pandemic outbreak still continues to pose challenges. There is an urgent need to develop effective vaccines and antiviral molecules. Ethnobotany and advance research may help in search of novel antiviral molecules from medicinal and aromatic plants. Bioresources are important components of biological diversity for progress and economic activity of any Nation and their sustainable use for human welfare through optimum utilization in a way and at a rate that does not lead to the long-term decline of biological diversity and which maintaining its potential to meet the needs and aspirations of present and future generations is a utmost importance. Hence, the best way of sustaining bioresources is to make use of them aligned with their multiplication.
6. Rapid and reliable tests for the Covid-19 detection are urgently required to bring the pandemic under control. Advance research may focus on development of Nano(bio-) sensor for rapid detection of Covid19. Electrochemical/optical/mass sensors will not necessarily

substitute the established nucleic acid based techniques such as PCR and Real-time PCR and an immune-assay such as antibody test kit, but could be used as alternative method for clinical diagnosis, and more prominently to measure the viral titer in the air/aerosols in the busy places and also if needed, agricultural commodities and livestock as well.

7. The literature suggests that beyond infecting bats and humans, the Covid-19 could have evolved the ability to infect other creatures too. Hence, there is a certainly need to carry out advance research / diagnosis in this direction, especially on the ruminants.

In conclusion, the Covid19 brings several opportunities to create innovations, which can be sustained to potentiate Make in India, and hence can pave the way for *Atma Nirbhar Bharat*. However, the real opportunity will exist in future when appropriate changes will be adopted, even after the crisis.

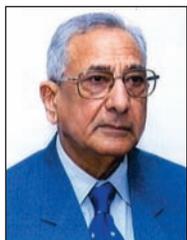
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## Obituaries

### Prof Virender Lal Chopra



Born on August 9, 1936 at Adhwal, a small village on the periphery of Rawal Pindi in West Punjab of the British India, Prof Virender Lal Chopra did his early schooling at Ramjas School, Delhi. After securing his graduate degree with honours in agricultural science from the Central College of Agriculture, Delhi in 1955 and following it up with an associateship at the Indian Agricultural Research Institute (IARI) during 1955–57, he proceeded to the Institute of Genetics, University of Cologne on a senior Humboldt scholarship. Subsequently, he shifted his base to Edinburgh in 1964 and secured a

doctoral degree (PhD) in Genetics from the Institute of Genetics of the University of Edinburgh in 1967.

Prof Chopra's career took prominence when he served as Professor of Genetics (1970-84) and Head, Division of Genetics (1977-80) of the Indian Agricultural Research Institute (IARI), and Professor of Eminence and Director of the National Research Centre on Plant Biotechnology (1985-90). He also served as a Member of the Scientific Advisory Committee to the Prime Minister of India from 1986 to 1990. He moved to Vietnam in 1990 on a FAO assignment as Chief Technical Adviser to the Government of Vietnam to assist it in establishing the Agriculture Genetics Institute (AGI) in Hanoi. Subsequently, the Government of India appointed him Secretary (DARE) and

the Director General of the Indian Council of Agricultural Research. After his superannuation from the ICAR in 1994, he continued his association with the Council as B. P. Pal National Professor (1994-2002). He was appointed as a Member of the Science Council of the Consultative Group on International Agricultural Research (CGIAR), and Member, Planning Commission, Government of India (2004-2009).

Prof Chopra was bestowed with several prestigious national and international awards for his contributions to agricultural science including Borlaug Award, 1983; Padma Bhushan, 1985; FICCI Award, 1986; Watumull Foundation, USA Honor Summus Medal, 1987; O.P. Bhasin Award, 1987; D.Sc. (*honoris causa*) CS Azad University of Agriculture & Technology, Kanpur; Banaras Hindu University, 1988; G.B. Pant University of Agriculture & Technology, 2003, IARI, 2005 & Narendra Dev University of Agriculture & Technology, Faizabad, 2007; FAO/IAAS World Food Day Award, 1993; ISCA Birbal Sahni Birth Centenary Award, 1997; INSA Silver Jubilee Commemoration Medal, 1991; INSA Aryabhat Medal 2001. He was an elected fellow of several science academies viz. the Indian Academy of Sciences, Indian National Science Academy, National Academy of Agricultural Sciences, National Academy of Sciences, India, European Academy of Sciences and Arts and The World Academy of Sciences (TWAS).

Prof Virender Lal Chopra, a distinguished biotechnologist, geneticist, agriculturalist and administrator, who made immense contribution to agricultural sciences, breathed his last on April 18, 2020 at New Delhi. On behalf of the Fellowship, to which Late Prof Chopra belonged to, the Academy prays to the Almighty to grant peace to the departed soul, and strength to the bereaved family to bear this great loss.

#### Dr Paul Thomas



Born in Cochin, India on March 22, 1939, Dr Paul Thomas obtained his early education at Sacred Heart High School, Ernakulam (1950-54) and Sacred Heart College, Ernakulam (1954-56). Subsequently, He was educated at Agricultural College & Research Institute, Vellayani, Kerala and Agricultural College & Research Institute, Coimbatore.

He started his brilliant career from CFTRI, Mysore as Project Leader, Fruit & Vegetable Technology Division (1962-67). Subsequently, he served in various positions including Scientific Officer, Fruit & Vegetable Preservation Section (1967-94) and Head, Food Technology Division (1994-99), at BARC, Mumbai. He was Secretary, Food & Agriculture Committee, Board of Research in Nuclear

Sciences, DAE (1992-98), Technical Expert of the International Atomic Energy Agency, Vienna in the field of food irradiation to Algeria, Iran, Nigeria, and Vietnam and Consultant, International Consultative Group on Food Irradiation, IAEA, Vienna (1999- 2003). He got Alexander von Humboldt Foundation Fellowship to serve as Post-doctoral Research Fellow (1976-78) at Federal Research Center for Nutrition, Karlsruhe, Germany. His major research areas included post-harvest physiology, technology of fruits and vegetables and food irradiation.

