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From the President's Desk

Crop Diversification for Efficient, Inclusive and Sustainable Development of Agriculture

The technological changes in agriculture, supported by investments in irrigation, infrastructure, markets and institutions (extension and credit) together with economic incentives (input subsidies and output support prices), have caused a significant increase in agricultural productivity and food supplies in India, making it self-sufficient in food from a situation of chronic deficit before the advent of Green Revolution in the mid-1960s. In 2020-21, the country produced 308.65 million tons of foodgrains and exported 17.72 million tons of rice and 2.09 million tons of wheat, and built a buffer stock of 58 million tons for the public distribution system and meeting unforeseen contingencies due to the risks and uncertainties and supply chain disruptions happened during the Covid-19 pandemic. It is heartening to note that India's agricultural exports have seen a steady rise, crossing US$50 billion in 2021-22.

However, in the pursuit of ensuring nation's food security, India's agri-food policy excessively emphasized on staple food crops, mainly rice and wheat, resulting in predominance of rice-wheat system and reduction in agro-biodiversity, especially in the north-western states of Punjab and Haryana. Rice has emerged as the most important crop in Punjab, raising its share in gross cropped area to 40% in 2020-21 from 7% in 1970-71. During this period, wheat area increased more than 1.5 times. The expansion of area under these two crops occurred, replacing less remunerative millets, pulses and oilseeds.

Rice, in particular, and wheat are water-guzzling crops grown under irrigated conditions, and an excessive policy emphasis on these crops has also led to an increase in inter-regional disparities in farm and farmers' income. Since the use of subsidized inputs and the output sales are directly proportional to the farm size or marketed surplus, large farmers in the irrigated regions benefitted proportionately more from these incentives. The procurement of rice and wheat at assured prices has resulted in an increase in the economic costs of holding stocks of foodgrains, and put a

significant burden on the public exchequer. Further, India's public stockholding of foodgrains has come under scrutiny of the member-countries of WTO for its distortionary effects on global food markets. More importantly, the subsidies and support prices have resulted in several hidden costs or negative externalities to the natural resources, for example, depletion of groundwater, deterioration in soil fertility, and greenhouse gas emissions, compromising the inter-generational sustainability of agriculture and the nation's food security. Besides, climate change has emerged as a big threat to sustainable growth of agriculture. The frequency and intensity of extreme climatic events have increased in the recent past, and are predicted to increase in future, which might negatively impact the productivity of rice and wheat. These trends indicate that agricultural production system will have to undergo significant adjustments in terms of changes in crop-mix, varietal diversification, input-use, agronomic practices and natural resource management.

Crop diversification is contemplated to possess considerable potential to improve productivity, sustainability and resilience of agriculture, besides improving the nutritional status of population, especially in developing countries like India that are dominated by small land holdings, have low-level of agricultural productivity, high exposure to climate risks, and lack resources for the adoption of risk transferring instruments like crop insurance.

Traditionally, crop diversification has been practiced as a means of stabilizing farm income to ensure household food and nutrition security. Crops differ in their requirements of water and heat, hence in their response to climate change. If a crop does not perform well under stressed conditions, the loss in the farm revenue can be compensated by cultivating crop(s) that can better withstand environmental stress. Such a cropping practice exists in the arid and semiarid regions of India.

Diversification also helps optimize use of scarce natural resources like groundwater. Although, the use of groundwater for irrigation has helped significantly in improving agricultural productivity and food security, groundwater resources have become stressed because of their over-extraction exceeding the recharging rate. Cultivation of low water footprint crops like pulses, oilseeds and millets can arrest the decline in groundwater table. Pulses and millets are a rich sources of protein and micronutrients. Pulses, by fixing atmospheric nitrogen in root nodules, contribute towards improving soil fertility. Besides, diversified cropping helps managing threats of insect pests and diseases. The use of fossil fuel in agriculture has increased considerably, resulting in greenhouse gas emission. Since, India meets a large part of its demand for fertilizers and fossil fuel through imports, crop diversification has the potential to reduce energy use, water and carbon footprints.

In the past three decades, driven by sustained income growth, urbanization, changing lifestyles, emerging supermarkets and improvements in supply chain logistics, the food consumption pattern in India has undergone a significant shift in favour of nutrient-rich high-value horticultural and animal food products. The per capita consumption of staple cereals has almost stagnated. This has given an impetus to diversification in favour of market-oriented crops that generate more returns compared to the widely-grown staple food crops. Crops like vegetables, generate a regular stream of outputs that farm households can consume to improve their nutrition, and/or sell in the market for cash. Indian agriculture is dominated by small landholders. Approximately 70% of the farm households cultivate landholdings of less than or equal to one hectare. Although these households are land constrained, have sufficient family labour of low opportunity cost. These characteristics of high-value agriculture perfectly match with the resource endowment and cash flow requirements of smallholders.

