# ANNUAL REPORT 2018-19



National Academy of Agricultural Sciences New Delhi

## **ANNUAL REPORT**

## 2018-19



National Academy of Agricultural Sciences NASC, DPS Marg, New Delhi - 110 012, India

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### PREFACE

It is my privilege to present to the esteemed Fellowship, Annual Report-2018-19 that includes brief account of the activities undertaken during period under report. Ever since its inception in 1990 the National Academy of Agricultural Sciences has established itself as a credible "Think tank" to provide views on a broad spectrum of issues related to agriculture research, education, extension, development and policy advocacy and has emerged as vibrant organization, over the years.

In keeping with its mandate, the Academy carried out various programmes in form of several brainstorming sessions/strategy workshops and national level consultations on important issues



Dr Panjab Singh

related to agriculture in the country that focussed on *Harnessing Full Potential of A1 and A2 Milk in India;Rumen Microbiome and Amelioration of Methane Production; Renewable Energy: A New Paradigm for Growth in Agriculture; Development and Adoption of Novel Fertilizer Materials; Experts' Meet on Saving the Harvest; and Experts' Meet on Uniform Policy for Fish Disease Diagnosis and Quarantine. The Foundation Day Lecture was delivered by Mr Erik Solheim, Executive Director, United Nations Environment on <i>The Future of Food and Farming: Ideas for a Changing World* in the afternoon of June 5, 2018. The Academy has brought out several publications in form of strategy and policy papers besides the regular NAAS-News, NAAS Year Book-2019 and NAAS Planner that were released on different occasions.

The Academy in collaboration with ICAR-IARI organized biennial XIV Agricultural Science Congress on 'Innovations for Agricultural Transformation' at NASC, Pusa, New Delhi from Feb 20-23, 2019. This Congress provided an intellectually rich multistakeholder platform to discuss and critically analyze veritable disruptive innovations for transforming agriculture and food systems in the country. The event was highly successful with participation of about 1800 delegates that included eminent scientists from India and abroad. On the eve of ASC, a press conference was held to brief the media about the event. Dr A.K. Singh, Director, IARI and Chairman, Organising Committee; Dr Ashok K. Singh, Joint Director, IARI and Organising Secretary; and their dedicated team made untiring efforts to ensure success of XIV ASC, and deserve special appreciation.

In a new initiative to generate resources, Academy approached several Ministries/ Departments to use the expertise of NAAS Fellowship. In this endeavour, the NAAS developed proforma and guidelines for ranking performance of ICAR institutions and a study on National Soil and Land Use Policy for the Ministry of Agriculture and Farmers' Welfare. I place on record my gratitude to the outgoing members of the NAAS Executive Council, especially, Dr C.D. Mayee, Vice President; Dr B.S. Dwivedi, Treasurer; Dr P.K. Joshi, Foreign Secretary; Dr D.P. Ray, Dr (Mrs) Chandrika Varadachari, Dr K.N. Ganeshaiah, Members and Shri Chailbendra Roul, ICAR nominee, on completion of their three year tenure and for their valuable contributions. I am grateful to the all EC members, conveners and members of various committees for effectively organizing various consultations, valuable inputs in election of Fellowship, and rating of Journals. My sincere thanks are due to colleagues in NAAS Secretariat, Dr A.K. Bawa; Shri Miraj Uddin, Ms Minu Tiwari, Shri P. Krishna, Shri Umesh Rai, Shri Jai Singh, Shri Banwari Lal Yadav and Shri Kamal Singh for effectively managing the day to day activities of the secretariat. The financial and logistics support of DARE and ICAR is gratefully acknowledged.

(Panjab Singh) President

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## **ABOUT THE ACADEMY**

Inspired by the vision of late B.P. Pal, FRS, the National Academy of Agricultural Sciences (NAAS) was established in 1990. The main focus of the Academy is on the broad field of agricultural sciences including crop husbandry, horticulture, animal husbandry, fisheries, agro-forestry, agricultural engineering, and interfaces between agriculture and agro-industry. The Academy's role is to provide a forum for agricultural scientists to deliberate on important issues of agriculture, agricultural research, education and extension, and offer views of the scientific community as policy inputs to planners and decision/opinion makers at various levels. The Academy organizes and supports national and international congresses, conferences, seminars, symposia, workshops and brainstorming sessions on the critical issues in the field of agricultural sciences. It articulates issues of agricultural research and education in various fora.

The Academy has emerged as a vibrant national level body devoted to agricultural sciences. The Fellows of the Academy, recognized for their contributions to science, include distinguished personalities in the field of agriculture and allied sciences, both from India and abroad.

#### **OBJECTIVES**

- To promote ecologically sustainable, economically vibrant and socially equitable agriculture.
- To recognize and support excellence in scientific research in the field of agriculture performed by scientists.
- To provide promising scientists with the conditions necessary for the advancement of their work.
- To promote contact among research workers in different institutions and organizations within the country and with the world scientific community.
- To organize and undertake inter-disciplinary analyses of issues of importance to farmers, farming and agrarian transformation to strengthen science-policy interface and bring out documents for the advancement of agricultural research, extension and education for development.
- To secure and manage funds and endowments for the promotion of agricultural sciences.
- To carry out other activities relevant to the accomplishment of the above goals.

#### Structure of the Academy

- The General Body: The General Body of the Academy comprises its Fellows.
- The Executive Council (EC): EC is the main policy and decision making body. It is assisted by different Committees to deal with various aspects of governance and activities of the Academy.
- Regional Chapters: Twelve Regional Chapters of the Academy are functioning at Bengaluru, Bhopal, Cuttack, Coimbatore, Hyderabad, Karnal, Kolkata, Lucknow, Ludhiana, Mumbai, Patna and Varanasi.

### SCIENTIFIC ACTIVITIES

#### Brainstorming Sessions/Strategy Workshops/Consultation Meetings

During the year 2018-19, following brainstorming sessions/strategy workshop/ consultation meetings were organized:

| S. No | Title   | Convener                         | Date          |
|-------|---|----------------------------------|---------------|
| 1.    | Strategy Workshop on <i>Harnessing Full</i><br>Potential of A1 and A2 Milk in India   | Dr A.K. Srivastava               | May 19, 2018  |
| 2.    | Strategy Workshop on Rumen<br>Microbiome and Amelioration of Methane<br>Production    | Prof D.N. Kamra                  | June 25, 2018 |
| 3.    | Strategy Workshop on Renewable<br>Energy: A New Paradigm for Growth in<br>Agriculture | Dr O.P. Yadav                    | Sept 25, 2018 |
| 4.    | Experts' Meet on Saving the Harvest   | Dr Anupam Varma                  | Sept 26, 2018 |
| 5.    | Strategy Workshop on Development<br>and Adoption of Novel Fertilizer<br>Materials     | Dr (Ms) Chandrika<br>Varadachari | Oct 5, 2018   |
| 6.    | Experts Meet on <i>Uniform Policy for Fish Disease Diagnosis and Quarantine</i>       | Dr P.K. Sahoo                    | Jan 29, 2019  |

## Strategy Workshop on "Harnessing Full Potential of A1 and A2 Milk in India" (Convener: Dr A.K. Srivastava)

The Academy organized one day Strategic Workshop on "Harnessing Full Potential of A1 and A2 Milk in India" at NAAS complex, New Delhi on 19th May 2018. On behalf of NAAS, Dr A. K. Srivastava, Vice President of NAAS and Chairman, ASRB, convened the strategic workshop to have an in-depth discussion on this issue among various



Strategic Workshop on Harnessing Full Potential of A1 and A2 Milk in India, in progress

stakeholders, and to devise a strategy framework and a future road map on A1 and A2 milk in India. The workshop was Chaired by Prof Panjab Singh, President, NAAS and Co-chaired by Prof R.B. Singh, Former President NAAS. More than 70 eminent scientists, policy makers and peer groups, industry, NGOs and social activists from various organization involving NAAS, ICAR, SAUs, Department of Animal Husbandry, Indian Dairy Association, BAIF, AMUL and NGOs dealing with promotion of indigenous milk participated in the Workshop.

Dr A.K. Srivastava, in his presentation, flagged the issues on the genesis of the concept of A1 and A2 milk. It was informed that there are more than 800 breeds of cattle (*Bos taurus and Bos indicus*) in the world which were domesticated nearly 10,000 years ago and in the beginning, all milk was A2 type. Later the genetic mutation took place in A2 milk around 8,000 years ago leading to generation of A1 beta casein genetic variant in cattle that produced A1 type milk. In the late 90s, due to cross breeding of indigenous cattle (*Bos indicus*) with *Bos taurus* in India, introgression of A1 allele took place in the crossbred cattle. The significance of A1 and A2 beta casein was not known till 1993 until the implications of A1 and A2 milk on human health were reported by researchers from New Zealand. The invited speakers also made presentations that included Demographic pattern of beta casein variants in India in terms of A1 and A2 milk; Health and nutritional attributes of A1 and A2 milk; Impact of A1 and A2 milk on health; Myths and facts about A1 and A2 milk; Genomic methods for analysis of A1 and A2 milk; Protein based methods for analysis of A1 and A2 milk; and Strategy for animal breeding in India with special reference to A1 and A2 milk.

Main suggestions that emerged during the discussion included a need to be put all socio-economic factors together including strategies involved in humanizing science; accelerated genetic improvement of indigenous cattle with far greater investment in research; need to carry out research about the various implications of A1 and A2 milk on human health and bring out a strategy paper on behalf of NAAS with detailed information on the on-going research on A1 and A2 milk worldwide and strategies that India should follow in future.

The Academy published Strategy Paper 12: *Harnessing Full Potential of A1 and A2 Milk in India: An Update* based on the available scientific evidences and recommendations.

Strategy Workshop on "Rumen Microbiome and Amelioration of Methane Production" (Convener: Prof D.N. Kamra)



Strategic Workshop on Rumen Microbiome and Amelioration of Methane Production, in progress

NAAS organized a strategic workshop on "Rumen Microbiome and Amelioration of Methane Production" on June 25, 2018 under the Chairmanship of Prof Panjab Singh, President, NAAS. Prof D.N. Kamra, Former ICAR-National Professor and

Convener of the workshop delineated the importance of the strategic workshop in the wake of growing concern over the contribution of ruminants to methane emission. Three lead papers on microbial diversity, methanogenesis and metagenomics of the rumen were presented. The microbiome of cattle and buffalo indicated that with conventional techniques, the microbial diversity was much lower as compared to the results arrived by using metagenomic technique. It was appraised that a large number of feed additives like e.g. methane analogues, antibiotics, inophores, unsaturated fatty acids and inorganic terminal electron acceptors like sulphate, formate, nitrate etc. have potential to inhibit methanogenesis, but majority of them are either toxic for animals or to the microbes responsible for methanogenesis. However, plants like Bergenia crassifolia, Emblica officinalis, Peltiphyllum peltatum, Populus deltoides, Quercus incana, Rheum undulatum, Terminalia belerica, Terminalia chebula, phyto-leaves such as Som and Jamun Allium sativum, Coriandrum sativum, Eucalyptus globulus, Foeniculum vulgare, Mentha piperita, Ocimum sanctum, Populus deltoides and Syzygium aromaticum contain secondary metabolites (tannins, saponins, alkaloids, essential oils etc.) that have antimethanogenic activity. Although plant secondary metabolites are effective against methane emission and protozoa growth in the rumen, but some of them also have adverse effects on feed degradability and nutrient utilization by the ruminants. Interspecies/breed differences were also reported between the microbiome of the animals. It was hypothesized that more H<sub>2</sub> production contributed to higher methane emission in cattle/buffalo as compared to yak. Even in cattle and buffalo there are high and low producers of methane. It was also reported that a non- methanogen, tammar wallaby (Macropus eugenii) harbours unique gut bacteria that produces only one-fifth of methane produced by cattle.

It was observed during the discussion that in last three decades the status of knowledge of rumen microbiology has changed dramatically with the discovery of anaerobic fungi, new genera of archaea and ruminophages. It was apparent from the research findings that Rumen Microbiome does not work in isolation and largely dependent on feed resources, climate and genetic make-up of the animal. Therefore, a standard operating procedure needs to be developed to conduct experiments and compare database. Prof Panjab Singh, President, NAAS in his concluding remarks observed that research on Rumen Microbiome and mitigation of methane production must contribute to the mission for effective utilization of lignified plants and production of animal protein with lesser effect on climate. He advised for an expanded research agenda to make economic exploitation of enormous diversity of rumen microbes for improvement in health and productivity of animals and to bridge the gap between the metagenomic data generated for various livestock species and its functional application for better feed conversion by the animals.

The Academy published Strategy Paper 11: *Rumen Microbiome and Amelioration of Methane Production* as an outcome of the strategy workshop

## Strategy Workshop on "Renewable Energy: A New Paradigm for Growth in Agriculture" (Convener: Dr O.P. Yadav)

A strategy workshop on "Renewable energy: A New Paradigm for Growth in Agriculture" convened by Dr O.P. Yadav, Director, ICAR-CAZRI, Jodhpur was organised at the National Academy of Agricultural Sciences, New Delhi on 25th September, 2018.



Strategic Workshop on Renewable Energy: A New Paradigm for Growth in Agriculture, in progress

During the opening remarks of the workshop, Prof Panjab Singh, President, NAAS stressed the importance of renewable energy use in agriculture sector, as the present day agriculture is becoming more energy-intensive than ever before. Dr O.P. Yadav presented the overall scenario of renewable energy generation through Agri-Voltaic System, biomass & waste utilization, solar PV greenhouse, thermal solar gadgets and co-generation through three-in-one system consisting of farming and electricity generation from solar and wind resources. The Agri-Voltaic System was reported particularly useful for crop production, PV generation and rainwater harvesting together from a single land unit. The RESCO model, in which private investor could be the power producer and farmer would be the owner of land for crop production, was considered to be a good choice for establishment of Agri-Voltaic System in farmers' field.

From the discussions, following important points emerged:

(i) Solar PV modules can be treated as one crop in Agri-Voltaic System, which has the potential to improve the land productivity.

- (ii) There is huge scope of implementing solar PV pumping system in agricultural fields.
- (iii) Solar PV pumps may be connected to net meter to sell the surplus electricity to grid for additional income generation by the farmers.
- (iv) Solar drying is another avenue that has lot of scope in agriculture sector, especially for post-harvest processing and value addition.
- (v) Harnessing wind energy ranks first among all renewable energy sources in India. However, there is a scope of generating wind and solar energy together utilizing solar-wind hybrid system.
- (vi) For biomass-based electricity generation, there should not be any conflict in use of biomass for animal feed and energy generation.
- (vii) Recent advanced 3G/4G technology needs to be followed for clean biomass based energy generation. Briquetting, bailing, biochar production technology etc. have been developed since long but their replication in field is comparatively less. Energy generation from biomass is also a way forward to biomass management and needs to be incentivised.
- (viii) Aggregation of various sources of energy needs to be done to use other logistics in a more holistic and economical way.

The Academy published Strategy Paper 10: *Renewable Energy: A New Paradigm for Growth in Agriculture* encompassing the status of knowledge and way forward in this area.





The National Academy of Agricultural Sciences (NAAS) organized a meeting of the experts to envision strategies to minimize the postharvest losses of the agricultural produce in the country. Experts' Meet on Saving the Harvest was held on September 26, 2018 at

Experts' Meet on Saving the Harvest, in progress

NAAS, New Delhi and was chaired by Prof Panjab Singh, President, NAAS. The main objective of the meeting was to identify the causes, select potential solutions adapted to local and product specificities, and develop recommendations for the consideration of the Government, processing industry and other stakeholders to minimize the pre and post-harvest losses of agricultural produce, especially fruits, vegetables, milk, meat, marine and poultry products.

According to the FAO estimates, nearly 30% of the cereals, 40 to 50% of fruits and vegetables, 20% of oilseeds, meat and dairy products, and 35% of fish are lost globally. The losses are greater in the tropics and semi-tropics due to the extraneous factors of climatic conditions and limited availability infrastructure for harvesting, storage, transportation, processing, cooling facilities, packaging and marketing systems. Although accurate estimations of the magnitude of losses and waste are not available, the losses of major agricultural produces at the national level were estimated to be of the order of Rs. 92,651 crores based on the production data of 2012-13 at 2014 wholesale prices (Annual Report: 2016-17, Min. of Food Processing Industries). The actual postharvest losses may be much greater as the above estimates are based on assumptions of less than 6% loss of cereals, less than 16% of fruits and vegetables, less than 11% of marine fish, etc. A FAO study suggests that the food loss in India is nearly 40%.

The variability in the estimates suggests a need for more comprehensive studies. There can be no doubt that losses to food are unacceptably high, and warrant urgent science-based solutions to strengthen the schemes launched by the Government for reducing the post-harvest losses.

The country achieved a record production of food grains, pulses and oilseeds, horticultural crops; and sugarcane. The growth in the production of the dairy, meat, poultry and fish sectors is also impressive. To utilize these gains for achieving nutritional security and meeting the SDGs, there is a strong need for developing viable solutions and strategies to minimize the pre and post-harvest losses. The major challenges in reducing the food losses include, lack of appropriate storage system, cold chain, adoption of good agricultural practices, infrastructure for processing and value addition, modern marketing system, quality deterioration and food wastage, and inefficient utilization of by-products.

#### Strategy Workshop on "Development and Adoption of Novel Fertilizer Materials" (Convener: Chandrika Varadachari)



Strategy Workshop on Development and Adoption of Novel Fertilizer Materials, in progress

A Strategy Workshop on "Development and Adoption of Novel Fertilizer Materials" washeld on 5th October, 2018 to deliberate on the various issues that need to be addressed, in order to develop a temperamentally improved scientific environment in India

for novel fertilizer materials and new technologies. The workshop was convened by Dr Chandrika Varadachari.

There was broad consensus amongst the participants that (a) there is a need for improved fertilizers because of the low efficiency and other problems with the current fertilizers, (b) materials and technologies are available to confront this problem, (c) it is necessary to improve the regulatory systems, that often create bottleneck, and (d) research and educational inputs need to be addressed to provide the requisite support for innovative materials.