Dr Thomas, a distinguished researcher and fellow of the Academy left for his heavenly abode on May 3, 2020 at his residence Sankalp Gardenia Apartment, Gokulam Main Road, Mysore. On behalf of the Fellowship fraternity, to which late Dr Paul Thomas belonged, the Academy prays to the Almighty to grant peace to the departed soul, and strength to the bereaved family to bear this great loss

#### Dr P.K. Chhonkar



Born in Aligarh on January 14, 1944, Dr P.K. Chhonkar received his early education at R. K. Mission School, Kanpur and D.A.V. School, Dehradun (1950-57). After securing his graduate degree in agricultural science from Bihar Agriculture College, Sabour in 1962, he joined the Indian Agricultural Research Institute and earned his M.Sc. and Ph.D. degrees in the years 1965 and 1968, respectively.

Dr Chhonkar left an indelible impression in the minds of students and agricultural scientists in his various exemplary roles of Professor of Soil Science, Head Division of Soil Science and Agricultural Chemistry and ICAR Emeritus Scientist at Indian Agricultural Research Institute, New Delhi. Dr Chhonkar also contributed immensely to agricultural science as Principal Advisor, International Institute of Development Management Technology, New Delhi and as Adjunct Faculty, Central Agricultural University, Shillong and IARI, New Delhi.

Dr Chhonkar was recognized for his various roles as a brilliant teacher and scientist. He was awarded the IARI Best Teacher Award 1998 and ICAR Bharat Ratna Dr C. Subramaniam Outstanding Teacher Award, 2004. He was also a recipient of Dr N.S. Randhawa Memorial Lecture Award 2011, Dhiru Morarji FAI Golden Jubilee Award 2005, Prof Sushil Kumar Mukherjee Commemoration Award of Indian Science Congress Association 2007 and S.B De Memorial Lecture Award of the Indian Society of Agricultural Chemists in 2010. He was a distinguished Fellow of the Academy and served it as Editor (2012-14).

In his loss, the scientific community has lost a brilliant scientist, teacher and administrator in the challenging research area of soil biochemistry, soil health and quality

assessment, organic farming and biofertilizers, besides human resource development. On behalf of the Fellowship fraternity, to which late Dr P.K. Chonkar belonged to, the Academy prays to the Almighty to grant peace to the departed soul, and strength to the bereaved family to bear this great loss.

#### Dr Pushkar Nath Bhat



Born on October 9, 1937 in Nunar, Ganderbal in Jammu & Kashmir, Dr Pushkar Nath Bhat received his education at National High School, Srinagar(1948-52), Sri Pratap College, Srinagar (1955), College of Veterinary Science and Animal Husbandry, Mathura (1955-59), Post Graduate College of Animal Sciences, Indian Veterinary Research Institute, Izatnagar (1959-61) and Institute of Population Genetics, Purdue University, Indiana, USA, 1961-65 for his PhD in Population Genetics.

Dr Bhat was truly a visionary scientific leader in the field of Veterinary and Animal Sciences – who always led from the front. He rendered distinguished service, as Project Coordinator (Animal Breeding) and Head, Division of Animal Genetics, IVRI, Izatnagar (1971-79), Director, Central Institute for Research on Goats, Makhdoom (1981-84), Director/Vice Chancellor, IVRI, Izatnagar (1984-92),

Animal Husbandry Commissioner to Government of India, Department of Animal Husbandry and Dairying, New Delhi and Deputy Director General (Animal Sciences), ICAR, New Delhi (1992-94), Director, Indian Agricultural Statistics Research Institute, New Delhi(1994) and Officer on Special Duty (DIPA), ICAR, New Delhi (1994-97). His major research interests included animal genetics and breeding, conservation and management of animal genetic resources, animal production in tropics, animal biotechnology, and research management systems, etc. He was considered as a prime architect of modern ICAR-IVRI – and its contemporary researches in Veterinary & Animal Sciences.

He was a distinguished Fellow of the National Academy of Sciences, India, National Academy of Veterinary Sciences, National Academy of Agricultural Science, and worked as Chairman, World Buffalo Trust and Centre for Integrated Animal Husbandry and Dairy Development. He also served NAAS as its Editor (1996- 1998).

Dr Pushkar Nath Bhat, a distinguished scientist, administrator and fellow of the Academy, who made immense contribution to Veterinary & Animal Sciences, left for his heavenly abode on June 11, 2020. On behalf of the Fellowship, to which Late Dr Bhat belonged, the Academy prays to the Almighty to grant peace to the departed soul, and strength to the bereaved family to bear this great loss.

## Announcement

### **XV Agricultural Science Congress of NAAS Banaras Hindu University, Varanasi November 13-16, 2021**

Due to the on-going COVID-19 pandemic, the XV-Agricultural Science Congress (ASC) originally scheduled from February 20-23, 2021 at BHU, Varanasi has been postponed. The Congress will now take place in Varanasi from **November 13-16, 2021** on the theme **Energy and Agriculture: Challenges in 21st Century**. The Organizing Committee through this announcement request everybody to book the new dates for this mega event. As announced earlier, the four days event will include technical sessions, plenary sessions/public lectures, poster presentations, inter-university student contest, panel discussions and number of satellite meetings. Your participation will be very important in discussing the challenges of 21<sup>st</sup> Century including policy options in Indian Agriculture. Further details will be shortly available on Congress website.

**Editors:** Dr Kusumakar Sharma and Dr P.S.Birthal

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