A diversified crop portfolio can generate multiple economic, social and environmental benefits — it reduces the use of external inputs, improves soil fertility, provides ecosystem services, reduces carbon and water footprints, mitigates greenhouse gas emission, offsets adverse effects of climatic shocks, enhances farmers' income and reduces incidence of poverty and malnutrition. Harnessing these benefits of crop diversification requires evidence-based recommendations regarding the choice of a crop portfolio that best fits the goal of efficient, sustainable and climate-resilient agriculture.

Understanding farmers' needs is basic to the implementation of diversification strategies. Farmers, often, have multiple needs of household food and nutrition security, increasing farm income and employment, reducing income risks, reducing cost of production, and ensuring feed for livestock. However, there is a significant heterogeneity in their resource endowment. The imperative is that the farming system research should develop location-specific and farm-specific crop portfolios, and generate information on their relative technical (yield, resource-use efficiency, climate resilience, etc.) and economic (costs and returns) feasibility, and accordingly, recommend their

adoption. Introduction of improved varieties and production technologies can potentially increase the system productivity and its resilience to climate and non-climate risks.

Given the recommendations on crop choices, there is a need to improve the flow of information on the economic, environmental and social benefits of different crops to farmers. Further, when a new crop is introduced in the cropping system, farmers require to know its cultivation practices and market opportunities. To increase the outreach of the public extension system, it is essential to utilize all the possible means of information dissemination involving the public extension system, non-governmental organizations, farmer-to-farmer exchange, agribusiness firms and village-level organizations (e.g., panchayats) to ensure inclusive delivery of the information on the recommended crop portfolio. Creating awareness about the benefits of crop diversification among school children can be an important means of influencing their parents' cropping decisions.

Farmers face several constraints, including access to finance. For example, while the cultivation of vegetables generates a regular flow of outputs/returns, it is labour-intensive. On the other hand, establishing a fruit orchard is capital-intensive and involves a longer gestation period. Liquidity constraint is rather more severe for smallholders. Their credit requirements are small, but they are often neglected by the financial institutions because of the higher transaction costs and lending risks associated with small loans. Financing high-value agriculture as an important component of diversification, is essential for its scaling up.

Farmers' poor access to markets is also one of the main limitations to diversification to high-value and nutrient-rich crops. Development of agricultural markets in India has not kept pace with growth in agricultural production, leading to depression in producer prices, especially of high-value but perishable food commodities. These commodities need immediate transportation to the demand centres or conversion into some semi-processed forms. This requires additional investments in transportation and post-harvesting, in the absence of which the farmers' will remain vulnerable to price fluctuations. Thus, support from the governments, processors and distributors for strengthening post-harvest infrastructure, logistics and supply chains is critical. It is also important to identify new uses of crops and their markets to stimulate their production. In this context, it is worth mentioning that the cultivation of millets, despite these being a rich source of several micronutrients, has declined. One of the reasons, apart from their lack of comparative advantage, is the excessive emphasis on distribution of rice and wheat through Public Distribution System even in the major millet growing regions. Nevertheless, with growing awareness of the health benefits of millets, their demand has been steadily growing. The need is to promote millets as nutri-food and include these in the PDS. Likewise, the growing demand for Ayurvedic products with multiple health benefits including immunity boosting, offers considerable scope for expanding area under medicinal plants.

Until now, the agricultural research agenda has remained anchored to productivity enhancement. Only recently, the quality and stress-tolerance traits have started gaining importance. In view of the facts that India remains a hotspot of malnutrition and is vulnerable to climate change, strengthening crop breeding research for bio-fortification and multiple stress-tolerance is the need of the hour. Stress-tolerant and bio-fortified crop varieties are expected to serve as an insurance against climate change and malnutrition. To enable farmers an easy access to seed, it is imperative to develop local seed systems. Krishi Vigyan Kendras (KVKs) can play a significant role towards meeting this essential need for crop diversification to succeed.

There is a need to repurpose the existing subsidies on fertilizers and electricity for irrigation that have benefitted primarily the farmers cultivating rice and wheat in the irrigated regions. Given that diversified agriculture generates significant ecosystem services, re-packaging input subsidies as the payment for ecosystem services will go a long way in ensuring agro-biodiversity and sustainability of agricultural production systems.

Finally, farmer organizations can be a catalyst in scaling up diversified farming systems with disseminating information on their social, economic and ecological benefits, building farmers' capacity for cultivation of new crops, facilitating access to institutional credit, reducing transaction costs by aggregation of input demand and collective marketing of produce, and searching new markets for farm commodities and linking farmers to these. There is a need to unleash the potential of Farmer Producer Organizations (FPOs) or other such social organizations for promoting crop diversification for efficient, inclusive and sustainable development of agriculture and agriculture-based livelihoods.