The fertilizers and their consumption have a substantial impact on Indian agriculture. Fertilizer import in 2016-17 was nearly 14 Mt of which Urea constituted the largest proportion at 5.5 Mt followed by DAP at 4.4 Mt. Urea is reported to suffer 50-70% losses due to leaching, volatilization as ammonia, leaching after transformation to nitrate and denitrification to NO<sub>x</sub>. Phosphates and micronutrients also have low use-efficiencies due to fixation reactions besides causing water and air with a huge loss to the exchequer (> Rs 50,000 crores) and to the farmer who is losing more than 50% of his investment in fertilizers. Other issues with present fertilizers include incompatibility between materials that makes it difficult to make composite combinations, handling and application, hygroscopicity, incompatibility with applicators, etc. With micronutrient fertilizers, some of these challenges are more magnified; utilization efficiencies are < 10% and lead pollution in zinc sulphate industries as one of the most serious concerns.

It was suggested that the entire regulatory process, including the Fertilizer Control Order (FCO) and the existing quality control measures need to be thoroughly reformed with zero compromise to farmer's interest and the environment. The Order should be replaced by an Act, similar to that for seeds (Seeds Act) and insecticides (Insecticides Act). The quality control process adopted for fertilizers should be similar to that for drugs. A Fertilizer Regulatory Authority would focus on quality of fertilizers to ensure that soil health is not adversely affected.

The participants were of the view that major constraint is that quality control laboratories that are far short of requirement in both manpower and instrumentation. To deal with such situations, a few high-tech Fertilizer Control Laboratories could be setup to monitor fertilizers sold in the market. These laboratories could analyse randomly picked samples to check with the label claims of the manufacturer. The existing subsidy policy was highlighted as a huge hurdle in the way of new, innovative and efficient fertilizers. This policy is discouraging investment in R&D by companies and not providing an environment favourable to innovation. Therefore, the subsidy structure has to be rationalized by subsidizing nutrients *per se* and particularly complex, customized fertilizers that will deliver NPK mixtures suited to particular crops. Freedom should be provided to states to decide the fertilizers critical for crop production and subsidy should be announced accordingly. Extent of subsidy should also vary depending on size of farmer's land-holding and income. Smaller farmers in lower income should receive more subsidy.

It emerged from the discussion that novel fertilizer materials are expected to possess patent rights. At present, there is a lot of misunderstanding with fertilizer companies that grant of FCO gives a free right to production and sale regardless of patent status. This is a worrisome situation for innovators. The FCO has no scope to certify patent protected fertilizers. All government agencies involved in granting licenses to manufacture or sales must give due cognizance to the secrecy of know-how and process details involved in manufacture of patented fertilizers. The FCO or an alternative Act if made, should also clarify that inclusion of a new fertilizer in any schedule does not remove the requirement for obtaining a license from the patent holder.

It was recommended that India needs to innovate new fertilizer materials and develop into a fertilizer research hub. At present, there is no research institute, or any other organisation in India devoted to fertilizer technologies and new fertilizer development. R&D centres at Universities and research institutes have to be set up for the purpose of developing new fertilizer materials. It was concluded that India must strive to develop into a fertilizer technology export base in design of new products including their components and intermediates, besides in engineering and design of fertilizer plants.

The Academy published Strategy Paper 13: *Development and Adoption of Novel Fertilizer Materials* based on the deliberations in the workshop.

#### Experts Meet on Uniform Policy for Fish Disease Diagnosis and Quarantine

NAAS Experts Meet on "Uniform Policy for Fish Disease Diagnosis and Quarantine" was held on 29<sup>th</sup> January, 2019 in order to strengthen disease management in aquaculture. The Expert Meet was chaired by Prof Panjab Singh, President, NAAS and convened by Dr P.K. Sahoo, Principal Scientist, ICAR-CIFA, Bhubaneswar. The workshop included experts from ICAR Institutes under Fisheries and Animal Sciences Divisions, besides eminent scientists from SAUs, State Universities, State Governments, Officials of DAHD&F and Executive Council members of NAAS.



Experts Meet on Uniform Policy for Fish Disease Diagnosis and Quarantine, in progress

In his opening remarks, Prof Panjab Singh outlined the need to debate upon all the important issues, knowledge gap, legal and operational aspects that concern fish disease diagnosis and quarantine in the country, and stressed upon in bringing out a National Policy document based on the deliberations.

Dr P.K. Sahoo, Convener presented the overall scenario of fish disease diagnosis in freshwater aquaculture and flagged off issues related to poor commercialization of

diagnostics already developed in the research institutes, lack of field level diagnostics, poor preparedness to handle emerging or re-emerging pathogens, involvement of private sectors in diagnostics development, lack of sufficient laboratories to cater the needs of the states, poor HRD with respect to diagnostic pathologists at state level, difficulties in identifying primary and secondary pathogens, confusing level I diagnosis and sero-diagnosis, zoonotic pathogens, regulatory mechanisms in setting up and functioning of diagnostic laboratories, uniformity in case coding, besides legal, regulatory and institutional issues with regards to quarantine. Dr K.V. Rajendran, Head, ICAR-CIFE, Mumbai made a detailed presentation on the status of shrimp disease diagnosis in the country and the gaps, constraints and way-forward. It was followed by a presentation on quarantine system practiced in India and the issues there on by Dr Neeraj Sood, ICAR-NBFGR, Lucknow. Dr R.K. Singh, Director, ICAR-IVRI, Izatnagar underlined the importance of diagnosis in disease eradication programme, parallel screening with more than one diagnosis methods for unequivocal diagnosis, looking for OIE twinning laboratories in fisheries, creation of CDDL–like facilities and portable diagnostic laboratories. Dr J. K. Jena highlighted the production from fisheries and aquaculture sector, the current trends in export and import of aquaculture products, the on-going National Surveillance Programme vis-à-vis the extent of loss due to fish diseases and some drawbacks in the quarantine system being practiced in the country. Mr I. A. Siddiqui, Asst. Commissioner, Fisheries, Department of Animal Husbandry, Dairy and Fisheries (DAHD&F) stressed upon the initiatives taken by the Government and use of NADRES system in disease reporting.

The major recommendations emerged from the presentations followed by group discussions and plenary session included:

- Accreditation of laboratories involved in disease diagnosis in public and private sectors.
- Formation of a statutory body for accreditation under the Department of Fisheries.
- Registration of existing diagnosis laboratories in all shrimp hatcheries and entered into ring testing mechanism.
- Establishment of One Central Diagnosis laboratory in CDDL pattern with 6 Regional Laboratories (8-10 manpower) under central funding, linking of such to each state level key laboratory (either at SAUs or at SFDs) and district laboratories.
- Institutionalization of National Surveillance Programme with technical backstopping from ICAR institutes.
- Strengthening of aquatic animal disease diagnosis and reporting to meet the national and international requirement of aquatic animal farming, trade, effective quarantine and trans boundary movement of aquatic animals.
- Development of regulatory framework to ensure the quality standards and sustained functioning of laboratories (state level, central level).
- Participation of industry/stakeholders in commercialization of diagnostics developed through R&D.

- Promotion of quarantine systems under PPP mode based on region, commodity or ecosystem.
- Feed additives following internationally recognised protocols for sampling and testing for trade.
- Mechanism for regulating movement of live aquatic animals within the country.

It was further recommended that the policy guidelines may be finalized as early as possible to develop a National Policy.

#### XIV Agricultural Science Congress – Innovations for Agricultural Transformation



The XIV Agricultural Science Congress of the NAAS was organized in collaboration with ICAR-IARI during 20-23 February, 2019 in the newly commissioned Bharat Ratna Dr C. Subramaniam Conference Hall, NASC Complex, New Delhi. The Congress was inaugurated by Hon'ble Union Minister of Agriculture and Farmers' Welfare, Shri Radha Mohan Singh Ji. The NAAS Awards were given to the respective recipients in the

Inaugural session by the Chief Guest. Dr AB Joshi Memorial Lecture Award was given to Dr R.A. Mashelkar, Former, Secretary, Department of Science and Dr B.P. Pal Memorial Award was given to Prof. R.B. Singh.

A total of 1768 participants were registered. There were 5 Plenary Talks and special lectures by eminent scientists. There were several entries for the poster session. Besides the regular technical sessions there was a Students Elocution Contest. Congress The Congress underpinned that Innovation is the process by which inventions are produced–it may involve new ideas, new technologies, or novel applications of existing technologies, new processes or institutions, or more generally, new ways of doing things in a place or by people where they have not been used before. Innovation, thus, has to



be viewed in a broader context–multidisciplinary and multi-stakeholder system geared to enhance productivity, income of the farmers, inclusiveness, livelihood security, input-use efficiency, climate resilience and ecological/environmental sustainability. Thus, agricultural innovation is a *sine qua non* for meeting the Sustainable Development Goals (SDGs), Agenda 2030.

This Congress provided an intellectually rich multi-stakeholder platform for discussing and critically analyzed veritable disruptive innovations for transforming agriculture and food systems to reshape India. It showcased agriculture not only as the main source of employment and livelihood security for nearly 50 per cent of India's population, bulging to be the largest in the world by 2025, but also as a business opportunity, service provider, industry, and ecosystem protector. Reflecting on the journey from the green revolution to the gene revolution, the Congress emphasized the need for innovations to drive congruent acceleration of productivity, profitability, sustainability, equity and inclusivity. Besides leaps in genetic enhancement, innovations in precision agriculture, natural resource management, climate smart agriculture, mechanization, micro-irrigation (per drop more crop), ICT, digital technology, farmer-market linkage, value chain and post-harvest management, renewable energy, price realization, and, of course, farmers' net income were deliberated in detail in its 5 Plenary Lectures, 32 in 10 theme areas sessions, and 4 Panel Discussions as listed below. A special Farmers' Session, one Student' Elocution Context and several enthusiastic and huge Poster Sessions enriched the contextuality of the Congress.

Along with innovative technologies, the Congress examined the uncommon synergistic transformative policies, strategies, institutions, partnerships, processes, products, investments, business models, trade, group dynamics (FPOs, cooperatives), and human resources development. Further, in this fast changing globalized world, and keeping in mind the increasing appreciation of Local-Global interdependence, increasing volatilities of climate change, achieving the SDGs by 2030, the Zero Hunger Challenge and the Paris Declaration, the Congress examined the scope of international partnership toward enriching the evergreen revolution for evergreen economy.



At the Inaugural Session the Hon'ble Minister of Agriculture Shri Radha Mohan Singh highlighted the excellent progress made in agricultural production, the various new initiatives of the Government and its special attention to the farming communities and agricultural development. He congratulated the scientific community and other stakeholders for their roles in transforming Indian agriculture. The Hon'ble Minister of State, Agriculture and Farmers Welfare, Shri Gajendra Singh Sekhawat, advised that innovations should be demand-driven and should be at the centre of the agricultural transformation.

In his Presidential Address, Prof Panjab Singh highlighted that knowledge, information and technologies are growing

at a very rapid speed that may be both, knowledge and cost intensive thus could remain out of reach of several developing countries. We need to develop mechanism whereby the exchange of knowledge, information, technologies and materials could be facilitated at the international level. A regulatory framework harmonized to create a win-win environment for all the cooperating countries needs to be put in place. He hoped that the scientists from different countries will deliberate on the issues of cooperation in S&T to achieve a sustainable agriculture and achieve the dream to see a world free of hunger (as actually happened). He stressed, it is extremely important to invest in agricultural research and education to promote and nurture excellence,



multi-disciplinary, system based knowledge intensive and problem-solving approach. This is most needed to provide food, nutrition and environmental security to entire population (sufficient, safe and nutritious food with low ecological foot print), feed and fodder security to our huge livestock population and on top of all livelihood security to small and marginal farmers and entire farming community.



Dr. Trilochan Mohapatra, Secretary DARE and DG, ICAR in his Plenary Lecture on "Indian Agriculture: Needs and Pathways for Food Security and Prosperity" revealed that the Government of India and ICAR are proposing several innovative technologies and policy pushups to ensure that India remains self sustained as far as food production is concerned. Convergence of agriculture, digital and engineering technologies with modern biotechnological tools would revolutionize the Indian agriculture in coming years. However, we need to enhance investment in agriculture for sustainable increase in production and productivity with enhanced inputs and resource use efficiency.

He concluded that India's population would touch 1.7 billion by 2050 and ensuring food and nutritional security for such a large population would be a great challenge. Use of technology and innovation in Indian agriculture would only be the way out. All out efforts have to be a made on generation, transfer and adoption of technologies during coming two decades. ICAR's vision for the future is to encourage "SMART FARMS" with greater technological support to reduce post-harvest losses, strengthen value chain and provide markets to increase farmer's income. Agriculture in India, being the source of livelihood of almost two thirds of the working population and vast contribution in India's economic growth in recent years, which is no less significant than that of industry and services (16% of total GDP and 10% of total exports). He exalted that we need to regularly innovate, invest and support to strengthen agricultural research and development in the country.

Dr Lee Hickey in his Plenary Lecture "Speed Breeding: A Powerful Tool to Accelerate Crop Research and Breeding" highlighted that Speed breeding protocols that shorten plant generation times can hasten breeding and research to help fulfill the everincreasing demands. Global agri-food systems rely on a relatively small number of plant species; however, there are calls to widen the scope of globally important crops to include orphan crops, which are currently grown and used by the world's poorest people or marketed as niche products for affluent consumers. Orphan crops can supply global diets with key nutrients, support economic development in the world's poorest region, and bolster the resilience of the global agri-food sector to biotic and abiotic stresses. Little research efforts has been invested in orphan crops, with farmers growing landraces that are sourced and traded through poorly structured market systems. Efforts are underway to develop breeding resources and techniques to improve orphan crops. Here, we highlighted the current efforts and opportunities to speed breed orphan crops and discuss alternative approaches to deploy speed breeding in less-resourced regions of the world. Speed breeding is a tool that, when used together with other multidisciplinary R&D approaches, can contribute to the rapid creation of new crop varieties, agricultural practices and products, supporting the production and utilization of orphan crops at a commercial scale.



Prof R.B. Singh, Former President, NAAS, in his Plenary Lecture "Nutrition-Sensitive – New India, highlighted India's enigma of carrying the triple load of Malnutrition perpetuating the double burden of human diseases as India is home to 21% of world's poor, 15% of world's undernourished children and over 50% of world's wasted children. Referring to the Hon'ble Prime Minister's pledge to build a New India by 2022, we scientists and other stakeholders must congrue to render India Zero Hunger as the highest national priority. He alluded to the elusive Pot of Gold at the end of the 'Rainbow', meaning thereby that we have to keep striving to achieve eternal justice, comprehensive, nutritional security, prosperity and peace.

He concluded that as Agriculture employees more than 50% of the people (nearly 700 m), accounts for 14% of GDP, and is almost three times more effective in alleviating hunger, poverty, and under nutrition, the sector (agriculture) matters the most in India. Thus, besides enhanced production, Agriculture and Food System (AFS) should emphasize ecological efficiency, More from Less for More (MLM), Save and Grow, environmental health, nutritional adequacy, inclusiveness, sustainability, and remunerative income (Doubling farmers income by 2022). Inter-disciplinary and integrative approaches, adequate investment, vibrant STI, trained human resources, responsive and effective implementation are a must to reach the unreached to help build a Zero Hunger New India.

Prof Raghunath Mashelkar in his Dr A.B. Joshi Memorial Lecture "Leveraging Agritech Startups in Indian Agriculture Innovation Ecosystem" highlighted that in India, we have daunting challenges in our agriculture system. They range from the need for substantial enhancement of our productivity to dealing with over dependency on monsoons, to managing dry land farming as also the small and fragmented land holdings to rapid elimination of poverty and malnourishment. Climate change poses some daunting challenges too. To deal with all these, India needs to take recourse to not only innovation but 'disruptive game changing innovation'.



He suggested that in building the new National Agricultural Innovation System, one of important measures is to fully develop and use 'collective intelligence' that involves several stake holders. Amongst this should be innovative youth, but not at the periphery but at the core. Recalling the various initiatives of the government, namely, Make-in-India, Skill India, Start-up-India, e-NAM, etc, he reiterated that for achieving assured success in innovation would come from an ASSURED Innovation matrix: with A (Affordable); S (Scalable); S (Sustainable); U (Universal); R (Rapid); E (Excellent) and D (Distinctive).

He concluded that Young Indian Agritech Startups are emerging, but somewhat slowly. If the current Agriculture Innovation Ecosystem can leverage the Agritech Startups by bringing them from periphery to the core then not only we provide an opportunity for the youth to contribute to the greatest public good, namely agriculture, but we can also accelerate the disruptive innovation led agriculture based inclusive growth, which can be achieved within a decade.

Prof Ramesh Chand, Member, NITI Aayog in his Plenary Lecture on "Policy Options, Actions, and Implementation to Achieve Accelerated Inclusive Growth" observed that most policies are not always win-win options for everyone. The trade-offs among the various options should be critically analyzed before implementing given policies. Likewise, inclusiveness should not only mean reduction in disparity but also equitable sharing of the benefit arising from the intended growth. Spatial, temporal, inter-generational and gender considerations should be kept in mind while pursing inclusiveness with equity. While policies should support to wipe-off the disparities as much as possible through providing effective social protection floors, investments in development and capital formation should always remain a high priority to ensure planned growth.





Prof John Dixon, Ex-Principal Advisor Research, Australian Centre for International Agricultural Research (ACIAR) in his Plenary Lecture "Climate Smart Agriculture and Averting Risks to the Food Chain" alluded to the various asymmetries in top 10 development successes viz. successes in farm intensification, but at great cost to natural resources; national food (calorie) security achieved, but with growing malnutrition; value chains/market access strengthened, but poor farm gate prices; public/ private agricultural services enhanced, but social capital weakened; focus on averages and aggregates, rather than spatial and temporal variability; limited coordination across climate, agriculture and economic growth; limited consideration of risk and management at all levels; limited targeting and tailoring to specific farming systems requirements; limited trans-

disciplinary systems approaches, including integrated GxMxE/P, production/value chains, and weak capacity for systems R&D methods.

While strongly advocating removal of the asymmetries, he underpinned that policy makers and science leaders need to be aware of the tight nexus between climate, agriculture and economic growth. The challenge of maintaining food security while reducing green house gas emissions was a central challenge. But the most important challenge for farmers in low income countries has been adapting to the increased variability and frequency of extreme events which are occurring. Considerable investment in Climate Smart Agriculture (CSA) has created frameworks at the international and regional (e.g., South Asia) levels. Fortunately, there are a sub-set of CSA practices which foster mitigation while building resilience and adaptive capacity of farmers, i.e., a win-win way forward. Effective CSA implementation requires appropriate technologies, social capital, institutions and enabling policies. Because of the diversity of farming systems and seasons, big data and modelling will contribute to progress with CSA technologies. Policy makers need good targeting approaches such as the FAO/ World Bank farming systems framework to optimise investments.