Trilochan Mohapatra
(President)

World Biodiversity Day

On May 22, 2022, the NAAS observed World Biodiversity Day by organising a discussion on *Global Genebanks and Biodiversity Management for Sustainable Agriculture.* Over 350 delegates participated in this program.

In his opening remarks, Dr T. Mohapatra highlighted the importance of biodiversity for human life, and emphasized on developing global partnership, preparing an action plan for preserving and utilising biodiversity, and creating public awareness especially among school children on the role that biodiversity plays in our daily life. He also emphasised on capacity building of the University graduates and involvement of policymakers in the efforts towards biodiversity conservation.

The participants discussed various aspects, including collection and conservation of crop biodiversity, seed bank, utilization of germplasm resources for crop improvement, sharing of the biological resources through a multilateral system under the Plant Treaty (ITPGRFA), genomics, pan-genomics, and product development using genomics-assisted and superior haplotype-based fast-forward breeding approaches.

Foundation Day

Prof P. Balaram delivered the NAAS Foundation Day lecture on June 5, 2022. He spoke on “Reflections on science in the age of the corona virus” and presented an excellent account on the evolutionary history of corona virus and highlighted the interdependence of biology and chemistry. He explained how chemistry and biology together can reveal the unknown in the nature. He defined science as the study of nature. Quoting Aldous Huxley, he said that 'we are surrounded and embraced by nature, powerless to separate ourselves from her and powerless to penetrate beyond', which was starkly experienced by us during the Covid 19 pandemic. He mentioned that when we practice science, we observe nature and/while the study of science depends a lot on the tools and technologies available. Citing the examples of the telescope and the microscope in pursuing the science of cosmology and microbiology, respectively, he pronounced the role of technologies and instruments in the practice of science. Quoting the theoretical physicist Freeman Dyson, he said that science is often driven by new technology than by new concepts. Science of microbiology progressed with the invention of microscope, and cosmology was driven by the discovery of telescopes. Elaborating this point, he cited the example of rDNA technology, which facilitated development of genetically modified crops.

Prof Balaram highlighted that science is advancing fast and its frontiers are endless. Scientists should keep

striving to unravel the mystery of nature and search nature-based solutions for human welfare through innovations in agricultural sciences. As we have learnt immensely from the corona virus pandemic, we should prepare ourselves for a better life in future through an integrated approach based on the basics of chemistry, physics and biology. He highlighted that it is a formidable combination, and a deeper understanding of the biology would require studying chemistry, physics and biology simultaneously to explore and expand the new horizons of science including the science of agriculture. Further, disciplines of mathematics and computational aspects of biology are also equally important. He concluded by reminding us of the lessons that we must learn from the corona virus pandemic, and the lesson is that we should respect the nature.

29th Annual General Body (GB) Meeting

The 29th Annual General Body Meeting of the Academy was held in a hybrid mode on June 05, 2022, at 9.30 a.m. under the Chairmanship of the President of the Academy, Dr Trilochan Mohapatra.

At the outset, a one-minute silence was observed as a mark of respect to the departed souls of seven esteemed fellows of the Academy, namely Dr Jitendra Paul Khurana, Dr Lal Narain Shukla, Dr Vishwa R.P. Sinha, Dr K.V.R Tilak, Dr V.K. Batish, Dr S. Vardarajan and Dr K.V. Peter.

Dr T. Mohapatra welcomed all the esteemed Fellows, including the newly elected Fellows and Associates. Dr P.K. Joshi, Secretary, took up the agenda as listed. He informed that in 2022, 34 new Fellows, including 2 Foreign Fellows and 3 Pravasi Fellows and 11 Associates were inducted. Six scientists were also conferred the Young Scientist Awards for the year 2022.

It was informed that 14 Brainstorming Sessions planned by the Programme Committee on topical themes were organized during the year. In addition, the Academy organized the National Science Day on 28th February 2022, and the International Women's Day on 8th March 2022. A special webinar was also organized on "Transforming Agriculture in Asia" on 20th December 2021. On this occasion, four Policy Papers viz. One World One Health; Sugarcane-based Ethanol Production for Sustainable Fuel Blending Programme; Utilization of Wastewaters in Urban and Peri-urban Agriculture; and Certification of Quality Planting Material of Clonally Propagated Fruit Crops for Promoting Agricultural Diversification were released.

Many important suggestions were given by the Fellowship regarding future activities, which will be considered by the Programme Committee for preparing the future programs of the Academy.