#### **Theme Presentations**

Some of the theme presentations gave insight to remove certain myths and misgivings. For instance, on the basis of the data of the period 1950 to 2017 on area, production and productivity in 127 million hectares grown to rice, wheat, maize, pearl millet and sorghum making up for about 85% of the area and 90% of the food grain production, it was evident that the Green Revolution of 1967-1984 in wheat and rice under irrigated ecosystem has actually continued in its next phase, in other major cereals including rice and wheat over both irrigated and rainfed ecosystems across all regions of the country, contrary to the general notion that the Green Revolution of first phase has fatigued and did not reach other crops or regions in the country. In fact, we are having an Evergreen Revolution, which must be sustained.

It was therefore recommended that in order to tackle the negative impact of climate change and other stresses in view of nutritional and food security needs of the expected population of the country targeting SDGs there has to be a substantial increase in the investment in agriculture as it has been also proved that every Rupee invested in agriculture returns the maximum benefits among all the sectors in the country.

At the end of the Congress, the Valedictory Function was held on 23rd February, 2019 in which Prof R. B. Singh, Chairman, Scientific Programme Committee presented the main recommendations of the Congress. This Valedictory Function was presided over by Prof K. VijayRaghavan, Principal Scientific Adviser to Government of India, who stressed the importance of science and scientists in solving societal problems and hoped that the deliberations of the



Dr. K. VijayRaghavan during valedictory session

Congress would enable and empower the nation in dealing with impacts of climate change and scientific research in agriculture. The recommendations that emerged from the different technical sessions are outlined below.

The major recommendations emerging out of the Congress included:

- Adoption and promotion of inter-disciplinary, interactive research based on agroecologically and socio-economically differentiated, disaggregated approaches to enable sustainable, equitable, nutrition sensitive and climate smart agriculture.
- Strive to enhance farmer's income through effective farmer-market linkage along the value chain, thereby ensuring quality and minimizing wastage, and realization of remunerative price.
- To enable science to serve the society, appropriate regulatory policies should be in place so as, (a) to ensure development and transfer of need based technologies and to promote public-private co-operation and (b) to bring congruence between science social responsibility and corporate social responsibility.
- To transform agricultural education system for developing necessary human capital with entrepreneurship, employability and leadership qualities in meeting the SDGs-2030 and to contextualize and provide academic legitimacy to various national initiatives to build a zero hunger and prosperous India as well as world.
- To create and implement effective implementation pathways to measure and manage the expected outcomes and impact with due accountability and responsibility of the stake holders.

## **REGIONAL CHAPTERS**

| Chapter                                  | Event   | Date & Venue  |
|--|---|---|
| Bengaluru                                | Interaction program for the<br>benefit of farmers of two districts<br>of Karnataka on the topic <i>Crops</i><br><i>and Millets for Intermittent Rains</i><br><i>and Drought</i>   | 26 <sup>th</sup> October, 2018  |
|  | Workshop on Awareness and<br>popularization of popular varieties<br>of Paustic rice varieties as a natural<br>source for protein and micro-<br>nutrients  | 16th February, 2019   |
| Bihar, Assam<br>and entire<br>North East | The NAAS-Regional Chapter<br>Meet (Bihar, Assam and entire<br>North East)   | 10 <sup>th</sup> July 2018 at ICAR-NRC<br>on Mithun, Medziphema,<br>Nagaland<br>11 <sup>th</sup> July 2018 at ICAR RC for<br>NEH Region, Barapani |
| Cuttack                                  | Workshop on <i>Climate change</i> ,<br>biodiversity and conservation<br>agriculture in relation to rice was<br>organized in collaboration with<br>ICAR-NRRI, Cuttack  | 24 <sup>th</sup> August 2018 at ICAR-NRRI,<br>Cuttack   |
|  | Brainstorming Session on<br>Possibilities and potentialities of<br>converting rice-fallow to rice-pulse<br>system in Eastern India  |   |
| Hyderabad                                | Krishi Kala Utsav   | 27 <sup>th</sup> Oct, to 2 <sup>nd</sup> Nov, 2018 at ICAR-NAARM, Hyderabad   |
| Karnal                                   | Invited Lecture on Economic<br>Viability in Indian Agriculture:<br>Challenges and Perspectives by<br>Dr P.S. Birthal, ICAR-National<br>Professor, ICAR-NIAP, New<br>Delhi   | 19 <sup>th</sup> Sept 2018 at NDRI, Karnal  |
| Kolkata                                  | World Soil Day in collaboration<br>with Bidhan Chandra Krishi<br>Viswavidyalaya, Dhaanya Ganga<br>Krishi Vigyan Kendra and<br>Ramakrishna Mission Asharam<br>with slogan <i>Cholo Jai Mati Ko</i><br><i>Bachai – let us join to save soil</i> | 5 <sup>th</sup> December 2018 at Sargachi,<br>Murshidabad   |

| Lucknow  | Interactive cum special Lecture on<br>Science led Food Production to Feed<br>Future India with Nutrition by Dr<br>A.K. Srivastava, Member, ASRB,<br>New Delhi                                 | 1 <sup>st</sup> March, 2019 at ICAR-IISR,<br>Lucknow     |
|----------|---|--|
| Ludhiana | Brainstorming Workshop on Crop<br>Residue Management  | 6 <sup>th</sup> Sept 2018 at PAU, Ludhiana               |
|          | Lecture on <i>Sustainability Concern</i><br><i>in Indian Agriculture: Needs Science-</i><br><i>led Innovation,</i> by Dr P.K. Ghosh,<br>National Coordinator, NAHEP<br>(ICAR)                 | 30 <sup>th</sup> October 2018 at PAU,<br>Ludhiana        |
| Mumbai   | A lecture on Food Security,<br>Intensive Food Production Systems<br>and Ecological Footprints by Dr<br>Mohan Joseph Modayil, Former<br>Chairman/Member, ASRB                                  | 29 <sup>th</sup> March, 2019 at ICAR-CIFE,<br>Mumbai     |
| Patna    | National Seminar on <i>Challenges</i><br>and Opportunities for Farmers'<br>Prosperity in Hill Agriculture jointly<br>organized by NAAS, ICAR-RC<br>for NEH, Umiam, CIMMYT, and<br>IAHF, Umiam | 29-30 November 2018 at ICAR-<br>RC for NEH Region, Umiam |
| Varanasi | Special Lecture on Feeding 1.37<br>billion with Nutritional Security:<br>Bigger Challenge by Dr. A.K.<br>Srivastava   | 29 January, 2019 at ICAR-IIVR,<br>Varanasi               |

#### **Bengaluru** Chapter

One day interaction program was organised on 26<sup>th</sup> October, 2018 for the benefit of farmers of two districts of Karnataka on the topic "*Crops and Millets for Intermittent Rains and Drought*".

One day workshop was organised on 16<sup>th</sup> February, 2019 on "Awareness and Popularization of Popular Varieties of Paushtic Rice as a Natural Source for Protein and Micro-nutrients" for the benefit to men and women farmers. The importance of cultivation and cooking aspects were also deliberated upon.

#### Bihar, Assam and entire North East Chapter

The NAAS-Regional Chapter Meet (Bihar, Assam and entire North East), jointly organized by NAAS, New Delhi; ICAR-NRC on Mithun, Medziphema, Nagaland; ICAR Research Complex for NEH Region, Umiam and ICAR-RCER, Patna, was held at

ICAR-NRC on Mithun, Medziphema, Nagaland on 10th July, 2018 and at ICAR Research Complex for NEH Region, Barapani on 11th July, 2018. The brief of the meetings held at ICAR-NRC on Mithun, Nagaland and ICAR Research Complex for NEH Region, Barapani is as under:

#### ICAR-NRC on Mithun, Nagaland

The meeting at ICAR-NRC on Mithun, Nagaland was Chaired by Dr Ashok Kumar, ADG (Animal Health), ICAR, New Delhi. Dr B.P. Bhatt, Director, ICAR-RCER, Patna; Dr A. Pattanayak, Director, ICAR-VPKAS, Almora; Dr Avijit Mitra, Director, ICAR-NRC on Mithun; Prof Sapu Chankija, Professor, SASARD, Nagaland; and Dr D.J. Rajkhowa, Joint Director, ICAR Research Complex for NEH Region, Nagaland Centre were present. More than 30 participants including Scientists from ICAR-NRC on Mithun, ICAR Research Complex for NEH Region, Professor, Sagaland Centre and the faculty from Nagaland University also participated in the meeting.

Dr Avijit Mitra, Director, ICAR-NRC on Mithun in his welcome address thanked the NAAS Regional Chapter for holding its first ever meeting to discuss the issues of agricultural development of NEH in general and Nagaland in



particular. He pointed out that both agriculture and animal husbandry in Nagaland are highly location specific and need location specific attention and solution. Scientific methods of animal rearing including proper breed, health care and feed need to be popularized in all the North Eastern states.

Dr A. Pattanayak presented in brief the agenda of the regional chapter and brief objective of the regional meetings. He also briefed about NAAS and the various awards, Fellowships and Associateships given by it to encourage quality science and education in the country.

Prof Sapu Chankija, Professor, SASARD, Nagaland presented a brief about the overall biodiversity of NE Hills with special reference to Nagaland. He said that NE Hills is the only region where snow clad mountains have both north and south aspects (Himalayas) and east and west aspects (Patkai range). Thus, even in snow clad mountains there are broad leaved species in Patkai range. He also said that out of 7000 species endemic to India, about 3000 are endemic to NE region. Talking about shifting cultivation, Dr Chankija said that although shifting cultivation is environmentally unsafe, it presents a good source of germplasm to exploit crop complementarities. Shifting cultivation is also a good source of plant growth promoting microorganisms. In his opinion the minor fruits and vegetables, medicinal plants and traditional foods need more scientific

insight not only for academic purpose but also for adding economic value to them. This will encourage their commercial cultivation and thereby saving them from extinction.

Dr D.J. Rajkhowa, Joint Director, ICAR Research Complex for NEH Region, Nagaland Centre presented a brief overview of the various farming systems of Nagaland and suggested that animal-based systems are the most profitable. Dr Rajkhowa said as there are lessons to be learnt from the water harvesting in Jabo and Apatani systems, there is an immense research need to make the rainwater harvesting and its utilization more efficient. Similarly, more scientific research is needed to address the problem of soil acidity, especially the sub-surface acidity.

Dr Ashok Kumar made a presentation on transboundary diseases. He informed that India has been identified as a 'Hot spot' for high impact emerging and re-emerging infectious diseases due to a number of risk factors like large human and livestock population and rapidly expanding farming system. The disease management programmes like FMD Control programme has successfully resulted in drop in the occurrence (92%) of the disease during last 13 years. He further emphasized on research for developing fast and efficient diagnostic and prophylactic tools along with strengthening management systems comprising capacity building, skill development, policies, legal framework and operational strategies as well as strengthening cross boundary cooperation for containment for combating this menace.

Convener of the Chapter, Dr B.P. Bhatt, in his address highlighted the researchable issues in agriculture for the North Eastern Region which need to be addressed and suggested to take up some studies.

#### ICAR Research Complex for NEH Region, Barapani

The meeting was chaired by Dr Anil K. Singh, Secretary, NAAS. Dr Ashok Kumar, ADG (Animal Health), ICAR, New Delhi; Dr B.P. Bhatt, Director, ICAR-RCER, Patna; Dr A. Pattanayak, Director, ICAR-VPKAS, Almora; Dr N. Prakash, Director, ICAR Research Complex for NEH Region, Barapani; Dr A.K. Tripathy, Director, ICAR-ATARI, Guwahati; Dr B.C. Deka, Director, ICAR-ATARI, Shillong; and Dr.



S. Bandopadhyay, ICAR-IVRI Regional Station, Kolkata also participated in the meeting. More than 100 participants from ICAR Research Complex for NEH Region, Barapani and faculty and students from CAU, Manipur participated.

At the outset, Dr N. Prakash welcomed all the dignitaries and briefed them about the physiographic and overall agrarian scenario of the North Eastern hills.

Dr Arnab Sen, Head (Animal Health), ICAR Research Complex for NEH Region, Barapani made a presentation on "A profile of vulnerability of the North East in context of exotic and emerging livestock diseases of moderate to severe threat potential". He enlisted some of the newly reported animal diseases in NEH region like PRRS of Pig (introduced from Myanmar), occurrence of Bovine Viral Diarrhoea in Pig, Leptospirosis in Bovine, Swine FMD, Chandipura Encephalitis etc. The strategies suggested by him included establishment of state of art diagnostic laboratory and early warning system and development of desired human resources. Dr A. Pattanayak made a presentation on "Crop genetic resources of North East India: Approaches for a better insight". He enlisted the availability of wide diversity of different crops in the region including cold tolerant, Aluminum tolerant, drought tolerant germplasm of rice, water logging tolerant germplasm of maize, different vegetables, spices and underutilized fruits. Further, he highlighted the need for increasing the utilization rate of the unique germplasm, which is very low at present viz., 80 out of 7000 germplasm in rice, 16 out of 3000 germplasm in maize, 4 out of 700 germplasm in rice bean. For this, there is a need to have a relook at characterization methods with special emphasis on characterization for mixed cropping, site of diversity and spatial characterization and change in diversity. He emphasized on the sustainable goals for the crop genetic resource management in NEH region that include, greater investment to ensure mainstreaming of biodiversity conservation, regular census and monitoring of biodiversity to assess risk, regulate access and impose benefit sharing for the utilization of genetic resources of the region.

Dr G. Kadrivel, Principal Scientist (Animal Reproduction), ICAR-RC, NEH Region made a presentation on "Indigenous animal biodiversity and conservation strategies in the North Eastern region of India". He enlisted the indigenous breeds of animals like pigs, cattle, buffalo, sheep, goat, poultry and other species like pony, horse, mithun and yak and emphasized on the need to conserve the indigenous breeds for their economic potential, climate resilient traits, scientific use and cultural interest. He highlighted a need for precise and reliable estimation of different important economic traits of indigenous breeds, their documentation and registration and ex-situ and onfarm conservation. Dr S. Bandopadhyaya briefed about 'Epidemiological studies and economic impact of Gastro Intestinal Parasitic infestation in livestock' and indicated a gradual decline in the rainfall pattern and increase in the temperature in Meghalaya, which might offer a possibility of decrease in the incidence of Gastro Intestinal Parasitic infestation in livestock in future.

By adoption of proper disease control strategy like 3 times use of anthelmintic drug during pre monsoon, monsoon and post monsoon, an approximate loss of Rupees 30 million can be avoided in Meghalaya alone.

Dr Anil K. Singh, Secretary, NAAS, outlined the role and different activities of Regional Chapters and emphasized on two particular activities, where the Regional Chapters can play a very important role. The first is to interact with state departments and provide technical and scientific inputs in implementation of various schemes and programmes and secondly in mentoring young professionals. He also briefed about the different events being organized by NAAS viz. Biennial Agricultural Science Congresses and International Agricultural Science events and informed the audience about the forthcoming Agricultural Science Congress to be held in New Delhi in February, 2019. He suggested that NAAS can partner in agriculture development through actualizing Government schemes viz. RKVY, PMKSY, PMFBY, SHM, Soil Health Card, Paramparagat Krishi Vikas Yojana, MIDH, DD Kisan etc. Based on the deliberations of the delegates at Nagaland and Barapani, following salient recommendations were made to initiate studies on:

- Survey and documentation of area under shifting agriculture for North East
- Biomass consumption vs crop productivity and sustainability of shifting agriculture
- Leaching losses in shifting vs settled cultivation
- Indigenous knowledge of soil and water conservation, particularly in jhum fields
- Ecosystem services: Protocol development for North East
- Carbon credit in different farming systems
- Rehabilitation of degraded lands through agro forestry interventions
- Protocol development for organic agriculture
- Accreditation/certification of mother blocks, particularly in fruit crops
- Large scale demonstration of scientific rice-fish cultivation
- Low input sustainable livestock production system
- Development and popularization of integrated farming system models in the region to achieve the target of doubling farmers' income,
- The available biodiversity of the North Eastern Hills can be important source for specific traits
- Need to develop and promote scientific cultivation of medicinal and aromatic plant diversity to prevent soil erosion in the region,
- Identify genes in different crops for tolerance against soil acidity
- Promote organic farming by identifying specific blocks in the region, where the prevailing practices are purely organic in nature and do not include application of external inputs
- Detailed study of indigenous farming systems through a comprehensive documentation of their historical background as well as the features, which distinguish them from other farming systems

#### **Cuttack Chapter**

A one day workshop on "Climate change, biodiversity and conservation agriculture in relation to rice" was organized by National Academy of Agricultural Sciences (NAAS), Bhubaneswar-Cuttack Chapter in collaboration with ICAR-National Rice Research Institute (NRRI), Cuttack on 24th August 2018. Distinguished NAAS-Fellows and renowned scientists and officials were present in the workshop.

Dr T.K. Adhya delivered lecture on "Climate Change and Microbial Diversity". The Social worker and Regional Director, WPSI, Sundarban, WB, Mr Anil Mistry delivered his talk on "Conservation of forest biodiversity in Sundarban: challenges and opportunities". Dr P.K. Sahoo, a distinguished fellow of the academy enlightened the gathering on the theme "Climate Change, Fish Diseases and



Fish Diversity Threats". Dr Himanshu Pathak, distinguished Fellow of the academy and convener of this chapter, delivered a lecture on "Climate change and rice". Dr S.K. Pradhan sensitized the audience about varietal development on climate change scenario and future challenges.

The NAAS, BBSR-Cuttack chapter also organized a brain storming session on "Possibilities and potentialities of converting rice-fallow to rice-pulse system in Eastern India". The discussion initiated by Dr B.B. Panda (Pr. Sc., Agronomy), working in cropping system approach. There were thoughtful and well interacted sessions and few important points emerged from the discussion, which are listed as:

- i) An urgent need to zonation of area suitable for rice-fallow, based on water availability, resource availability, climate change vulnerability in Eastern India.
- ii) Improved and less water required pulse varieties may be considered to the potent rice-pulse areas.
- iii) Ecology wise varietal selection and water harvesting/ management strategy is the key to convert potential rice-fallow areas to rice-pulse cropping sequence.
- iv) The proportion of area of rice-fallow (potential) which would be proposed for rice-pulse must consider local market demand and procurement transparency. Suitable MSP for specific pulses may be introduced depending on region specific condition for boosting the conversion from potential rice-fallow to rice -pulse in Eastern India.

#### Hyderabad Chapter

A "Krishi Kala Utsav" was organized by NAAS-Hyderabad Chapter in association with ICAR-NAARM during October 27, 2018 to November, 2, 2018 at ICAR-NAARM, Hyderabad.

There are different ways of communication in extension science. Art work is one of the most captivating ways to communicate and capture the imagination of the viewer. Art works are particularly attractive to young minds. The pictures convey and deliver the content to the mind faster and better than through lectures or other forms of communication.



In order to create works of art to capture successful journey of Indian agriculture and integrated farming systems which can be showcased to various trainees at NAARM, a residential art workshop (Krishi Kala Workshop) was organized during Oct 27 – Nov 02, 2018 by ICAR- NAARM in association with NAAS-Hyderabad Chapter. For this, a team of 23 artists of Sir J.J. School of Arts accompanied

by faculty, Prof Ananth Nikam and Smt Shilpa Nikam & Shri Deepak Khogre, ACTO (Artist), ICAR-CIFE, Mumbai were invited to stay and create customized works of art paintings. Fifty two paintings have been generated through this workshop. This exercise is a sequel of the same experiment which was organized and immensely appreciated during 2017 at NAARM.

Dr Ch. Srinivasa Rao, Director, ICAR-NAARM, Hyderabad and Convener, Hyderabad Chapter inaugurated the Utsav on 27 October, 2018 at NAARM Campus and presented the success of agriculture and allied sectors in India towards food secured nation. Dr B.S. Sontakki, HoD, Extension Division & Director I/c NAARM, Hyderabad presided over the valediction on 2nd November, 2018.



Dr M. Krishnan, HoD, ESM Division, Dr S. Senthil Vinayagam, Principal Scientist and Shri P. Namdev, Artist, ICAR-NAARM were the program directors.

#### **Karnal Chapter**

Haryana Regional Chapter of NAAS at Karnal organized an invited lecture by Dr P.S. Birthal, ICAR-National Professor, ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi on 19th September 2018 at NDRI campus, Karnal on "Economic Viability in Indian Agriculture: Challenges and Perspectives". The session was attended by more than 100 participants including Directors of ICAR Institutes, NAAS Fellows and Associates, Scientists, Research Associates, Research Fellows and Students. Dr A.K. Mohanty, Principal Scientist, NDRI and Treasurer, Haryana Regional Chapter welcomed the delegates. Dr M.L. Madan, Convener of NAAS Haryana Regional Chapter, in his brief remarks highlighted the importance of economics in Agriculture. Dr Birthal delineated various factors like declining size of landholdings, rising cost of production, increasing frequency of extreme climatic events and poor prospects of employment outside agriculture responsible for farmers' distress, despite the fact that agriculture supports more than half of the population in India. He welcomed the move to double farmers' income and stress given to agriculture by Government of India in its two consecutive budgets of 2016-17 and 2017-18 in the wake of growing agrarian distress, which may disturb socio-political equilibrium and nation's food security. Prof Birthal also covered the economic viability in terms of output of land, labour, efficient use of resources and cost benefits for farm/farmers, besides policy choices and different ways to enhance the farmers income and profitability. Dr M.L. Madan, Convener of NAAS, Haryana Regional Chapter, Karnal in his concluding remarks discussed about the micro and macro agricultural economy and explained that viability of farm operations will be maintained by a harmonious connection between consumer and producer. He stressed on the utilization of natural and other resources in a balanced way to achieve the target of economic upliftment of the farming community. Dr A.K. Mohanty, Treasurer and local Secretary extended a vote of thanks to the chair and participants.

#### Kolkata Chapter

Like previous years, the World Soil Day was celebrated by the Kolkata Chapter of the National Academy of Agricultural Sciences in collaboration with Bidhan Chandra Krishi Viswavidyalaya, Dhaanya Ganga Krishi Vigyan Kendra and Ramakrishna Mission Asharam at Sargachi, Murshidabad on December 5, 2018. The slogan was "Cholo Jai Mati Ko Bachai – let us join to save soil". The day long celebration was started



with a 'Prabhat Pheri' with participation of about 500 farmers from the adjoining villages of the Asharam. During the procession, colorful placards, posters, slogans were displayed to sensitize farmers about the importance of healthy soil and moral of celebrating the World Soil Day. After the Prabhat Pheri, participants were assembled in an auditorium for an interaction session with experts from agricultural university and line Departments of State Government. A poster session was also arranged for the occasion where 25 Ph.D. students from the Department of Agricultural Chemistry and Soil Science of Bidhan Chandra Krishi Viswavidyalaya displayed 25 posters on the theme of soil and its sustainable management. About 300 school students from adjoining seven schools were also participated in drawing (for students up to class eight standard) and essay writing (for class nine to twelve standard) competitions on the theme of the celebration and the best performers from each school and event were awarded with prizes. A number of distinguished personalities viz., Swami Vishwamayananda, Secretary, Ramakrishna Mission Ashrama, Sargachi, Mosaraf Hussain, Sabhadhipati, Zilla Parishad, Murshidabad District, Prof Ashim Sinha, former Vice-Chancellor, Uttar Banga Krishi Viswavidyalaya, Cooch behar, Prof Srikanta Das, Dean, Faculty of Agriculture, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur and many others

including Professor Biswapati Mandal, Convener, NAAS, Kolkata Chapter graced the celebration. All India Radio, Murshidabad district aired the whole programme for the benefit of farmers of the locality.

#### Lucknow Chapter

NAAS Lucknow Chapter organized a one day interactive cum special lecture program at ICAR-Indian Institute of Sugarcane Research, Lucknow on March 01, 2019. More than 70 scientists from ICAR-IISR, ICAR-NBFGR, ICAR-CISH and ICAR-CSSRI, RRS, Lucknow attended the program. Young researchers were also invited to participate in the program. Dr A.K. Srivastava, Member, ASRB and Vice-



President NAAS, New Delhi delivered the lecture on *"Science Led Food Production to Feed Future India with Nutrition"*. Dr P. L. Gautam, Dr R.K. Singh, Dr P.S. Pathak, Dr Mathura Rai, Dr D.K. Sharma, Dr S. Rajan, Dr V.K. Mishra and Dr A.K. Verma were also present and attended the program.

At the outset Dr S.K. Pandey, Convener NAAS Lucknow Chapter welcomed the distinguished NAAS Fellowship, participants and introduced the speaker, Dr A.K. Srivastava, Member, ASRB and Vice President, NAAS, New Delhi. Dr A.D. Pathak Director ICAR-IISR Lucknow also welcomed the participants/dignitaries and highlighted the activities of the institute and appreciated the NAAS choosing the venue for a very informative and interactive talk. Dr Amaresh Chandra, Organizing Secretary of the program briefed about the past activities taken under Lucknow Chapter at IISR Lucknow and highlights of the recently concluded 14<sup>th</sup> Agricultural Science Congress.

Dr P.L. Gautam as a special invitee presented the agenda and objectives of the 12 Regional Chapters located at different parts of the country. He also briefed about NAAS, its various awards, Fellowships and Associate-ships given to encourage quality science and education in the country. He made an earnest appeal to scientists and researchers to apply for these coveted awards/fellowships. He also appreciated the efforts so far made by Lucknow Chapter having arranged various programs in past under the convenership of Dr P.S. Pathak and Dr R.K Singh.

Dr A.K. Srivastava spoke about the agricultural scenario in the country and highlighted the quantum jump in production and productivity of various commodities with exhaustive and lively presentations of the facts and figures. He emphasized the role of science in achieving astounding progress in food production to feed future India with nutritional security. He flagged the hidden hunger and malnutrition as serious problems that still exist in India and invited the attention on some of the following issues:

- 1/4<sup>th</sup> of world's hungry and poor have their home in India.
- More than 70% Indians consume less than 50% of the RDA of micronutrient.
- 6000 children die annually due to malnutrition or lack of micronutrients.
- 80% women of reproductive age are suffering with Fe deficiency anaemia.
- 57% women and children are suffering with vitamin A deficiency.
- One-third of girls aged 15-19 years are stunted.
- Iodine deficiency continues to be public health problem.

He expressed a need for new researches and cutting edge sciences to play a pivotal role in addressing these issues. He exploded many myths especially associated with A1/A2 milk and use of oxytocin in dairy by emphatically explaining scientific facts. He summarized his presentation with following positive notes:

- Science led growth and development in food and agriculture will continue to feed future India.
- A "Mission Mode" action is required to address the Malnutrition.
- Livestock, Fishery and Horticulture will play major role.
- The new vision for agriculture food sector for 2050 would be to work together and to enhance productivity by 40%; reduce hunger and rural poverty by 30% and reduce emission by 20%.

Following suggestions emerged for enhancing the activities under Lucknow Chapter in the afternoon session:

- 1. Chapter must take strong initiatives in making public aware about the Government policies along with program development/refinement and up gradation.
- 2. Chalk out action plan to address state level agricultural issues after interactions with Government. A brief write up in this regards would be helpful.
- 3. Arrange brainstorming on various burning topics associated with agriculture with invitation to State Government officials, especially associated with agriculture.
- 4. Awareness among Fellowship of the Chapter must be increased and if possible a seminar/conference must be arranged taking them all along.
- 5. Chapter must take initiative and act as mentor to enthuse scientists/researchers to become Fellows/ associates of the academy.
- 6. Arrange lectures on various topics regularly to achieve scientific excellence basis for greater awareness about NAAS as an independent body having pool of expert/ think tank.
- 7. A visible physical office must be made available where esteemed Fellows and other dignitaries can share their experiences and have meaningful discussion on the subjects/ problem arising from time to time and prepare action plan accordingly.

At the end, Dr Amaresh Chandra thanked the honourable speaker Dr A.K. Srivastava, special invitee Dr P. L. Gautam, distinguished Fellowship, Directors of the Institutes, past and present conveners and participants.

#### Ludhiana Chapter

A Brainstorming Workshop on Crop Residue Management was organized by Ludhiana Chapter of National Academy of Agricultural Sciences (NAAS) at PAU, Ludhiana, on September 6, 2018. The highlight of the workshop was the key lecture delivered by Dr J.S. Samra, Former CEO, National Rainfed Area Authority, Planning Commission/Niti Aayog (GOI) on 'Generation of Bio CNG (methane), Manure, Income, Employment and Clean Environment from Agro-waste'.



Dr N.S. Bains, Director Research, PAU welcomed Dr J.S. Samra, Guest of Honour, other dignitaries, and delegates. Dr B.S. Dhillon, Vice Chancellor, PAU Ludhiana and Convener, Ludhiana Chapter, NAAS was the Chief Guest. Other dignitaries who participated the Brain Storming Session included Dr A.S. Nanda, Vice-Chancellor, GADVASU; Dr S.M. Virmani, Adjunct Professor, PAU; Dr S.K. Singh, Director, National Bureau of Soil Survey and Land Use Planning, Nagpur; Dr Rajvir Singh, Director ICAR-ATARI, and NAAS Fellows. The Deans, Directors and Heads of the departments from the PAU, scientists from ICAR-ATARI, ICAR-CIPHET, GADVASU, Borlaug Institute for South Asia (BISA) and PAU, besides scientists and officials from the Corporate Sector also attended the workshop.

Initiating the presentations, Dr J.S. Mahal, Director Extension Education, PAU discussed the technologies developed for paddy straw management by PAU for *in-situ* mulching and incorporation and its baling. Pros and cons of different technologies were discussed. He highlighted the complementary role of various farm machines like PAU Straw Management System, PAU Happy Seeder and Straw Cutter-cum-Spreader for paddy straw management. He also mentioned that with the development of short duration rice varieties by PAU, farmers have been provided an adequate window for straw management and, therefore, retention/incorporation of rice straw in soil is feasible as well as desirable.
The Guest of Honour & Key Speaker, Dr J.S. Samra made a presentation on 'Generation of BioCNG (methane), Manure, Income, Employment and Clean Environment from Agro-waste'. He was of the view that BioCNG production under anaerobic conditions in leak proof steel digesters and collection of methane gas in cylinders can result in reducing pollution and thereby global warming and also would cut down fuel imports, as BioCNG has the same standards as fossil CNG with 98 per cent methane and S<10ppm. Further, the by-products i.e slurry and bio-compost produced retain all the nutrients and can be returned to the soil to maintain its health. He stressed that bio-compost is in no way inferior to farm yard manure. Dr Samra informed that Indian Oil Corporation Limited (IOCL) has signed MOU with Punjab Government to set up 400 BioCNG plants in the state and it will set up 100 BioCNG units in Haryana.

Dr Manju Wadhawa, Head, Department of Animal Nutrition, GADVASU; Dr H.S. Sidhu from BISA; Dr Anil Kumar from CCS-HAU; Shri Sreejit Basu from IOCL and Er Sanjeev Nagpal from Sampuran Agri Ventures Pvt. Ltd also made presentations followed by open discussion on various options and status of crop residue management.

Following points emerged from the workshop:

- 1. All the options available for crop residue management should be promoted to manage such a huge quantity of straw available in the region.
- 2. With the burning of rice straw residues, NOx and Particular Matter (PM) are produced which have the highest global warming potentials. Hence, paddy straw should be managed in-situ and/or ex-situ rather than burning. The emissions can be considerably reduced with the use of Bio-CNG instead of using petrol/CNG in heavy vehicles.
- 3. Carbon-Nitrogen (C/N) ratio of feed material for raw biogas production is very important parameter, hence the crop residues having more C/N ratio must be mixed with other material having low C/N ratio like animal dung to make a feed having ideal C/N ratio of 25-30 required for efficient gas production. Further research should aim at working out optimal combination of feed material. Researchers should determine the properties of all feedstock available in the region for biogas generation.
- 4. *Ex-situ* options (e.g. baling) involve almost double the cost of in-situ options (e.g. happy seeder) for paddy straw management. The comparative economics after factoring-in BioCNG and compost production needs to be worked out under different scenarios.
- 5. For efficient biogas generation, pre-treatment of straw like particle size reduction is must, hence research should be conducted for various mechanical interventions/ pretreatments.
- 6. Rice straw can also be used as animal feed through natural fermentation process as it acts as maintenance ration and partly meets production requirements. Fermented rice straw has a shelf life of more than a year; it improves milk production, conception rate and overall health of animals. Collaborative research should be conducted to mechanize the fermentation technology.

7. Various training programmes should be organized on the repair and maintenance of agricultural machinery developed for paddy straw management and their popularization for the straw management.

A lecture from Dr P.K. Ghosh, National Coordinator, NAHEP (ICAR) on 'Sustainability Concern in Indian Agriculture: Needs Scienceled Innovation', was organized at Punjab Agricultural University, by Ludhiana Chapter of NAAS on October 30, 2018. The lecture was attended by Dr B.S. Dhillon, Vice Chancellor, PAU and Convener of the Ludhiana Chapter of the NAAS; Dr A.S. Nanda, Vice Chancellor, Guru Angad Dev Veterinary and Animal Sciences University (GADVASU); Dr Sujoy Rakshit, ICAR-IIMR; NAAS Fellows, Deans, Directors and officers from the PAU; faculty from GADVASU, CIPHET, IIMR, ATARI and PAU, and also by officers from the line departments, and the students.

At the onset, Dr B.S. Dhillon welcomed and introduced Dr Ghosh in his opening remarks highlighting his significant contributions in areas of soil fertility and fertilizer use, crop nutrition and soil quality, conservation agriculture, soil and water conservation, feed and fodder resources.



Dr Ghosh made a presentation highlighting the broad contours of the agricultural production system in the country defined by the need to achieve food security and called for close attention to rice-wheat cropping system of the Indo-Gangetic Plains (IGP) whose sustainability is under threat. He focussed on degradation of natural resources, severe biotic and abiotic stresses especially drought, floods, pest infestations with accompanying impacts on biodiversity and agricultural productivity as major constraints to agricultural development. He drew attention to climate change that has gained significant global attention over the past decade due to concerns of its deleterious long-term impact on agriculture, environmental issues and human welfare for redressal on priority. He was of the view that understanding long-term soil organic carbon (SOC) changes in various agro-ecologies is important because it directly affects soil quality and serves as a major reservoir of plant nutrients. In this context, he mentioned agricultural practices with a profound positive effect on SOC content such as cover crops and fallowing, agro forestry and agro-pastoral systems, rotations with deep-rooted crops, and crop residue management or mulching and conservation tillage practices. He called for inclusion of pulse crop as a component of INM to conserve natural

resources, maintain soil health and increase soil organic carbon though leaf drop and root biomass.

The agricultural technology needs to move from production to profit oriented sustainable farming practices. Now is the time to explore the potential and importance of these practices not only for their economic significance but also as the basis for further intensification and ecological sustainability. The intensification of ecological agriculture is now required as it has the potential to sustainably feed the growing population by bringing 'Evergreen revolution' based on sustainable thinking. He shared that smallfarm management to improve productivity, profitability and sustainability of the farming system will go a long way to ensure all round sustainability. It has been observed that for a country like India, the practice of sustainable agriculture is very important as it accelerates the productivity, efficiency, employment, and provide guidance to reduce the practices which affect the quality of soil, water resources and degradation of other natural resources. In sum, if the focus of policies is on investment and infrastructure, land and water management, technology and market reforms, agriculture can contribute to (i) environmental services such as soil conservation, watershed services, biodiversity, and carbon sequestration; (ii) poverty reduction; (iii) food security; (iv) agriculture as a buffer in times of crisis, and (v) social viability.

Dr Ghosh concluded that India needs to produce more, better, safe and diverse food from less land for more people, which is possible through enhanced productivity and efficiency. Further, he pointed out that second green revolution is in the offing and, that unlike first green revolution, is likely to come through multiple interventions through 'science led agriculture'. He stressed on adoption of holistic approach by integrating research, education and extension for achieving enhanced productivity and efficiency, by connecting farmers, producers, consumers and entrepreneurs.

Dr A.S. Nanda, VC (GADVASU) thanked Dr Ghosh for delivering an inspirational talk with many take home messages for agricultural scientists.

### Mumbai Chapter

A lecture on *Food Security, Intensive Food Production Systems and Ecological Footprints* was delivered by Dr Mohan Joseph Modayil, Former Chairman/ Member, ASRB on 29<sup>th</sup> March, 2019 at ICAR-Central Institute of Fisheries Education (CIFE), Mumbai. Dr. Gopal Krishna, Director and Vice-Chancellor, ICAR-CIFE welcomed the speaker and the guests. The Convenor, Dr S.D



Tripathi (Former Director, ICAR-CIFE, Mumbai) introduced the key speaker Dr M.J Modayil. Besides a total of 100 faculty and students, Dr T.J Varghese (Former Prof of Aquaculture, College of Fisheries, Mangaluru), Dr H.G Hingorani (Former Faculty of ICAR-CIFE) and Dr A.K Reddy (Emeritus Scientist, ICAR-CIFE) attended the lecture.