Presidential Address

Dr T. Mohapatra, President, NAAS, delivered the Presidential Address. In his address, he drew attention to the fact that although India has made remarkable progress in food production, ensuring food and nutrition security, and increasing agricultural exports, improving agricultural sustainability remains important in the process of transformation of food system in view of the changing consumers' preferences and social aspects of food consumption.

Food production is linked to consumption. As supply and demand are closely associated and linked to markets, it is pertinent to understand the markets and the disruptive technologies to capture and consolidate the market share. Food processing is another aspect of food system transformation which needs attention, as we hardly process 10% of the food produced. The government has introduced many schemes and programmes to promote food processing. Food processing and value addition not only reduce the loss but also add nutrition through fortification. It also generates employment. Hence, transforming food system needs innovations and entrepreneurship in food processing. Farmer Producer Organizations (FPOs) can play a role in value addition from production to market, leading to more returns for farmers and reduction in import dependence. Food waste management, along the food value chain, is another concern that needs to be addressed in the food system transformation.

Energy in agriculture is a crucial component of the food system transformation. The XV Agricultural Science Congress of the NAAS was based on this theme, and comprehensive deliberations were held on the agriculture-energy nexus. The lesson learnt is that there is an imminent need to transform farm operations to increase use of bio-resources and renewable energy.

Realising that the public distribution system (PDS) plays a crucial role in food system transformation, pulses and millets have to be emphasized in PDS to improve the nutritional outcomes. A complete value chain approach is envisaged to transform the food system, involving various stakeholders. More importantly, the food system transformation needs to be understood through the climate lens, as climate change has started disturbing the agricultural systems away from its path of

sustainability. Hence, to achieve the Sustainable Development Goals, there is a need to redefine and revisit the food system transformation strategies and accelerate programs to offset the impacts of the Covid 19 pandemic.

The aging farm population is emerging as an issue of concern. The youth must be provided with the right kind of opportunity and technologies to attract them towards agriculture. Start-ups are addressing this issue along the value chain from farm to fork. The youth must be encouraged to come forward in creating infrastructure and explore the use of funding sources to their advantage and bring about faster transformation in the food system.

Technologies are needed to reduce the use of water and chemical footprints by encouraging eco-friendly agriculture. Can we consider compensating for ecosystem services and large-scale carbon trading? Similarly, can we use the new technology of genome-editing to develop high yielding varieties of neglected crops that can economically replace the water-guzzling crops?

Finally, to transform the food system, we need to re-skill everybody in the context of new developments and redefine our strategy of skilling youth, farmers, KVK scientists, and extension personnel.

Executive Council Meetings

125th Meeting

The 125th Meeting of NAAS Executive Council was held through hybrid mode at 10.00 A.M. on 29th April 2022 under the Chairmanship of Dr T. Mohapatra, President, NAAS.

The President apprised about the meetings of all the Science Academies convened by Dr (Mrs.) Manju Sharma involving their Presidents to discuss the issue of increasing allocation to R&D activities by the Government. Based on the deliberations a brief note on R&D expenditure and suggestions on the way forward has been submitted to the Government.

On this occasion, the President released Policy Paper "One World One Health"; and two publications from the Hyderabad Chapter (i) NAAS Hyderabad Chapter Book and (ii) Telugu Translation of NAAS Policy Paper on Organic Farming. Thereafter, the Agenda items as listed were taken up for discussion.

126th Meeting

The 126th Meeting of the NAAS Executive Council was held in a hybrid mode at 2.30 p.m. on June 3, 2022 under the Chairmanship of Dr T. Mohapatra, President NAAS. In his opening remarks, Dr Mohapatra mentioned that the agriculture exports have reached an all-time high of US$ 50.21 in 2021-22, even while free food was provided to a large population during the Covid period. This is a great achievement for the country, which must be highlighted and celebrated. He expressed satisfaction that the recommendations of the Academy on Gene Editing have led to significant policy change. Similarly, the recommendations on Pesticide Act and Biological Diversity Act have been very well received by the Government. It is pertinent that the Academy organises an event to highlight these achievements, inviting the press to create general awareness about the role of the Academy and its contributions.

He also mentioned that considering the rising aspirations of the farmers, the Academy may organise a round table to invite ideas on parameters for quantifying the same, identifying the critical gaps and ways to bridge these.

The Agenda items as listed were taken up for discussion and decisions taken. The EC approved the dates for the XVI ASC at Kochi.