Dr Modayil highlighted the major concern about the food for future and aspects related to food security, intensive production systems and how it impacts the ecological footprints. Citing a lot of statistical data available on global platforms he indicated that the UN has envisaged the sustainable development goal of zero hunger to be achieved by the year 2030. There is also a growing recognition that a more humane understanding of food security is needed. According to the World Food Programme, nearly 50% of World's hungry people are in India and 35% of the total population is food insecure, hence ensuring food security is of prime importance for India.

Most farming systems are concentrated around the World near the tropical and subtropical belt. These are also areas which are prone to severe impacts of nature's vagaries and climate change. He highlighted role of water as food and input for agriculture. Since the total water available on planet earth remains the same, climate change and extreme water events are posing threats. New adaptive water management strategies are needed in all areas of agriculture, industry and human consumption. He also emphasized that water foot print is a multi-dimensional indicator showing water consumption volumes by source and polluted water by type of pollutants. Increasing input efficiency will have environmental benefits for both crops and livestock systems. Plant-based foods have lowest environmental impacts. Studies have quantified the spatial expanse of global marine fisheries based on PPR (Primary Production Required) as an index of ecological footprint. Understanding the linkages between diets, production practices and environmental degradation is important for reducing the adverse impacts. Challenges and uncertainties resulting from stagnation of productivity and negative impacts of climate change, in addition to competition for land and water are challenges to meet the target envisaged by FAO for increasing the global food production by 60% by the year 2050. Alternate non-conventional species like sea cucumbers, insects, euphasids etc. are all future foods for humans. He said that our current knowledge of food and various dimensions of nutritional security and environmental impacts have advanced. Agriculture and animal production have a multitude of environmental impacts beyond the usual indicators currently analysed. More work is needed to understand the complex issues on environmental impacts. He summed up by saying that produce food responsibly, reduce post-harvest losses, wastage, conserve every drop of water and finally empathise and think from a hungry man's perspective.

Dr Gopal Krishna, Director and Vice-Chancellor, ICAR-CIFE highlighted the importance of this special lecture for the benefit of faculty and students. The programme ended with a formal vote of thanks proposed by Dr N.K Chadha, Principal Scientist and Head, Division of Aquaculture, ICAR-CIFE.

### Patna Chapter

A National seminar on *Challenges and Opportunities for Farmers' Prosperity in Hill Agriculture* was jointly organized by NAAS, New Delhi, ICAR-RC for NEH, Umiam,

International Maize and Wheat Improvement Centre (CIMMYT), New Delhi, and Indian Association of Hill Farming, Umiam at ICAR-RC for NEH Region, Umiam, during 29-30th November 2018.

During inaugural welcome session on 29th November, 2018, Shri Wailadmiki Shylla, Hon'ble MLA, Jowai, Meghalaya, stressed the ways to explore the potentials of the region and ensure maximum benefits from agriculture without harming the natural ecosystem. Dr N. Prakash, Director, ICAR-RC for NEH Region advocated to make a roadmap for



exploring the differences between hill and plain agriculture. Dr B. P. Bhatt, Director, ICAR-RCER, Patna, presented a plenary lecture on "Issues and Strategies for Agricultural Development in the Eastern Himalayan Region" and emphasized on having more extensive research for the development of hill agriculture and taking forward the potential technologies and practices.

The first technical session on "Frontier Technological Options for Hill Agriculture" was chaired by Dr N. Prakash, co-chaired by Dr N.B. Singh and coordinated by Dr A.K. Jha. The issues and strategies were discussed by different eminent speakers, On 30th November, 2018, the second technical session on "Issues and Strategies for Agricultural Development in NEH Region including Potential Farming/ Cropping Systems, Organic Agriculture" was chaired by Dr A. Arunachalam, ADG (International Relations), ICAR, New Delhi, co-chaired by Dr M. L. Jat, CIMMYT, New Delhi, India and coordinated by Dr R. Laha, Principal Scientist (Animal Health), ICAR-RC for NEH, Umiam. The major issues/challenges of different NE states in hill agriculture were discussed by various researchers.

In the third and final technical session, a panel discussion on the roadmap for scaling sustainable and resilient agricultural technologies in hill agriculture was held. The session was moderated by Dr B. P. Bhatt and Dr A. Arunachalam. The panelists of the session were Director, ICAR-RC for NEH Region, Umiam, Director, ICAR-VPKAS, Almora, Dean, CPGS (CAU), Umiam, Director, ICAR-ATARI, Guwahati, Director, ICAR-ATARI, Umiam, Meghalaya, JDs of ICAR-RC for NEH Regions of Nagaland, Sikkim, Arunachal Pradesh, Manipur, Mizoram, and Tripura Centres, Prof Sapu Chankija, SASRD Campus, Nagaland University, Dr M.L. Jat, CIMMYT, Dr S. Bandhopadhyaya, Pr. Scientist & Head, IVRI Regional Station, Kolkata and Prof Dwipendra Thakuria, Associate Professor, CAU, Umiam, Meghalaya. The following points were taken up to initiate roadmap for scaling up of hill agriculture:

- Assessment of technology adoption gaps
- Human resource development and capacity building

- Showcasing of proven technologies
- Expansion of poultry and pig farming in the state
- Year round vegetable production through low cost polyhouse
- Community based approach for development of agriculture in IFS mode (integration of pig and poultry component)
- Technology based cropping system through awareness and input support system for IOFS and seed chain development
- Secondary Agriculture
- Commodity based Processing Unit
- Seed Production programme

The concluding session of the two day national seminar was chaired by Dr A. Pattanayak, Director, ICAR-VPKAS, Almora and co-chaired by Dr U.K. Behera, Dean, College of Agriculture, CAU, Umiam. Based on the deliberations, following salient recommendations were made:

- ICAR-RC for NEH should initiate the generation of spatial database along with statistics on land use pattern, area under shifting cultivation, abundant Jhum, current fallow, net sown area (upland & low lands), forest areas (open/ dense) etc. using finer resolution recent satellite data for regional scale (NE India).
- Emphasis should be laid on extreme climatic variability and development of forecasting system and mitigation strategies.
- Development of bio-intensive production system models in horticultural crops in rainfed scenario: basin enrichment, multitier production system, use of microbial consortia in fruit crops.
- Promotion of ecologically and economically viable indigenous farming systems across the agro-climatic zones for employment generation, environmental conservation besides food and nutritional security.
- Promotion of fodder cultivation, increased maize cultivable area and use of location- specific feed and fodder resources to meet the fodder requirement of the region.
- Primary processing of perishable commodities in a cluster area of production and development of infrastructure for value chain of niche crops.
- Production of superior germplasms/ improved varieties through large-scale propagation of artificial insemination in pig and goats at the farmers' doorstep.
- Promotion of small-scale rural entrepreneurship development in pig, poultry and dairy.
- Strengthening of bio-security measures with special reference to transboundary and infectious diseases.

• Research priority on Anti Microbial Resistance (AMR) in microbes and creating awareness about AMR among farmers and farm women.

### Varanasi Chapter

### Inauguration of NAAS-Varanasi Chapter

Prof Panjab Singh, President, NAAS with Dr A.K. Srivastava, Vice-President, NAAS inaugurated the office of NAAS-Varanasi Chapter on 2nd May 2018 located in the campus of ICAR-Indian Institute of Vegetable Research, Varanasi. The NAAS-Regional Varanasi Chapter will have parts of Eastern and Western U.P. and Bundelkhand. The inaugural function marked the presence of several eminent NAAS fellows and scientists like



Dr Kirti Singh, Former Chairman, ASRB, New Delhi, Prof Ram Badan Singh, Former President, NAAS, Dr Gautam Kalloo, Former Vice Chancellor, JNKVV, Jabalpur, and Dr I.S. Solanki, ADG, ICAR, New Delhi. In his inaugural address, Prof Panjab Singh, President, NAAS emphasised on the need for development of entrepreneurship and investment from the private sector in agriculture for opening better opportunities for the farmers and achieve the target to increase their income. He expressed confidence that NAAS-Varanasi Chapter would be helpful as a bridge between researchers and the farmers. In this context, he cited the example of FAARD Foundation which helped in registration of 12 Farmers Producer Cooperatives engaged in dairy farming, milk processing, vegetable farming and marketing in eastern U.P. to ensure better price for their produce.

Dr A.K. Srivastava, Vice President, NAAS in his address highlighted the main objective of NAAS Regional Chapter at Varanasi being to identify the farmers' problems in the region, and to offer science led solutions by organizing need based programmes for different stakeholders. Prof R.B. Singh, Former President, NAAS; Dr Kirti Singh, Former Chairman, ASRB, New Delhi; Dr Gautam Kalloo, Former Vice Chancellor, JNKVV, Jabalpur, and Dr I.S. Solanki, ADG, ICAR, New Delhi also addressed the gathering. The regional chapter also organized Kisan Kalyaan Divas to mark the inauguration under the aegis of Gram Swaraj "Sabka-Sath, Sabka-Gaon, Sabka-Vikash" which was attended by scientists of ICAR-IIVR, Varanasi, BHU, 50 farmers of this region and 5 representatives of FPOs. Dr Bijendra Singh, Director, ICAR-IIVR, Varanasi and Convener, NAAS, Varanasi Chapter welcomed and thanked all dignitaries, scientists, Fellows and farmers present during this function and briefed about the achievements of the institute.

The National Academy of Agricultural Sciences - Varanasi Chapter organized a Special Lecture on "Feeding 1.37 billion with Nutritional Security: Bigger Challenge" at ICAR-Indian Institute of Vegetable Research, Varanasi on 29th January, 2019. The lecture was delivered by Dr A.K. Srivastava, Member, Agricultural Scientists Recruitment Board, New



Delhi and Vice President, NAAS. In his deliberation, Dr Srivastava emphasized on farmer's nutritional, food and economic security. He also advised the scientists for developing the climate resilient technologies which can help in sustaining the production for feeding the increasing populations.

He gave emphasis to develop the hybrids in vegetables by public sector and making them available to the farmers at affordable prices.

During his visit to the Technology Park, Experimental Fields and Laboratories of the Institute, Dr Srivastava applauded the ICAR-IIVR team for the excellent works done at the institute.

Dr Gautam Kalloo, Ex-VC, JNKVV, Jabalpur and Ex-DDG (Hort.) gave his remarks. Dr Bijendra Singh, Convener, NAAS-Varanasi Chapter and Director, ICAR-IIVR, underlined the ongoing activities of the Chapter and also the achievements of the Institute along with their impacts on the farmers.

The Fellows of NAAS-Varanasi Chapter, Scientists, Technical, Research Associates and SRFs, etc. were also present during the occasion.

# LINKAGES

### Academy's Collaborative Activities

### 5<sup>th</sup> Meeting of GTWG-SA Validation Workshop of TIFAC

The Global Technology Watch Group-Sustainable Agriculture (GTWG–SA) Validation Workshop under the aegis of Technology Information Forecasting and Assessment Council (TIFAC) was organised jointly by National Academy of Agricultural Sciences (NAAS), New Delhi on 5<sup>th</sup> April, 2018. Prof Panjab Singh, President, NAAS welcomed Dr Anil Kakodkar, Chairman, TIFAC, Dr Prabhat Ranjan, ED, TIFAC and all esteemed NAAS Fellows to the Validation Workshop. He highlighted the issues related to Climate Change and its effect on sustainable agriculture in India and emphasized on the need for advanced and innovative technologies to tackle the associated problems. Dr Prabhat Ranjan shared his views on the project Technology Needs Assessment (TNA) and Global Technology Watch Group (GTWG) on climate change being implemented by TIFAC. He also stressed the need for advanced technologies such as artificial meat or cellular agriculture, vertical farming, sensor based technologies in future to reduce GHG emission and water consumption in agriculture sector. Dr Akhilesh Gupta, Scientist G/Advisor, DST appreciated the work done by TIFAC and successfully implementing the project. He was of the view that cost is a major barrier in the selection and implementation of technologies in India. He opined that agriculture, being a key sector in India for a large population, has to be more focused. Dr Anil Kakodkar, Chairman, TIFAC shared his valuable thoughts with participants and mentioned that current farming practices may constrain sustainability in agriculture. He emphasized on the role of technology in agriculture sector for solving India specific problems in a time bound manner and dwelt on various issues/barriers like social, psychological, financial, risk management etc. confronting agriculture sector. Dr Kakodkar mentioned that feedback mechanism is an important tool for better improvement and time bound results, if leveraged by technology. He also cautioned that although biomass residue availability and production are showing upward trend, but no new agriculture residue processing plants are coming up in India. Dr Kakodkar flagged some of the potential areas for intervention such as application of solar energy/solar panel, solar pumps and use of saline water for better crop production and need of 'Climate Proofing' due to increasing frequency of extreme weather events. Subsequently Dr T. Mohapatra, DG, ICAR and Secretary, DARE who joined the workshop, appreciated TIFAC's initiatives in the area of climate change and hailed the support of NAAS by joining hands with TIFAC in organizing the workshop. Dr Mohapatra emphasized that with the help of proper crop management strategy and appropriate technologies, the emissions and pollution can be reduced. He stressed on the need for adaptation and use of energy on sustainability scale in agriculture sector. In this context, he highlighted the use of solar pumps to run heavy machines used in agriculture, energy production from agriculture waste, proper use of water and fertilizer, need of proper policy and compensation issues. He called for promotion of zero budget natural farming (organic farming), technology vulnerability assessment on regular time interval, climate resilience villages, furtherance of Krishi Vigyan Kendra, Inter department coordination system as important components of sustainable agriculture. Dr Gautam Goswami, PI, GTWG project mentioned that while scouting technologies, it was decided that besides climate change, sustainable livelihood component will also be taken into account so that climate change vulnerability is reduced. Later, Dr Himanshu Pathak, Chairman GTWG- Sustainable Agriculture group made a detailed presentation on the findings of the GTWG–SA group under various sub-sectors identified under agriculture including livestock, animal husbandry and fisheries. In response, detailed discussions were held where-in esteemed NAAS Fellowship actively participated and provided their valuable comments and suggestions. The summary of discussion points that emerged include multiple stress (flood, draught, salinity), non-conventional innovative technologies like drone for site specific application, use of biosensors for feed management, solar power for machineries, zero budget natural farming, microbial tools for methane mitigation from ruminants and from rice fields, vertical farming, interdepartmental coordination technology for salinity control, technologies for agricultural waste utilization, translation from research to commercial technologies, capacity building, resource management, mapping of grasslands, crop improvement for better digestibility of residues to reduce methane emissions from livestock, semen sexing, productive biotechnology or cloning, use of crop residues for energy generation, water use efficiency, post harvest technology and reducing drudgery, development of quality and robust farm machinery, application of remote sensing technologies, prevention of residue burning. Prof Panjab Singh thanked all the participants, especially Dr Anil Kakodkar and appreciated the GTWG-SA groups work under the Chairmanship of Dr Himanshu Pathak. The workshop ended with thanks to chair and all the participants.

### **Reshaping Agricultural Education**

The National Academy of Agricultural Science (NAAS) collaborated with the Indian Agricultural Universities Association (IAUA) in organizing the IAUA Golden Jubilee International Conference on "Agricultural Education Sharing Global Experience" during November 23-25, 2018. The Conference reiterated that education, research and extension systems, particularly in agriculture and food systems, have been instrumental globally in bringing transformational changes in a dynamic mode to ensure livelihood security for all for all times. It was highlighted that in India State Agricultural Universities (SAUs) and Deemed Agricultural Universities, as a part of the National Agricultural Research, Education and Extension System (NARES), had contributed significantly to usher in the Green Revolution, followed by White, Yellow, and Blue Revolutions. Similar developments had taken place in China, Brazil and other developing countries.

In view of the persisting high hunger, undernutrition, poverty and inequity, escalating demand for quality food, stagnating and low total factor productivity (TFP) growth, the shrinking land, water, and biodiversity resources, and the proverbial uncertainties of the fast changing climate and volatile markets, the Conference emphasized that the global educational system must be sensitive to these trends. Integrated



system approach, non-splitting of agricultural universities, enrichment of agriculture through the inclusion of basic sciences, quality assurance and accreditation, governance and adequate financial support to and investment in agricultural education system should be adopted towards transforming agriculture.

The Conference recommended that the educational system should undertake business unusual to achieve (i) sustainable intensification and diversification of production and zero waste to meet demand for nutrition and food quantity and quality, (ii) 100 percent increase in smallholder productivity and income; ensuring desired profitability, social justice, and attractiveness to agriculture as a profession, (iii) ecosystem services that improve water quality and quantity, soil health, carbon capture, and biodiversity, and (iv) rendering agriculture attractive to the youth.

### **Institutional Membership**

The Institutions having established reputation with clean record and have demonstrably involved or propose to involve itself in activities related to the objectives of the Academy and carrying out activities in conformity with the requirement of preserving human, ecological and environmental health and willing to make a contribution of Rs. 10 lakhs towards the NAAS Corpus Fund for supporting its activities needing sustained long term support are eligible to become Institutional Member of the Academy. The following 5 institutions have become the Institutional Member of the Academy during year 2018-19:

- 1. Bihar Animal Sciences University; Veterinary College Campus, Patna, Bihar
- 2. Mahatma Phule Krishi Vidyapeeth; Ahmednagar, Rahuri, Maharashtra
- 3. Maharashtra Animal and Fishery Sciences University, Nagpur, Maharashtra
- 4. Institute of Bioresources and Sustainable Development, Imphal, Manipur
- 5. Sher-e-Kashmir University of Agricultural Sciences & Technology, Srinagar, J&K

### **RECOGNISING EXCELLENCE (2019)**

### New Fellowship

### **Section I: Crop Sciences**

### Dr. Ravish Chatrath

Principal Scientist & Principal Investigator, (Crop improvement), ICAR-Indian Institute of Wheat and Barley Research, Karnal, Haryana

### Dr. Swarup Kumar Parida

Staff Scientist IV, National Institute of Plant Genome Research (NIPGR), New Delhi

### Dr. Bakshi Ram

Director, ICAR-Sugarcane Breeding Institute, Coimbatore, T.N.

### Dr. Kunwar Harendra Singh

Principal Scientist (Genetics & Plant Breeding), ICAR-Directorate of Rapeseed Mustard Research, Sewar, Bharatpur, Rajasthan

### Dr. Raman Meenakshi Sundaram

Principal Scientist (Biotechnology), Crop Improvement Section, ICAR-Indian Institute of Rice Research, Rajendranagar, Hyderabad, Telangana

### Dr. Sudesh Kumar Yadav

Scientist-F, Center of Innovative and Applied Bioprocessing, Knowledge City, Mohali, Punjab

### Section II: Horticulture Science

### Dr. (Ms) Kambham Madhavi Reddy

Principal Scientist, Division of Vegetable Crops, ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka

### Dr. Debasis Pattanayak

Principal Scientist, ICAR-National Researh Centre on Plant Biotechnology, Pusa Campus, New Delhi

### Dr. Arun Kumar Singh

Principal Scientist & Head, ICAR-Research Complex for Eastern Region, Research Centre Ranchi, Plandu, Ranchi, Jharkhand

### Section III: Animal Sciences

### Dr. (Ms) Sushila Maan

Professor and Head, College of Veterinary Sciences, Lala Lajpat Rai University of Veterinary and Animal Scieces, Hisar, Haryana

### Dr. Devendra Tarachand Mourya

Director, National Institute of Virology, Pune, Maharashtra

### Dr. Bhupendra Nath Tripathi

Director, National Research Centre on Equines, Hisar, Haryana

### Dr. Amrish Kumar Tyagi

Head and Principal Scientist, Animal Nutrition Division, National Dairy Research Institute, Karnal, Haryana

### **Section IV: Fisheries Sciences**

### Dr. Basanta Kumar Das

Director, ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, W.B.

### Dr. Priyabrat Swain

Pricipal Scientist & ICAR National Fellow, ICAR-Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswra, Odisha

### Section V: Natural Resources Management Sciences

### Dr. Anup Das

Principal Scientist (Agronomy) & Head (I/c), Division of Crop Production, ICAR Research Complex for NEH Region, Agartala, Tripura

### Dr. Tapas Kumar Das

Principal Scientist, Division of Agronomy, ICAR-Indian Agricultural Research Institute, New Delhi

### Dr. Pawan Kumar Joshi

Professor, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi

### Dr. Tapan Jyoti Purakayastha

Pricipal Scientist, Division of Soil Science and Agrilcultural Chemistry, Indian Agricultural Research Institute, New Delhi

### Dr. Dinabandhu Sahoo

Director, Institute of Bioresources and Sustainable Development (IBSD), Imphal, Manipur

### Section VI: Plant Protection Sciences

### Dr. (Ms) Rashmi Aggarwal

Head and Principal Scientist, Division of Plant Pathology, ICAR-Indian Agricultural Research Institute, New Delhi

### Dr. Mukesh Kumar Dhillon

Principal Scientist, Division of Entomology, ICAR-Indian Agricultural Research Institute, New Delhi

### Dr. Sunil Kumar Khare

Associate Dean (R&D) and Professor of Biochemistry, Indian Institute of Technology Delhi, New Delhi

### Dr. (Ms) Neera Singh

Principal Scientist, Division of Agricultural Chemicals, Indian Agricultural Research Institute, New Delhi

### Section VII: Agricultural Engineering and Technology

### Dr. C. Anandharamakrishnan

Director, Indian Institute of Food Processing Technology, Thanjavur, T.N.

### Dr. Krishna Pratap Singh

Principal Scientist, AMD, ICAR- Central Institute of Agricultural Engineering, Nabibagh, Bhopal, M.P.

### Section VIII: Social Sciences

### Dr. Akhilesh Chandra Kulshreshtha

Former Addl. DG, Central Statistical Organisation, Flat No. 802, Plot No. 15, New Rashtriya, Sector 18-A, Dwarka, New Delhi

### Dr. Ranjay Kumar Singh

Principal Scientist (Agricultural Extension), ICAR-Central Soil Salinity Research Institute, Karnal, Haryana

### Foreign Fellows

### Dr. Abdelbagi M. Ismail

Principal Scientist, (IRRI) Representative for Africa; Leader, Stress-Tolerant Rice for Africa and South Asia, Nairobi, Kenya

### Dr. Hosahalli Ramaswamy

Professor, Department of Food Science, McGill University, Canada

### Associateship

Dr. Rajib Deb Dr. (Ms) B. Parameswari Scientist (SS), Division of Cattle Genetics Senior Scientist (Plant Pathology), and Breeding, ICAR-Central Institute for **ICAR-Sugarcane Breeding Institute** Research on Cattle, Meerutcantt, Haryana Regional Centre, Karnal, Haryana Dr. Ashok Kumar Parihar Dr. Bheemanna Somanna Gotyal Scientist, Division of Crop Protection, Central Scientist (Sr Scale), ICAR-Indian Research Institute for Jute and Allied Fibres, Institute of Pulses Research, Kanpur, Barrackpore, Kolkata, W.B. U.P. Dr. Prem Lal Kashyap Dr. Ravi Ranjan Scientist, ICAR-Indian Institute of Wheat and Senior Scientist, Animal Physiology Barley Research, (IIWBR), Karnal, Haryana and Reproduction Division, ICAR-Central Institute for Research on Goat, Mathura, U.P. Dr. Neeraj Kumar Dr. (Ms) Sarika Scientist, ICAR-National Institute of Abiotic Senior Scientist, Centre for Agricultural Stress Management, Baramati, Pune, Bioinformatics, ICAR-IASRI, Pusa, Maharashtra New Delhi Dr. C.O. Mohan Dr. Salej Sood Senior Scientist, ICAR-Central Institute of Scientist (SS), Crop Improvement Fisheries Technology, Cochin, Kerala Division, ICAR-Central Potato Research Institute, Shimla, H.P.

### Academy Awards for the Biennium 2017-2018

Following awards were given during XIV ASC at NASC Complex, New Delhi on 20<sup>th</sup> February 2019 by NAAS

### Memorial/Lecture Award

| Dr B.P. Pal Award for Excellence in<br>Agricultural Sciences | <b>Prof. Ram Badan Singh</b> , Immediate Past Chancellor, CAU  |
|--|--|
| Dr K. Ramiah Award   | <b>Dr Kailash Chander Bansal</b> , Former Director, NBPGR  |
| Dr K.C. Mehta Award  | <b>Dr Appa Rao Podile</b> , Vice Chancellor,<br>University of Hyderabad, Hyderabad                                   |
| Dr M.S. Randhawa Award                                       | <b>Dr Probir Kumar Ghosh</b> , National Coordinator, National Agricultural Higher Education Project, ICAR, New Delhi |

| Dr N.S. Randhawa Award                 | <b>Dr Biswapati Mandal</b> , Professor, Bidhan<br>Chandra Krishi Viswavidyalaya, Nadia,<br>W.B.  |
|--|--|
| Dr P. Bhattacharya Award               | <b>Dr Sudershan Kumar Bhatia</b> , Professor (Retd), HAU   |
| Dr A.B. Joshi Memorial Lecture Award   | <b>Dr R.A. Mashelkar</b> , F.R.S., Former DG, CSIR   |
| Endowment Award                        |  |
| Dr L.C. Sikka Endowment Award          | <b>Dr Bijendra Singh</b> , Director, ICAR-Indian<br>Institute of Vegetable Research, Varanasi,<br>U.P.   |
| Dr (Ms) Prem Dureja Endowment<br>Award | <b>Dr (Ms) Chandish R Ballal</b> , Director,<br>ICAR-National Bureau of Agricultural<br>Insect Resources, Bengaluru                                      |
| Dr N.G.P. Rao Endowment Award          | <b>Dr A.T. Sadashiva</b> , Principal Scientist &<br>Head, Division of Vegetable Crops, ICAR-<br>Indian Institute of Horticultural Research,<br>Bengaluru |
| Recognition Award                      |  |
| Plant Improvement                      | <b>Dr D.K. Yadava</b> , Principal Scientist & Head,<br>Division of Seed Science & Technology,<br>ICAR-IARI, New Delhi                                    |
| Plant Protection                       | <b>Dr Kaushik Banerjee</b> , Principal Scientist,<br>ICAR-National Research Centre for Grapes,<br>Pune, Maharashtra                                      |
| Soil, Water & Environmental Sciences   | <b>Dr R. Dinesh</b> , Principal Scientist, ICAR-<br>Indian Institute of Spices Research,<br>Kozhikode, Kerala  |
| Animal Sciences                        | <b>Dr K.K. Krishnani</b> , Principal Scientist,<br>ICAR-Central Institute of Fisheries<br>Education, Versova, Mumbai, Maharashtra                        |
| Social Sciences                        | <b>Dr Hukum Chandra</b> , ICAR National<br>Fellow, ICAR-Indian Agricultural Statistics<br>Research Institute, New Delhi                                  |
| Young Scientist Award                  |  |
| Plant Improvement                      | <b>Dr S.K. Upadhyay</b> , Assistant Professor,<br>Department of Botany, Panjab University,<br>Chandigarh   |

| Plant Protection                      | <b>Dr D.M. Firake</b> , Scientist (Agricultural<br>Entomology), Division of Crop Protection,<br>ICAR Research Complex for NEH Region,<br>Umiam, Meghalaya            |
|---------------------------------------|--|
| Soil, Water & Environmental Sciences  | <b>Dr Vijay Pooniya</b> , Scientist (Sr Scale),<br>Division of Agronomy, ICAR-Indian<br>Agricultural Research Institute, New Delhi                                   |
| Animal Sciences                       | <b>Dr Subrota Hati</b> , Assistant Professor,<br>Department of Dairy Microbiology,<br>SMC College of Dairy Science, Anand<br>Agricultural University, Anand, Gujarat |
| Agricultural Engineering & Technology | <b>Dr V.E. Nambi</b> , Scientist, ICAR-Central<br>Institute of Post-harvest Engineering &<br>Technology (CIPHET), Ludhiana   |
| Social Sciences                       | <b>Dr E. Varghese</b> , Scientist, Fishery Resource<br>Assessment Division, ICAR-Central Marine<br>Fisheries Research Institute, Kochi, Kerala                       |

### FOUNDATION DAY AND AGM

### (i) Presentations by Newly Elected Fellows



The newly elected Fellows of the Academy made their presentations in the afternoon of June 4, 2018 in two sessions before the full house of Academy Fellowship. Dr C.D. Mayee, Vice President and Dr J.K. Jena, Secretary chaired and co-chaired the Session-I, respectively. In this session, 13 Fellows elected in the disciplines of Crop, Horticultural and Animal Sciences, one Pravasi and one Foreign Fellow made presentations of their work. The Fifteen Fellows under the

disciplines of Fisheries, NRM, Plant Protection, Agricultural Engineering and Technology and Social Sciences presented their work in Session-II, which was chaired by Dr A.K.

Srivastava, Vice President and co-chaired by Prof Anil K. Singh, Secretary. All the presentations generated lot of discussions and many valuable inputs were given to the presenters. All these Fellows were inducted to the Fellowship of the Academy at AGM on June 5, 2018 and presented with Certificate, Tie/Scarf and Lapel by the President.



### (ii) Presidential Address

Prof Panjab Singh, President, NAAS delivered the Presidential Address on "Agriculture: The Driver of Inclusive Growth". In his address, he dwelt on the contribution of agriculture at the national level in providing food, nutritional and livelihood security to millions of farming families, accounting for 17% of the Gross Value Added, 12% of the national exports and engaging over 50% of the national workforce. Prof Singh emphasized that technology and investments in R&D are main drivers of agricultural growth and that the returns to investment in agriculture are among the highest. He called for better infrastructure, technologies and markets to promote food processing, product development and value addition of the farm produce. He deliberated on the need to enhance investment to the level of atleast 1% of AgGDP in the immediate future to meet ever increasing national food demand and also to improve farmers' income. President highlighted some of the priority areas for investments in Agriculture Research and Development (AR&D) as under:



- A distinct focus on conservation of natural resources:
- Rain water management wherein every drop of water has to be saved. It is now not uncommon to see that the areas that witness floods also are faced with drought like situations soon after the receding of floods. Water will be the most limiting factor in agriculture. Therefore, water storage and conservation, recharge of ground water, and water bodies have to be given top priority.
- Soil health management will be crucial and it will be a major challenge to sustain the fertility and production potential of the soils.
- Biodiversity conservation and utilization-in all forms, floral, faunal and microbial.
- Promotion of rain fed and dry land agriculture through technological interventions on more than 50 per cent of the rain dependent agricultural lands. Integrated farming with emphasis on livestock component is desirable.
- Climate change will have far reaching consequences for agriculture and therefore, adaption and mitigation approach to combat the problem needs emphasis.
- Diversification, involving crop, horticultural, livestock and fisheries, for sustainable growth and also minimising the risk arising out of climate change effect.

- Processing and value addition to produce for enhancing farmer's income and reducing post-harvest losses at farm level.
- Research on modern tools and technologies viz. precision farming, biotechnology, nano-technology, novel fertilizers, microbe-based interventions, mobile-based apps (ICT), weather forecast at sub-block level etc. need to be used in promoting agriculture.
- Enhancing use of Drones, Robotics, Space technology, ICTs and Artificial Intelligence (AI) applications in agriculture.
- Improving advisory services and forecast and forewarning systems especially to regulate farm production and avoid distress sales.
- Pricing mechanism for farm produce and prior price announcement and sale of produce through network of e-markets and other village level markets.
- Higher investment in agriculture R&D to generate advanced technologies and meet the food challenges of the future growing population.

He underscored the paradoxical situation in the country having enough food production, food availability, accessibility, markets and consumption, but, the producer of food is in distress. There is no other industry where the production units run into losses when the market environment is favourable. He requested the Fellowship and all stakeholders to seriously think and analyse the situation and suggest remedial steps to make farming more remunerative. He cautioned that knee jerk reactions will not take the country anywhere. He was of the view to adopt a holistic approach to address the various problems and issues from production to consumption by involving all stakeholders simultaneously and not one after the other. He concluded that Indian agriculture is characterized by a very vast agro-ecological diversity in terms of natural endowments, rainfall, land forms, soils, climate, biodiversity, socio-economic levels of farming communities, etc. and therefore, "one size fits all" approach cannot work and each situation has to be dealt with separately and comprehensively. The Address was circulated among the Fellowship / Associateship and widely appreciated.

### (iii) Foundation Day Lecture

Mr Erik Solheim, Executive Director, United Nations Environment delivered the Foundation Day Lecture on The Future of Food and Farming: Ideas for a Changing World in the afternoon of June 5, 2018. He highlighted the need for urgent action in the global food system to make it sustainable whilst adapting to climate change to satisfy growing world population as critical resources such as water, energy and land become increasingly scarce. He emphasized to redouble efforts to address hunger, which continues to affect



Mr Erik Solheim, Executive Director, United Nations Environment, delivering Foundation Day Lecture

a large population worldwide. He was of the view that deciding how to balance the competing pressures and demands on the global food system, is a major task facing policy makers. He made a strong case for governments, the private sector and civil society to continue to prioritise global food security, sustainable agricultural production, reform of trade and subsidy, waste reduction and sustainable consumption. He concluded that many challenges facing farming and food will require decision-making that is fully integrated across a diverse range of policy areas which are all too often considered in isolation, and for action to be based on sound evidence.

### iv) Excerpts from the Minutes of the 25<sup>th</sup> AGM

The 25<sup>th</sup> General Body Meeting (AGM) of the Academy was convened on June 5, 2018 at 9.30 A.M. at A.P. Shinde Symposium Hall, NASC, New Delhi under the Chairmanship of the President of the Academy, and attended by 221 Fellows. The AGM was graced by Past Presidents including Prof V L Chopra and Prof R.B. Singh and a number of former senior peers and office bearers of the Academy. A 2-Minute silence was observed by the entire house prior to initiation of business, as a mark of respect in the memory of esteemed Fellows, namely, Dr Arun Kumar Sharma, Dr Lalji Singh, Dr Y.L. Nene and Dr B.R. Barwale, who left for their heavenly abode since last AGM held in 2017.



The President welcomed the esteemed Fellowship assembled for the AGM and conveyed felicitations on the World Environment Day being organized with the theme "Beating Plastic Pollution". He also welcomed all newly elected Fellowship and Associates to the Academy.

The meeting started with the presentation of Secretary's report by Dr J.K. Jena, Audit and Accounts report by Dr B.S. Dwivedi, Editors' report by Dr V.K. Bhatia, Foreign Secretary's report by Dr P.K. Joshi, and Action Taken Report by Prof Anil K. Singh. All these reports including Annual Report-2017-18 and Audited Accounts were accepted and adopted by the house after brief interaction by the Fellowship. The AGM also accorded its approval to some of the important decisions taken by EC that included appointment of new auditors, guidelines for Regional Chapters, organisation of XIV Agricultural Science Congress at Delhi in the year 2019, and change in the eligibility



Dr J.K. Jena, Secretary; Dr B.S. Dwivedi, Treasurer; Dr V.K. Bhatia, Editor; Dr P.K. Joshi, Foreign Secretary, presenting their reports during the Annual General Body meeting

criteria of NAAS-Recognition Award. The Fellowship were also appraised about the salient recommendations of the NAAS Review Committee that was chaired by Dr C.R. Bhatia, Former, Secretary, DBT.

### (v) General Discussion

The esteemed Fellowship actively participated in general discussion and made suggestions on many pertinent issues confronting agriculture, some of them are as under:

1. The newspapers and other print media often carry news about agriculture in the country that, at times, is unfounded and misleading. The Academy



should respond to such news items appropriately and present a realistic picture, especially to enhance public awareness and remove any apprehensions.

- 2. The Academy needs to give attention to start-ups in agriculture. There are 62 start-ups in agriculture at national level. In order to highlight the initiative, it was suggested that a session on start-ups may be included in the forthcoming XIV-ASC.
- 3. Globally, 5th June is celebrated as World Environment Day, which coincides with AGM of NAAS. Therefore, it will be befitting tribute to environment awareness if NAAS also plan some special activity as a part of the AGM programmes. The President may pledge Fellowship on Foundation/Environment day to restore/ sustain environment.
- 4. A concern was expressed over the number of Fellowship nominations from North-east states that remain very low, despite a large number of universities and research institutions located in the region.

- 5. A suggestion was made by Fellowship to raise the number of Fellowship in the NRM section from 5 to 7. Regarding the criteria to elect new Fellows, a careful evaluation was needed to see that the papers are relevant to agricultural research.
- 6. It was suggested that the Academy should look into some of the important issues such as: Rising number of stray male animals that are now invading the crop fields; Need to make agricultural education more skill oriented; Develop a science based formula for fixation of MSP of major food crops; Academy's view on the Model Act of Contract Farming, and farm loan waivers that are running into thousands of crores. Recognizing the role of organised agricultural markets to boost farmers' income, Agriculture Market Revolution was suggested as a theme for XV ASC.