NAAS Programs

Brainstorming Session on Sustaining Pulses Revolution in India (Convener: Dr Anjani Kumar, Co-Convener: Dr Shivendra Srivastava)

Pulses play a vital role in sustaining food and nutritional security in India, which is its largest producer and consumer in the world, constituting 28 percent of global production and 39 percent of global consumption (FAO, 2018). In spite of the significant progress made, the pulse production in the country has remained inadequate to meet the domestic demand resulting in the imbalance in demand and supply, soaring import bills and unpredictable price fluctuations, which often create panic in the economic and political environment. The poor pulses production in the 2015-16 due to weak monsoon resulted in excess demand that led to the surge in imports. Given a limited availability of pulses at affordable rates in the

international market, improving the domestic production remains the only option to meet our domestic demand. With the concerted efforts made by the Government of India to increase pulse production, a significant upward trend in the production of pulses has been registered in the recent years. Since 2015-2016, pulse production has registered a remarkable progress reaching 25.72 million tons in the year 2020-21. A 58 percent increase in pulse production has been achieved during the last five years, as compared to only 29 percent increase during the previous 54 years. As a result the per capita production of pulses went up to 51.8 grams per day in 2020-21.

Sustaining increased production of pulses, managing the supply effectively for improved food and nutritional security, and making India self-reliant in pulses needs careful strategy. The National Academy of Agricultural Sciences (NAAS) organized a one-day brainstorming session on “Sustaining Pulse Production in India" in hybrid mode on 05 April, 2022 under the chairmanship of Dr T. Mohapatra, President of the Academy. Participants included researchers, policy makers, representatives from the private sector, government organisations, civil societies, farmers groups and emerging agripreneurs. The brainstorming session deliberated on various aspects to chalk-out strategies and action plan for accelerating and sustaining production of pulses and improving its consumption. Need for a multi-pronged approach to accelerate and sustain pulses production and improve their consumption was reiterated. These include

- Sustained technological development for higher productivity and bridging the yield gap (through breeding, mechanization, disease control etc.
- Improved farmers’ price realization
- Minimizing the production and price risk
- Improvement of procurement system
- Consistency in trade policies
- Valuation of ecosystem services

Short, medium and long term measures were identified and technological and policy interventions suggested, which include:

- Mapping spatial variation in pulse yields and identifying the hot spots where yield gap in pulse crops is wider, to prioritize these under NFSA-Pulses interventions. Bridging yield gap by 25 percent alone can improve pulses production up to 1.5 million tonnes.
- Improvement of seed replacement rates.
- Promotion of pulse production and diversification in pulses basket with necessary policy support and incentives.
- Maintain a buffer stock of about 10 percent of total production to stabilise pulse prices.
- Aggressively support advanced technological developments for improving yield potential through tolerance to various biotic and abiotic stress.
- Make pulses as an attractive sector for the private sector investment in production, storage and marketing.
- Include pulses in welfare schemes for improving nutritional security and sustaining food system.
- Create awareness about the benefits of pulses for nutrition and environment.

Brainstorming Session on Impact of COVID 19 on Livestock and Poultry Sector (Conveners: Dr R.K. Singh and Dr D. Bardhan)

The Academy organized a brainstorming session on ‘Impact of COVID 19 on livestock & poultry sector’ on 24th June, 2022 in hybrid mode. Dr T. Mahapatra, President, NAAS, chaired the session along with Dr A.K. Singh, Vice-President, NAAS and Dr A.K. Srivastava, Vice Chancellor, DUVASU. Dr J.K. Jena, DDG (FS), ICAR, Dr H. Rahman, Regional Representative, ILRI South Asia and Dr Abhijit Mitra, Director, ICAR-CIRC and several other eminent scientists attended the meeting.

Sector-specific presentations were made on the impact of COVID 19 on dairy, poultry, fisheries, feed and meat industries as well as on breeding and health. Specific policy inputs were suggested for managing veterinary services, supply chain solutions, challenges in veterinary science education and role of extension services in mitigating the impact of the pandemic.

The primary recommendations emerging from the brainstorming session were to use the learnings from COVID 19 to document the policies to mitigate the adverse impact of such calamities in future. In this context, the role of innovative technologies in reducing the scope of human-to-human contact needs to be explored. Preparedness to address future shocks from pandemics in terms of ensuring smooth supply of raw materials, like feeds, semen, even curative and preventive veterinary services to ensure that the supply chains operate normally, is critical, for points of interventions based on risk assessment need to be identified. Development of diagnostics and vaccines for challenging diseases (like ASF, MERS, LSD and RVF) and strengthening of the surveillance system is also critical.

It was felt necessary to adopt 'one-health' approach to address the environmental, human and animal health issues. The lack of reliable database was identified as one of the critical factors in estimating the true quantitative impact of COVID 19 and decision making for mitigating the negative impact of pandemics. Hence preparing a repository on animal diseases is imminent and critical. It is necessary to strengthen animal husbandry sectors for preventing future pandemics and for emergency preparedness with adoption of biosecurity measures.

Activities of the Regional Chapters

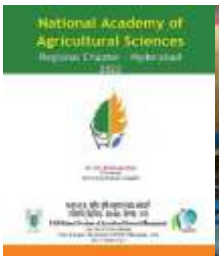
Bengaluru Chapter

A special lecture on "Rumen Microbes - Renewed Focus on Animal Health, Production and Sustainable Interventions" by Dr Vivek Fellner, Director of Graduate Programs and Professor of Ruminant Nutrition, College of Agriculture and Life Sciences, North Carolina State University, USA, was organised on 27 May 2022 by the Bengaluru chapter. His presentation primarily focused on the importance of rumen microbes in agriculture and human health, and highlighted the factors that improve nutrient use by gut microbes and minimize nutrient waste. He emphasized the role of ruminants in carbon pool transformation for human food, and discussed different strategies for reducing enteric methane emissions from rumen and their variable response in different types of feeding. He mentioned that the present studies conducted by his research group indicate that nitrates are effective in reducing the emission of methane irrespective of the diet composition. It was concluded that the rumen microbes can be used as effective models to establish link between gut biomolecules, fermentation energetics and overall energy transactions in the gut. The lecture was attended by more than 100 participants across different locations of India and France.

Hyderabad Chapter

- NAAS Policy Paper 30 – "Organic Farming" and Policy Paper 65 – "Climate Resilient Agriculture in India" have been translated in Telugu, and were released during the 125th Executive Council Meeting of NAAS, held at Delhi on April 29th 2022.

- A Bulletin containing the profile of Fellows and Associates of NAAS Hyderabad Regional Chapter for the year 2022, covering the regions of Andhra Pradesh and Telangana, has been compiled, published and released during the 125th Executive Council Meeting of NAAS, held at Delhi on Apr 29, 2022.



- Translation of NAAS Policy Paper 87 - Abiotic stress, droughts, floods cyclones and hailstorms management, in Telugu, was released on 3-6-2022 during the NAAS 126th EC meeting.


Ludhiana Chapter

NAAS Ludhiana chapter in association with the Krishi Vigyan Kendra, Budh Singh Wala, Moga (Punjab) organized an awareness programme for the school children and teachers of the Government Senior Secondary School, Charik, Moga on 'Strategies to combat challenges of global warming' on 22.06.2022 in which 270 school students and twenty-five teachers participated. The students also participated in the 'Painting Competition' based on the theme of global warming. Dr Prabhjot Kaur Sidhu, Assistant Professor (Animal Science) welcomed all the participants and sensitized them regarding the present situation of global warming and its negative impact on household animals. Dr Amandeep Singh Brar, Deputy Director (Trg.)

enlightened the school students about various technologies such as adoption of crop diversification to stabilize the ground water level which, is declining rapidly, and urged the students to spread this message amongst their parents, neighbours and public in general. Dr Prerna Thakur, Assistant Professor (Vegetable Science) talked about the importance of different kinds of trees and plants and encouraged students to plant at least one tree a year. Dr Ramandeep Kaur, Assistant Professor (Processing and Food Engineering) talked about processing of fruits and vegetables to reduce wastage, and composting of the left-over material to enrich the soil. Dr Parminder Kaur, Professor (Home Science) discussed the importance of food nutrients in human health and adoption of healthy life-style by incorporating green vegetables and fruits into their daily diet. School teachers also shared their views on the present situation. Students were motivated to follow the learning at their home and be an influence in the society. At the end, Dr Prabhjot Kaur thanked the Principal, the staff and the students for participating.

Awareness programme on 'Strategies to combat challenges of global warming' organised at KVK, Moga by Ludhiana Chapter

Kolkata Chapter

On the occasion of the World Earth Day, Kolkata chapter organised an online special lecture on 30 April, 2022 on 'Climate Change and Indian Agriculture: IPCC 6th Assessment Report and Beyond' by Dr H. Pathak, Director, ICAR- NIASM, Baramati. Dr Anil K. Singh, Vice-President, NAAS was the Chief Guest. A large number of scientists belonging to various disciplines from across the country participated in this event.

A virtual interaction with school leaving students was organized by the Kolkata Chapter of NAAS in the evening of 21st June, 2022 to create awareness about the scope of agricultural sciences and to motivate the bright students to pursue higher studies in agricultural sciences as career option. A total of 267 students from 21 schools participated from across the state of West Bengal. The students showed keen interest in learning about the avenues in agricultural sciences and interacted actively with the convener Dr Biswapati Mandal and Dr Srikanta Das, Dean, Post-graduate Studies, BCKV for over two hours.