The President thanked the Fellowship for raising important issues and assured to get the points examined and initiate appropriate action, wherever required.

### **PUBLICATIONS**

### Policy/Status/Strategy Paper

| (i)   | Strategy Paper 8:  | Conservation Policies for Hilsa and Mahseer   |
|-------|--------------------|---|
| (ii)  | Strategy Paper 9:  | Accelerating Seed Delivery Systems for Priming Indian<br>Farm Productivity Enhancement: A Strategic Viewpoint |
| (iii) | Strategy Paper 10: | Renewable Energy: A New Paradigm for Growth in Agriculture  |
| (iv)  | Strategy Paper 11: | Rumen Microbiome and Amelioration of Methane Production   |
| (v)   | Strategy Paper 12: | Harnessing Full Potential of A1 and A2 Milk in India: An Update   |
| (vi)  | Strategy Paper 13: | Development and Adoption of Novel Fertilizer Materials  |

### **Policy Brief**

(i) Policy Brief 3: Soil Health: New Policy Initiatives for Farmers Welfare

### Newsletter

(i) NAAS-News, Vol. 18, Nos. 2 to 4 and Vol. 19, No. 1 (quarterly)

### Journal (published by Springer India Pvt. Ltd.)

(i) NAAS Official Journal '*Agricultural Research*' Vol. 7, Nos. 2 to 4 and Vol. 8, No. 1 (quarterly)

### **Other Publications**

- (i) Presidential Address on '*Agriculture: The Driver of Inclusive Growth*' delivered by Prof. Panjab Singh at Foundation Day 2018
- 50 NAAS Annual Report 2018-19

- Presidential Address on 'Indian Agriculture: Past, Present and Future' delivered by Prof. Panjab Singh at the Inaugural Function of XIV ASC on 20<sup>th</sup> Feb 2019
- (iii) Fourth Dr A.B. Joshi Memorial Lecture on 'Leveraging Agritech Startups in Indian Agriculture Innovation Ecosystem' delivered by Dr R.A. Mashelkar, FRS, National Research Professor, at XIV ASC on 20<sup>th</sup> Feb 2019
- (iv) NAAS Year Book and Planner

# **EVENTS AND MEETINGS**

### New Year Get-together

The Academy organised a get-together of Delhi based Fellowship at NAAS Complex on January 1, 2019 under the Chairmanship of Prof Panjab Singh, President of the Academy. Others present on the dais included Prof A.K. Srivastava, Vice-President, Dr T Mohapatra, Secretary DARE and DG, ICAR and incoming Vice-President, NAAS, and the two Secretaries of the Academy Dr J.K Jena and Dr Anil K. Singh.

Dr Jena, Secretary, NAAS extended a very warm floral welcome to all the dignitaries and introduced the newly elected members of EC, Fellowship and Associates present in the house. He also briefly described the activities and achievements of the Academy during the year 2018.

Prof Panjab Singh President of the Academy also welcomed the Fellowship and extended his warm greetings and best wishes for the New Year. He highlighted the implementation of some important recommendations made by the Academy to address contentious issues like use of GE technology for food and nutrition security, solutions to crop residue burning, sustaining soil health etc. He also lauded the impact of NAAS policy/strategy/ status papers in formulating policies for growth of national economy. He further informed that a compendium of impact of NAAS publications would be brought out very shortly. Further, he drew attention of the Fellowship towards national issues like waiver of farm loans, heavy subsidies on fertilizers, water and electricity, governance



and need for enhancing interest in research and teaching by scientific community. He appealed and requested the Fellowship to focus on achieving something innovative for the growth of agriculture in general and for farmers in particular and submit proposals to be addressed by the Academy in near future. He appreciated the positive development observed in increasing number of nominations of young scientists for NAAS Fellowship.

Dr T. Mohapatra, Secretary DARE and DG, ICAR and Vice-President, NAAS conveyed his warm greetings and best wishes for the New Year to all dignitaries and NAAS Fellowship gathered on this occasion. He highlighted the role of policy interventions



so that the research carried out may reach the stakeholders in a more efficient manner. He emphasised that there is a strong need to identify areas of research where it has reached maturity for immediate policy intervention. He expressed his concern over the imbalanced/skewed distribution of Fellowship across gender, institutions and disciplines. He hoped that Regional Chapters shall play very important role in dissemination of policies and knowledge in most effective manner, besides creating awareness about various activities of the Academy. He further laid emphasis on science communication and also suggested that the recommendations of the Policy/Status/ Strategy papers must be precise so that Policy Decisions can be made and implemented.

Dr A.K. Srivastava, Vice-President, NAAS introduced the topic "Search for Research" for discussion among the Fellowship. While giving the genesis of the topic, he emphasised that the real need is to take/translate research to stakeholders. He explained this concept with the help of several live examples like bad and good cholesterol, iron fortified milk, iodine fortified salt, probiotic/fermented milk etc. He pointed out that "SEARCH" generally involve looking for something, while "RESEARCH" denotes looking into



something. However, when the concept of research is used in an academic activity, it involves both. He was of the view that Researchers have to not only find the missing links in their thoughts and so called hypothesis, but they also need to look into the matter to discover the justifications for their outputs. He stressed to identify most important thrust areas for research with direct relevance to society at large.

On this occasion, Academy's Strategy Paper No 10 "Renewable Energy: A New Paradigm for Growth in Agriculture", NAAS Year Book 2019 and NAAS NEWS October-December 2018 were also released. The programme ended with a vote of thanks by Dr Anil K. Singh, Secretary, NAAS.

### **Executive Council Meetings**

During the year 2018-19, four meetings were held on (June 4, 2018, September 14, 2018, November 27, 2018, and February 19, 2019 at New Delhi. Some important items considered and actions taken during the meetings are elaborated as under:

### 104th Meeting

The 104th Executive Council (EC) meeting was held on June 4, 2018 in the Academy Secretariat. In this meeting, the Executive Council approved the minutes of 103<sup>rd</sup> meeting. The action taken report was deliberated and the progress was noted with satisfaction. The Executive Council expressed appreciation on the concept of Mentoring Scheme and Science Communication Strategy. The Council was informed that the Academy has written letters to the Vice-Chancellors of PAU, Ludhiana and AAU, Jorhat to implement these schemes on pilot scale. Regarding issue of NAAS Rating of Journals, the EC reiterated that the present guideline is to continue as stipulated for 3 years. It has also been agreed that the further course of action would be decided only after receiving the recommendations of the Journal Score Committee. The report of Committee constituted for framing Guidelines for Regional Chapters was discussed. The Committee took note of the number of Fellows in each region and their activities and recommended merging of some of the Regional Chapters and also creating some new Chapters to improve the visibility of the Academy. EC also approved the Annual Report 2017-18 of the Academy and the Audited Statement of Accounts for the year 2017-18 and recommended the appointment of M/s Virender K Gupta & Co., New Delhi as Auditor of the Academy for 2018-19. The President reviewed at length the arrangements being made by the Organizing Committee for organizing the XIV Agricultural Science Congress at New Delhi. It was also decided that, Dr R.A. Mashelkar, Former DG, CSIR may be approached to deliver Dr A.B. Joshi Memorial Lecture. Finally, the EC approved the Eligibility Criteria for Recognition Awards to make it open to all scientists as is being done for other Awards of the Academy. Executive Council also finalized the programmes for 2018.

### 105<sup>th</sup> Meeting

The 105<sup>th</sup> Meeting of Executive Council (EC) was held on 14<sup>th</sup> September, 2018 under the Chairmanship of Prof Panjab Singh, President, NAAS. The salient points of the meeting were:

- The 14<sup>th</sup> Agricultural Science Congress (ASC) team made a presentation to update the EC about the status of preparations of the Congress.
- The names of the scientists recommended by Conveners' Group were approved by the Executive Council for inclusion in the panel for election to NAAS Fellowship 2019 as per guidelines through ballot. Similarly, the recommendations on Pravasi and Foreign Fellowship for the year 2019 were also accepted by EC.

- The EC also approved the selection of ten scientists as Associates of the Academy with effect from 1st January, 2019.
- The EC considered the recommendations of Judging Committees constituted for selection of nominees for Memorial, Endowment, Recognition and Young Scientists' Awards of the Academy for the biennium 2017-2018 and accorded its approval.
- The EC was also appraised that the Academy has completed and submitted its Report for ranking of ICAR institutions. Further, the Academy has been assigned the task for preparing guidelines for deciding academic standing of the Scientific Societies.
- Dr R.A. Mashelkar, former DG, CSIR to be given the 4th Dr A.B. Joshi Memorial Lecture Award during XIV ASC in February, 2019.
- The issue of merger of Pravasi and Foreign Fellowship was discussed and it was decided that presently five Fellowships in two categories for scientists working abroad, (i) Pravasi Fellows (3 Fellowships/year) for scientists of Indian origin who are/have working/worked abroad and (ii) Foreign Fellows (2 Fellowships/year) for non-Indians may be merged as Foreign Fellows with number of Fellowships restricted to only two to be elected every year.

### 106<sup>th</sup> Meeting

The 106<sup>th</sup> meeting of the Executive Council (EC) was held on November 27, 2018 and chaired by Prof Panjab Singh, President, NAAS. After a brief welcome by the President and before taking up the scheduled agenda of the EC, the Agricultural Science Congress (ASC) team, represented by Dr A.K. Singh, Organizing Secretary; Dr D.K. Yadava, Jt. Organizing Secretary and Dr (Ms) Shelly Praveen, Treasurer, XIV-ASC, gave an update to the EC about the status of preparations/progress of the ASC. All the issues including financial component of organisation of ASC were deliberated at length and wherever corrective measures were required, EC gave its suggestions. After this, the listed agenda were discussed in detail and approval accorded wherever necessary. Some of the important decisions included approval of members of the executive council, Fellows and associates for the year 2019; NAAS awards; NAAS programmes; Calendar of Activities scheduled for the year 2019; Consideration of the recommendation of NAAS Journal Scoring Committee and Felicitations of outgoing Office Bearers and Members of the Executive Council, 2018.

### 107th Meeting

The 107<sup>th</sup> meeting of the Executive Council of the Academy was held under the chairmanship of Prof Panjab Singh, President, NAAS on February 19, 2019. Dr J.K. Jena, Secretary, NAAS welcomed the participants, especially the newly elected office bearers and Executive Council members. He recorded the useful contributions of the outgoing EC members that enabled the Academy to successfully implement its mandated

activities. The President of NAAS, Prof. Panjab Singh extended a warm welcome to all EC members including new members Dr Brahma Singh and the ICAR Nominee, Dr Ch. Srinivasa Rao. He appreciated the approval of ICAR to use the new conferencing facility by the Academy to organise the XIV ASC. The EC expressed its satisfaction over the development and thanked the ICAR authorities for the gesture. Further, EC members also expressed their satisfaction on the scale of preparedness for this Congress and appreciated the concerted efforts being made by the core group. The notable decisions taken by the Executive Council included the Constitution of Sectional Committees for Election of Fellows / Selection of Associates for the year 2020, Constitution of New NASS Journal Score Committee for evaluation of Journals, approval of the proposed programme for AGM and approval for disposal of non-impact factor scientific journals received for NAAS scoring.

### Journal Score Committee

A meeting of the NAAS Journal Scoring Committee was held on June 4, 2018 in the NAAS Secretariat to deliberate *inter alia* on the issues concerning some journals which have been rated by NAAS but have been pointed out as potential predatory journals, in some communications to the Academy. After detailed deliberations, the following suggestions/ recommendations are made:



- Some additional criteria being used by UGC and other organization in respect of plagiarism, ethics, processing fee, percent of rejection of papers, peer review, etc. may be included for future NAAS scoring of the journals.
- A brainstorming session involving the NAAS Journal Score Committee and other experts from NAAS, UGC, CSIR, DST, DBT, etc. may be organized by the Academy to review the criteria of scoring of journals for the use in the new block year starting 2020.
- In order to ensure the adoption of good publishing practices by different publishers, Academy may organize a NAAS-PAAS interface workshop involving the professional societies and publishers for the needed capacity building.
- Appropriate parameter(s) may be included in the evaluation process to impose a check on inclusion of predatory journals in the list of NAAS scored journals in future.

The NAAS Journal Score Committee again met in the Academy's Secretariat on November 13, 2018 under the chairmanship of Dr. P.L. Gautam with Dr. Himanshu Pathak as Member Secretary for evaluation and finalization of NAAS Scores of nonimpact factor journals received in the Academy during 2018. After due evaluation and approval, the list of newly scored journals has been included in the existing list and a consolidated list of NAAS scored journals effective from January 1, 2019 have been uploaded on NAAS website.

It may be mentioned here that this exercise of scoring of journals was undertaken by the Academy primarily for critically assessing the published work of the nominees for Fellowship, Associateship and Awards of the Academy and for developing a transparent and quantifiable mechanism that brings uniformity in assessment.

### Meeting of the Conveners of Regional Chapters

A meeting of the Conveners of NAAS Regional Chapters and Office Bearers was held on the sidelines of XIV Agricultural Science Congress in Bharat Ratna C. Subramaniam Auditorium, a new ICAR conferencing facility, NASC Complex, New Delhi on February 22, 2019. The meeting was chaired by Prof. Panjab Singh, President, NAAS. The salient features of activities carried out during the year 2018-19 by various chapters was shared by the Conveners, besides the appraisal of programme to be undertaken during the financial year 2019-20. It was suggested that regional chapters should focus and develop strategies to create general awareness about the technical strength of NAAS at regional and national level. It was also reiterated to organize an annual meeting of the all Conveners preferably a day before the AGM of NAAS. The Conveners were requested to compile a directory of NAAS Fellows located in the states coming under the jurisdiction of their respective Chapters. It was also felt that some of the NAAS Policy/ Strategy Papers may be translated in the local language by regional chapters for large scale benefit of the stakeholders. A need to develop website of the respective chapter with hyperlink on the main NAAS website was also felt. The Conveners were requested to contribute an account of their activities that could be included in the NAAS-News on regular basis. The meeting ended with a vote of thanks to the Chair.

### **Consultancy Services by NAAS**

### Ranking Performance of ICAR Institutes: A Framework

The National Academy of Agricultural Sciences in the past had developed a proforma for rating of Agricultural Universities in the country and the same is being used by the Education Division of the ICAR. The ICAR requested the Academy to develop a suitable proforma for ranking its research institutions. Accordingly, a proposal was submitted from NAAS to the ICAR. The ICAR desired to have major focus on the point mentioned below:

- I. The type of research technology which can generate farm output significantly.
- II. The research work which can be transmitted quickly and easily.

- III. The research work which is less input-cost intensive and
- IV. Customised research work according to future agriculture market potential etc.

To prepare a suitable proforma, the President, NAAS constituted a Core Group with Dr J.C. Katyal, Convener; Dr B.S. Dhillon; Dr Arvind Kumar; Dr. B.Venkatesvarlu; Dr. R. K. Jain; Dr Rajender Parsad; Dr(Ms) Usha R Ahuja; Dr Sant Kumar; and Dr. A.K. Bawa. The Group held several in-house meetings and two brainstorming sessions at Hyderabad and Delhi. The final document on Ranking Performance of ICAR Institutes: A Framework has since been submitted to the Council.

### Policy Document on National Land Use and Soils

With an enhanced recognition of the fragility of natural resources and their significance in overall well-being of the mankind, public interest in restoration and maintenance of these finite resources has increased. With an unabated deterioration in soil health due to over-exploitation and neglect of science-led management, and a mounting pressure on finite land resources due to increase in population and substantial diversion of prime agricultural lands to non-agricultural uses in order to meet the requirements of other important sectors of economic growth, the need to rationalize the use of soil and land is more intensely felt now than ever before. The number of operational farm holdings increased from 71 million to 146 million during the period 1970-71 to 2015-16, due to fragmentation of farm lands. At present, about 86% of the farm holdings belong to marginal and small category. The per capita availability of land has decreased from 0.91 ha in 1951 to 0.19 ha in 2001, and is expected to be only 0.15 ha by 2050. Unless a mechanism is in place for constant monitoring and utilizing the land for different purposes, it would be difficult to sustain agriculture thereby jeopardizing food security and even leading to undesirable conflicts among stakeholders.

Keeping in view the necessity of a policy framework to suggest rational use of the soil and land resources, Department of Agriculture Cooperation and Farmers Welfare (DAC&FW), Govt. of India entrusted the National Academy of Agricultural Sciences responsibility to draft a National Soil and Land Use Policy. Accordingly, a draft policy framework is prepared that offers recommendations in the areas of policy measures, structural reforms, operational interventions and regulations for initiating appropriate action by the concerned agencies. The policy framework envisages efficient use of soil, land and water resources, so that their inherent use potential is handed over undiminished to the posterity.

This document will meet the expectations of the DAC&FW in devising soil and land use programmes for sustained growth and development of agriculture sector.

### **Programmes Planned for 2019**

The Academy organizes Brainstorming Sessions (BSS) each year on thematic areas of national importance related to Indian agriculture. For the year 2019, the Executive Council has approved the following programmes:

| No. | Title of BSS   | Convener/Co-Convener                         | Proposed date |
|-----|--|--|---------------|
| 1.  | Strategy Workshop on Uniform Policy for<br>Fish Disease Diagnosis and Quarantine       | Dr P.K. Sahoo                                | 29 Jan, 2019  |
| 2.  | Brainstorming Session on Enhancing<br>Science Culture in Agriculture Institu-<br>tions | Dr N.H. Rao                                  | 25 Jun, 2019  |
| 3.  | Brainstorming Session on Payment of Ecosystem Services                                 | Dr P.S. Birthal                              |               |
| 4.  | Brainstorming Session on Vertical<br>Farming   | Dr Brahma Singh                              | 11 Apr, 2019  |
| 5.  | Brainstorming Session on Big Data<br>Analytics   | Dr Rajender Parsad                           |               |
| 6.  | Brainstorming Session on Potential of<br>Non-bovine Milk                               | Dr M.S. Chauhan and<br>Dr Ashish Kumar Singh |               |

### FINANCIAL STATEMENT

The main source of generating funds for the Academy is Grant-in-Aid received from the Department of Agricultural Research and Education (DARE), New Delhi. During the year 2018-19, Grant-in-Aid of Rs. 136.0 lakh was received. The Accounts of the Academy are audited by Chartered Accountants appointed with the approval of the General Body. The Utilization Certificate for the year 2018-19 has been submitted to the DARE.