Pune Chapter

An ICAR-University-NAAS-Stakeholders Interface Meeting was organized at ICAR-National Institute of Abiotic Stress Management, Baramati on June 17, 2022. Dr V.M. Bhale, Hon'ble Vice Chancellor of PDKV, Akola and Dr Y.S. Nerkar, Former Vice Chancellor MPKV Rahuri co-chaired the meeting. Dr S.D. Sawant, Vice Chancellor, BSKKV, Dapoli; Dr P.K. Patil, Vice Chancellor, MPKV, Rahuri; all the Directors of ICAR Institutes located in Maharashtra and their representatives; progressive farmers; private sectors;

NGOs and KVKs participated in the meeting. Senior NAAS Fellows and Associates based in Maharashtra also attended the meeting in person or online.

Dr Himanshu Pathak, Director, NIASM and Convener, NAAS Pune chapter, presented the background and the objectives of the meeting. Dr Bhale emphasized the problems of Maharashtra agriculture and presented a vision for improvement. Dr Sawant highlighted the improvements in agriculture of the coastal and inland saline regions, whereas Dr Patil suggested action points for improvement of agriculture and allied sectors in the state. All the Directors of the ICAR institute presented their views on the researchable, developmental and policy issues for the improvement of respective commodities. Progressive farmers and representatives of private firms highlighted the problems

and suggested ways for adoption of different emerging technologies.

The meeting emphasized to strengthen partnership among the SAUs, ICAR research organizations, private sector, NGOs, KVKs, NAAS and farmers to develop need-based technologies that can upgrade farmers' livelihood and enhance the resilience against climate change. Dr Nerkar briefed about the challenges of agriculture and allied sectors and observed that farming under current situations is risky and non-profitable, which may become riskier in times to come due to emerging climate change and biotic and abiotic stresses. He emphasized on the role of NARES and NAAS in agriculture development in Maharashtra. He also suggested that the SUAs, agriculture research institutions, state government and other organizations need to play an active role in addressing these challenges. On this occasion, a book on 'Abiotic Stress in Agriculture: Impacts and Management' published by ICAR-NIASM and three policy papers published by the Pune Chapter of NAAS were released.

The issues related to the field and horticultural crops, soil and water management, animal husbandry and fisheries along with the academic and policy interventions were discussed; and action points were identified. It was decided that a report on 'Reorienting Maharashtra Agriculture' will be prepared and shared with ICAR, Maharashtra Government, NAAS and other stakeholders to chalk out a program to address the current and emerging problems.

Varanasi Chapter

Varanasi chapter organised two awareness programmes for the PG/UG students about the scope of higher studies in agriculture. A science awareness programme particularly related to biotechnological aspects in vegetable research was organised on 11th April, 2022 for the post-graduate students of Agricultural Biotechnology of BHU Rajiv Gandhi South Campus, Barkachha, Mirjapur. A total of 27 students along with the teachers visited the research farm, technology park, waste management facility, seed production and seed processing unit of the ICAR-Indian Institute of Vegetable Research, Varanasi, where the importance of vegetables for nutrition security, organic farming, waste management, seed production and protected cultivation were explained by the scientists and NAAS Fellows present. Dr Sudhakar Pandey, the convener of the Varanasi chapter briefed about the research activities of Indian Institute of Vegetable Research and apprised about the career opportunity for Ph. D. courses in Agriculture, particularly in biotechnology and allied sciences, while Dr Ramchander briefed about the research activities and courses covered during degree programme.

The Varanasi chapter organized another science awareness programme on 30th May, 2022, particularly for the B. Sc. (Ag.) 4th year students of UP Autonomous College, Varanasi. A total of 50 students along with teachers visited the ICAR-Indian Institute of Vegetable Research, Varanasi. Dr Sudhakar Pandey, Convener NAAS-Varanasi Chapter briefed about the research activities of Indian Institute of Vegetable Research and its achievements. Dr Nakul Gupta, Scientist, ICAR-IIVR briefed about the career opportunities for post graduates in agriculture and motivated the students for pursuing higher education in the areas of agriculture, particularly agricultural biotechnology and allied Sciences. Several queries raised by the students related to careers in Agricultural Biotechnology and allied sciences were replied to by the scientists of IIVR and fellows of NAAS present on the occasion.

Awareness programme for the students of BHU Rajiv Gandhi South campus, Mirjapur

Awareness programme for the students of UP Autonomous College, Varanasi

Forthcoming Programmes of NAAS

1. Plant - based vs Dairy Milk- Myths and Facts
2. Scaling up Innovative Agricultural Extension Models
3. Public-Private Partnership in Agriculture: Current Opportunities and Challenges
4. Sea Weed Cultivation and Utilization
5. Beyond Price Support and Subsidy
6. Service Delivery Mechanism in Livestock Sector

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Obituaries

During this quarter, the Academy lost three of its very distinguished Fellows.

Dr S. Varadarajan (1928-2022)

Dr Srinivasan Varadarajan, an outstanding scientist and distinguished Fellow of our Academy and one of the architects of modern science in India, passed away on May 11, 2022. He was actively involved in the international negotiations which led to the establishment of International Centre for Genetic Engineering and Biotechnology in Delhi and Trieste as well as the Indo-French Centre for Advanced Scientific Research in Delhi. He also made significant contributions in the studies on environmental effects of refinery on Taj Mahal monument (1974-76 & 1994-95), and on the safe disposal of highly toxic stored materials after gas leakage at Bhopal in December 1984.

Dr Varadarajan was the President of INSA (1996-98), Indian Academy of Sciences, Bangalore (1980-82), Indian National Academy of Engineering (1992-95), Nutrition Society of India (1982-86) and Oil Technologists Association of India (1984-86). He was also a Member of International Committee of ICSU on Chemical Research Applied to World Needs (CHEMRAWN); the small India-Japan Eminent Persons Group of Governments and the INSA-Japan Science Advisory Council.

Dr Varadarajan's immense contributions were recognized by the Govt. of India by awarding him the prestigious Padma Bhushan in 1985. He was the Secretary in the Department of Science and Technology, Department of Scientific and Industrial Research & Director General of CSIR as well as Department of Biotechnology. He was also the Chief Consultant, Planning Commission, Govt. of India. He received the INSA CV Raman Medal for promotion of Science (2004) and occupied Platinum Jubilee Chair for Promotion and Service to Science (2009-14).

In his passing away, the country has lost an extra-

ordinary scientist and an accomplished science administrator, who will be missed by all those who came in his contact. The Fellowship of the Academy prays to the Almighty to give eternal peace to his soul in his heavenly abode.

Dr Kuruppacharil V. Peter (1948-2022)

Dr K V Peter, an outstanding Horticulture Scientist and distinguished Fellow of our Academy, passed away on May 15, 2022. The former Director, ICAR-Indian Institute of Spices Research, Calicut; Professor, Director of Research and Vice-Chancellor of Kerala Agricultural University, Trichur, Dr Peter will be remembered for his immense contributions in horticulture research, teaching and communication. Dr Peter was awarded several fellowships and awards, including Dr Harbhajan Singh Award, 1993; Rafi Ahmed Kidwai Award, 1996-98; Silver Jubilee Medal, 1998; Silver Jubilee Memento, 1998; Dr M.H. Marigowda National Award, 2000; DBT National Award for Processing and Product Development, 2003; HSI-Shivasakthi Lifetime Achievement Award, 2008. He was Author and Editor, Horticulture Science series; President, Indian Society of Vegetable Science, Varanasi; and President, Kerala Chapter, National Academy of Sciences. He will be remembered for his dedicated efforts to promote research, cultivation, and use of Noni in India.

Dr Peter was a Member, Executive Council, NAAS from 1 Jan, 1999 to 31 Dec, 2001; and received Recognition Award 1999-2000 and Dr K. Ramiah Memorial Award 2007-2008.

The scientific community has lost a brilliant scientist, teacher, science writer, academician and over all, a wonderful human being. The Fellowship of the Academy prays for eternal peace to the departed soul.

Dr Chittranjan Bhatia (1936-2002)

Dr Chittranjan Bhatia, the former Vice President of the Academy and the former Secretary, Department of Biotechnology, Govt. of India, passed away on June 13, 2022. An outstanding scientist, Dr Bhatia made immense contributions in the field of plant genetics and breeding, and biotechnology. During a long illustrious career, he left an indelible impression in various exemplary roles as a researcher, research manager, and administrator in India and abroad. He was the Secretary to the Govt. of India, Department of Biotechnology, 1993-95; Consultant, International Atomic Energy Agency, Vienna 1996, 1998- 99, 2001; Winrock International, 1999.

Dr Bhatia was awarded several fellowships and awards, including National Academy of Sciences Prof R. N. Tandon Memorial Award, 1993; INSA S.K. Mitra Memorial Award, 1995; and Om Prakash Bhasin Award, 1995. He was Fellow of Maharashtra Academy of Science; Indian Academy of Sciences; Indian National Science Academy; National Academy of Sciences, India; Third World Academy of Science; U.P. Academy of Agricultural Sciences.

The scientific community has lost a brilliant scientist, teacher, academician and wonderful human being. The Fellowship of the Academy prays for eternal peace to the departed soul.

Announcement

The XVI Agricultural Science Congress will be organised in Kochi with ICAR-CMFRI as the host institute. The theme of the Congress shall be 'Transformation of Agri-Food Systems for Achieving Sustainable Development Goals'. The Congress will be held during 10-13 October, 2023. (Website: 16asc2023.in)

Editors: Dr P.S.Birthal and Dr Malavika Dadlani

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