A brief Audited Statement of Accounts and Auditor's Report for 2018-19 is annexed with the report as Annexure I and II.

# ACKNOWLEDGMENT

The Academy gratefully acknowledges the Department of Agricultural Research and Education and the Indian Council of Agricultural Research (ICAR), Delhi for their continued support to the programmes, and for extending the financial support. The Academy also places on record the cooperation and support in terms of logistics provided by other organizations.

Academy's publication activities are largely due to the voluntary and honorary services of its Editor-in-Chief, Editors, Associate Editors, Advisory Board, NAAS Office Bearers and EC Members, large number of Reviewers who examine and provide comments and suggestions on the manuscripts sent to them for review. Our esteemed Fellows also contributed their services to other activities of the Academy such as Annual General Body Meeting, Scoring of Research Journals, critically examining the nominations for new Fellowship and Academy Awards, Agricultural Science Congress, Brainstorming Sessions, Strategy Workshops, Symposia and conducting Programmes on Public Lectures, Interaction Meetings, etc. The Academy gratefully acknowledges the services of Academy Fellowship and other staff involved in above activities during the year 2018-19.

### Annexure-I

### **AUDITOR'S REPORT**



VIRENDER K. GUPTA & CO. CHARTERED ACCOUNTANTS

M.C.D. BUILDING, D.B. GUPTA ROAD, PAHARGANJ NEW DELHI-110055 Contact: 9811142078, (O) 23583216 Email: vkguptaca14@gmail.com

### Independent Auditor's Report

TO,

THE MEMBERS, NATIONAL ACADEMY OF AGRICULTURAL SCIENCES NASC COMPLEX, DPS MARG,PUSA, NEW DELHI-110012

We have audited the attached Balance Sheet of National Academy of Agricultural Sciences, New Delhi as on 31<sup>st</sup> March, 2019 and the annexed Income and Expenditure Account for the year ended on that date. These Financial Statements are the responsibility of the management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with the auditing standards generally accepted in India. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatements. Our audit includes in the examining on a test basis, evidence supporting the financial transactions and disclosures in the financial statements. Our audit also included assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

### Emphasis of Matter

 Contingent Liability: Income Tax order passed U/s 143(3) of the Income Tax Act by the Income Tax Officer, Delhi of the trust for year ending 2015-16 (AY-2016-17) on dated 18-12-2018 raising the demand of Rs. 1,33,91,970/-.

Against the same, appeal have been filed before the CIT(A) Delhi and same is pending for hearing. Management is of the view that No Addition should sustain hence, No provisions is made against the demand. However, Rs.2678394/- have been deposited, against the grant of stay.

- GST have not been paid on the activities carried on by the XIV Agricultural Science Congress. Management has assured that due taxes should be paid shortly. Working is being made.
- TDS under Income Tax Act:- On the expenses incurred by the XIV Agricultural Science Congress has not been deducted and liability cannot be ascertained due to shortage of time. Management has started to calculate the due tax.
- Accounts are continuously maintained on "cash basis" however TDS by the banks, have claimed on accrual basis.
- 5. GST have to be paid on "accrual basis" while accounts are being maintained on "cash basis".



Subject to above we further report that:

- We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit.
- In our opinion, proper books of account, as required by law have been kept by the Academy, so far as it appears from our examination of those books.
- The Balance Sheet and the Income and Expenditure Account dealt with by this report are in agreement with the books of the accounts of the Academy.
- In our opinion, the Balance Sheet and the Income and Expenditure Account dealt with by this report, comply with the accounting standards, to the extent applicable.
- 5. In our opinion and to the best of our information and according to the explanations given to us, the said statements of accounts read together with notes thereon and documents annexed there to given a true and fair view:
  - i.) In the case of Balance Sheet, State of Affairs of the Academy as at 31<sup>st</sup> March, 2019
  - ii.) In the case of Income and Expenditure Account, of the excess of Income over Expenditure of the Academy for the period ended on that date arrived on the basis of Cash/Receipt basis of accounting as disclosed in the method of Accounting followed by National Academy of Agricultural Sciences.

For Virender K Gupta & Co. Chartered Accountants FRN: 0000198N

V.K. Gupta) Partner M.No.080585

Place : New Delhi Dated : May 21, 2019



### NATIONAL ACADEMY OF AGRICULTURAL SCIENCES

### Accounting Policies and Notes to Accounts Forming Part of the Balance Sheet as on March 31, 2019

1. Method of Accounting

The Academy is following cash basis of accounting. Income and Expenditure is therefore recognized on cash/receipt basis.

- 2. Investments
  - (a) The Academy has made investments as required to be invested under section 11(5) of the Income Tax Act, 1961 and value of the investments are shown at cost.
  - (b) Income from investments has been recognized on cash/receipt basis.
- 3. Fixed Assets and Depreciation
  - (a) Fixed Assets are stated at written down value less Depreciation calculated as per the rates of Depreciation provided in the Income Tax Act 1961, read with Rules made there under.
- 4. Income tax Provision and contingent Liabilities:
  - (a) The Income Tax Department has disallowed the claim of benefits of Rs. 3,91,85,233/u/s 11(2) towards accumulation of Income for specified purposes for the assessment year 2016-17 and raised a demand of Rs. 1,33,91,970/- after adjusting the refund claim of Rs. 32,90,177/-. An appeal against the disallowance of the claim of benefits u/s 11(2) has been filed before the Commissioner of Income Tax. Management is of the view that No Addition should sustain hence, No provisions is made.
  - (b) During the year under consideration a sum of Rs. 4,87,57,514/- is proposed to be accumulated u/s 11(2) of the Income Tax Act, 1961.

| 5. | Payments of Auditors           | 31/03/2019 | 31/03/2018 |
|----|--------------------------------|------------|------------|
|    | Audit Fee/GST Fee and expenses | 68,120/-   | 44,084/-   |

- 6. Others
  - a) The cost of Publications has been charged off in the year in which such expenditure is incurred.
  - b) The income from contribution from fellowship fee has been accounted for on cash basis.
  - c) During the financial year 2018-19, the Academy has received the Grant-in-Aid of Rs. 1,36,00,000/- from D.A.R.E. and the same has been utilized.
  - d) The necessary action to reconcile the defaults of Rs. 24,090/- as appearing on the Income Tax Website is still pending.



National Academy of Agricultural Sciences

Treasure

Secretary

Annexure-II

# NATIONAL ACADEMY OF AGRICULTURAL SCIENCES

# **BALANCE SHEET AS ON 31.03.2019**

| LIABILITIES   | AMOUN   | IT (Rs.)                         | ASSETS   | AMOUN                                   | T (Rs.)                            |
|---|---|----------------------------------|--|---|------------------------------------|
| CAPITAL FUND<br>Opening Balance<br>Add: Transferred from Accumulated Fund<br>Add: Excess of Income over Expenditure during the year<br>Less: Funds transferred to Specific Reserve Fund | 14,28,73,557<br>1,29,65,127<br>4,64,72,922<br>4,87,57,514 | 15,35,54,091                     | EIXED ASSETS<br>Opening Balance<br>Additions during the year<br>Write off during the year<br>Depreciation for the year written off | 2,26,11,616<br>10,91,272<br>(26,66,566) | 2,10,36,322                        |
| SPECIFIC RESERVE FUND<br>Opening Balance  | 11,81,27,669  |                                  | Deposits in Approved Securities  |   | 26,88,00,148                       |
| Add: Addition during the year<br>Less: Utilized during the year<br>ENDOWMENT FUND   | 4,87,57,514<br>1,29,65,127                                | 15,39,20,056                     | CURRENT ASSETS<br>Bank Balances  |   | 89,72,116                          |
| Copening Balance<br>Received during the year  | 20,00,000   | 20,00,000                        |  |   |                                    |
| CURRENT LIABILITIES<br>National Soil & Land Use Policy<br>Developing Proforma to Rank ICAR Institutions<br>Earnest Money (MM ACTIV)<br>Misc I jabitiv                                   |   | 8,29,210<br>5,45,506<br>5,00,000 | ADVANCES<br>Advances with NAAS Regional Chapters<br>Tax Deducted at Source<br>Payment to Income Tax Department (AY 2016-17)        |   | 3,89,079<br>94,78,957<br>26,78,394 |
| TOTAL   |   | 31,13,85,144                     | TOTAL  |   | 31,13,85,144                       |

Refer Notes Attached To and forming part of Accounts.

As per our report of even date attached

For Virender K Gupta & Co Chartered Accountants

ACRIM (V.K.Gupta)

(V.K.Gupta) Partner M.NO.-080585 Place: New Delhi Dated: May 21, 2019



NATIONAL ACADEMY OF AGRICULTURAL SCIENCES

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| EXPENDITURE                                      | AMOUNT (Rs.) | INCOME  | AMOUNT (Rs.) |
|--|--------------|---|--------------|
|  |              |   |              |
| To Expenditure towards NAAS activities           | 1,80,20,947  | By Grant-in-Aid from D.A.R.E.   | 1,36,00,000  |
| To Expenditure towards XIV ASC activities        | 1,45,45,089  | By Interest on Investment   | 3,64,08,158  |
| To Depreciation                                  | 26,66,566    | By Interest, Contribution from Subscriptions, Publications and Other receipts towards NAAS activities | 1,09,39,301  |
| To Excess of Income over Expenditure transferred | 4,64,72,922  | By Registration Fee, Sponsorship & Other Miscellaneous Income towards XIV ASC                         | 2,07,58,064  |
|  |              |   |              |
| Total:   | 8,17,05,523  | Total:  | 8,17,05,523  |
|  |              |   |              |

Refer Notes Attached To and forming part of Accounts.

As per our report of even date attached

For Virender K Gupta & Co Chartered Accountants

000 (V.K.Gupta)

Partner M.NO--080585 Place: New Delhi Dated: May 21, 2019



National Academy of Agricultural Sciences



### Annexure-III

### **EXECUTIVE COUNCIL**

| Position                 | 2018                     | 2019                  |
|--------------------------|--------------------------|-----------------------|
| President                | Prof Panjab Singh        | Prof Panjab Singh     |
| Immediate Past President | Dr S. Ayyappan           | Dr S. Ayyappan        |
| Vice-President           | Dr C.D. Mayee            | Dr T. Mohapatra       |
| Vice-President           | Prof A.K. Srivastava     | Prof A.K. Srivastava  |
| Secretary                | Dr J.K. Jena             | Dr J.K. Jena          |
| Secretary                | Dr Anil K Singh          | Dr Anil K. Singh      |
| Foreign Secretary        | Dr P.K. Joshi            | Dr U.S. Singh         |
| Editor                   | Dr V.K. Bhatia           | Dr V.K. Bhatia        |
| Editor                   | Dr Kusumakar Sharma      | Dr Kusumakar Sharma   |
| Treasurer                | Dr B.S. Dwivedi          | Dr R.K. Jain          |
| Member                   | Dr T. Mohapatra          | Dr Madhoolika Agrawal |
| Member                   | Dr K.C. Bansal           | Dr K.C. Bansal        |
| Member                   | Dr R.K. Jain             | Dr B.S. Dwivedi       |
| Member                   | Dr S.N. Jha              | Dr S.N. Jha           |
| Member                   | Dr Arvind Kumar          | Dr Arvind Kumar       |
| Member                   | Dr Ashwani Kumar         | Dr Ashwani Kumar      |
| Member                   | Dr V. Prakash            | Dr V. Prakash         |
| Member                   | Dr K.N. Ganeshaiah       | Dr Rajender Parsad    |
| Member                   | Dr S.K. Sanyal           | Dr S.K. Sanyal        |
| Member                   | Dr D.P. Ray              | Dr Brahma Singh       |
| Member                   | Dr R.K. Singh            | Dr R.K. Singh         |
| Member                   | Dr Chandrika Varadachari | Dr Rajeev K. Varshney |
| ICAR Nominee             | Shri Chhabilendra Roul   | Dr Ch. Srinivasa Rao  |

### **SECRETARIAT**

Dr Anil K Bawa, Executive Director Shri Miraj Uddin, Budget & Accounts Executive Ms. Minu Tiwari, Programme Executive Shri P. Krishna, Programme Executive Shri Umesh Rai, Programme Executive Shri Jai Singh, Office Management Jr. Executive Shri B.L. Yadav, Driver cum Office Assistant Shri Kamal Singh, General Office Assistant

# LIST OF ACRONYMS

| ACIAR       | Australian Centre for International Agricultural Research         |
|-------------|---|
| AFS         | Agriculture and Food System                                       |
| ASRB        | Agricultural Scientists Recruitment Board                         |
| BAIF        | Bharatiya Agro Industries Foundation                              |
| CAU         | Central Agricultural University                                   |
| CDDL        | Common Development and Distribution License                       |
| CSA         | Climate Smart Agriculture   |
| DAHD&F      | Department of Animal Husbandry, Dairying & Fisheries              |
| DAP         | Diammonium phosphate  |
| DARE        | Department of Agricultural Research and Education                 |
| e-NAM       | electronic-National Agriculture Market                            |
| FAO         | Food and Agriculture Organization of the United Nations           |
| FCO         | Fertilizer Control Order  |
| FMD         | Foot-and-mouth disease  |
| FPOs        | Farmers' Producer Organizations                                   |
| FRS         | Fellow of the Royal Society                                       |
| GADVASU     | Guru Angad Dev Veterinary and Animal Sciences University          |
| GDP         | Gross Domestic Product  |
| HAU         | Haryana Agricultural University                                   |
| ICAR        | Indian Council of Agricultural Research                           |
| ICAR-ATARI  | ICAR-Agricultural Technology Application Research Institute       |
| ICAR-CAZRI  | ICAR-Central Arid Zone Research Institute                         |
| ICAR-CIFA   | ICAR-Central Institute of Freshwater Aquaculture                  |
| ICAR-CIFE   | ICAR-Central Institute of Fisheries Education                     |
| ICAR-CIPHET | ICAR-Central Institute of Post-Harvest Engineering and Technology |
| ICAR-CSSRI  | ICAR-Central Soil Salinity Research Institute                     |
| ICAR-IARI   | ICAR-Indian Agricultural Research Institute                       |
| ICAR-IISR   | ICAR-Indian Institute of Sugarcane Research                       |
| ICAR-IIWBR  | ICAR-Indian Institute of Wheat And Barley Research                |
| ICAR-IVRI   | ICAR-Indian Veterinary Research Institute                         |
| ICAR-NAARM  | ICAR-National Academy of Agricultural Research Management         |
| ICAR-NAHEP  | ICAR-National Agricultural Higher Education Project               |
|             |   |
| ICAR-NDRI  | ICAR-National Dairy Research Institute                                     |
|------------|--|
| ICAR-NRRI  | ICAR-National Rice Research Institute                                      |
| ICAR-RCER  | ICAR-Research Complex for Eastern Region                                   |
| ICAR-VPKAS | ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan                      |
| ICT        | Information and Communications Technology                                  |
| INM        | Integrated Nutrient Management   |
| MIDH       | Mission for Integrated Development of Horticulture                         |
| MLM        | More from Less for More  |
| MSP        | Minimum Support Price  |
| NADRES     | National Animal Disease Referral Expert System                             |
| NGOs       | Non-Governmental Organisations   |
| NITI Aayog | National Institution for Transforming India Aayog                          |
| OIE        | World Organisation for Animal Health (Office International des Epizooties) |
| PMFBY      | Pradhan Mantri Fasal Bima Yojana   |
| PMKSY      | Pradhan Mantri Krishi Sinchai Yojana                                       |
| PRRS       | Porcine Reproductive and Respiratory Syndrome                              |
| PV         | Photovoltaics  |
| RESCO      | A Renewable Energy Service Company   |
| RKVY       | Rashtriya Krishi Vikas Yojana  |
| SASARD     | School of Agricultural Science and Rural Development                       |
| SAU        | State Agricultural University  |
| SDGs       | Sustainable Development Goals  |
| SFDs       | State Fisheries Departments  |
| SHM        | Soil Health Management   |
| STI        | Science, Technology and Innovation   |
| TIFAC      | Technology Information Forecasting and Assessment Council                  |

## NAAS Documents on Policy Issues\*

| 1.  | Agricultural Scientist's Perceptions on National Water Policy   | -1995  |
|-----|---|--------|
| 2.  | Fertilizer Policy Issues (2000-2025)  | -1997  |
| 3.  | Harnessing and Management of Water Resources for Enhancing Agricultural Production in the Eastern Region                          | -1998  |
| 4.  | Conservation, Management and use of Agro-biodiversity   | -1998  |
| 5.  | Sustainable Agricultural Export   | -1999  |
| 6.  | Reorienting Land Grant System of Agricultural Education in India  | -1999  |
| 7.  | Diversifcation of Agriculture for Human Nutrition   | -2001  |
| 8.  | Sustainable Fisheries and Aquaculture for Nutritional Security  | -2001  |
| 9.  | Strategies for Agricultural Research in the North-East  | -2001  |
| 10. | Globalization of Agriculture: R & D in India  | -2001  |
| 11. | Empowerment of Women in Agriculture   | -2001  |
| 12. | Sanitary and Phytosanitary Agreement of the World Trade Organization – Advantage India  | -2001  |
| 13. | Hi-Tech Horticulture in India   | -2001  |
| 14. | Conservation and Management of Genetic Resources of Livestock   | - 2001 |
| 15. | Prioritization of Agricultural Research   | - 2001 |
| 16. | Agriculture-Industry Interface: Value Added Farm Products   | -2002  |
| 17. | Scientists' Views on Good Governance of An Agricultural Research Organization   | -2002  |
| 18. | Agricultural Policy: Redesigning R & D to Achieve It's Objectives   | -2002  |
| 19. | Intellectual Property Rights in Agriculture   | -2003  |
| 20. | Dichotomy Between Grain Surplus and Widespread Endemic Hunger   | -2003  |
| 21. | Priorities of Research and Human Resource Development in Fisheries Biotechnology  | -2003  |
| 22. | Seaweed Cultivation and Utilization   | -2003  |
| 23. | Export Potential of Dairy Products  | -2003  |
| 24. | Biosafety of Transgenic Rice  | -2003  |
| 25. | Stakeholders' Perceptions On Employment Oriented Agricultural Education   | -2004  |
| 26. | Peri-Urban Vegetable Cultivation in the NCR Delhi   | -2004  |
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