ANNUAL REPORT 2019-2020



National Academy of Agricultural Sciences New Delhi

ANNUAL REPORT

2019-20



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

August 2020

PREFACE

It gives me great pleasure in presenting the Annual Report 2019-20 to the esteemed Fellowship, more so in the new normal of post COVID 19 scenario where the AGM is being held in a virtual mode for the first time ever. This report gives a brief account of the activities taken up by the Academy during the year and accentuates the role the Academy has played as a pro-active think-tank of the nation as far as the agriculture sector is concerned.

During the year, the Academy organized fourteen Brainstorming Sessions consisting of Strategy Workshops, Experts' meet and



Expert Consultations Meetings as well as lectures at national level on contemporary issues of Indian agriculture and brought out publications based on the recommendations from these events with action points for the Policy makers, Government, institutions of higher learning, farmers and other stakeholders. The Foundation Day Lecture of the Academy was delivered by Dr Peter Carberry, Director General, International Centre for Research in Semi-Arid Tropics, Hyderabad on *Can India's Success in Agriculture Benefit* Africa? in the afternoon of June 5, 2020 highlighting India's initiative to offer greater South-South Collaboration to support development pathways that will benefit African farmers and consumers. The Presidential Address on *Feeding 1.7 billion* was delivered by Prof Panjab Singh, President, NAAS in 26th AGM of NAAS in which he urged to set-up a national mission on precision agriculture including livestock & fisheries with a mandate to utilize cutting edge tools and technologies to ensure sustainable nutritional security for the 1.7 billion Indians by 2050. One of the salient initiatives during the year included release of a comprehensive compendium published by the Academy on Agricultural *Transformation – The Road to New India* authored by Prof R.B. Singh suggesting policy options and research priorities for transforming India's agri-food system with a human face. The regional chapters of NAAS organized several events to highlight major trends, issues and challenges of the region and create awareness about various activities of the Academy. The Academy played a very significant role in providing vital and timely inputs to many critical policy issues under active consideration of the Govt. All issues of the NAAS-News were published on time to keep the Fellowship updated quarterly about the events and activities of the Academy along with the NAAS Yearbook 2020 and NAAS Yearly Planner.

I place on record my gratitude to Prof Panjab Singh, Immediate Past President, NAAS; the NAAS Executive Council; Prof A.K. Srivastava, and Dr J.C. Katiyal (*w.e.f. 1.1.2020*) Vice-Presidents; Dr J.K. Jena, Immediate Past Secretary (*up to 31.12.2019*), Dr A.K. Singh, and Dr P.K. Joshi (*w.e.f. 1.1.2020*) Secretaries; Dr U.S. Singh, Foreign Secretary;

Dr Kusumakar Sharma, and Dr P.S. Birthal, Editors; and Dr R.K. Jain, Treasurer, for their guidance and contributions. A special word of thanks to Dr. Vijay Kumar Bhatia, Outgoing Editor and Dr. K.C. Bansal, Dr. Dr. S.N. Jha and Dr. R.K. Singh, outgoing EC members. I would like to thank Prof Anupam Varma, Editor-in-Chief of the NAAS journal, *Agricultural Research*, for his untiring efforts in bringing out all issues of the Journal on time. I am grateful to the Conveners of the regional chapters, brainstorming sessions and related events.

My sincere thanks are due to Colleagues in NAAS Secretariat, Dr. A.K. Bawa (*up to 31.12.2019*), Shri Miraj Uddin, Ms. Minu Tiwari, Shri P. Krishna, Shri Umesh Rai, Shri Jai Singh, Shri Kamal Singh and Shri Banwari Lal for effectively managing the day to day activities of the Secretariat. The financial and logistics support of the DARE and ICAR is gratefully acknowledged.

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(T. Mohapatra) President

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ABOUT THE ACADEMY

Inspired by the vision of late Prof B.P. Pal, FRS, the National Academy of Agricultural Sciences (NAAS) was established in the year 1990 to provide a forum for agricultural scientists from different disciplines including the crop husbandry, animal husbandry, fisheries, forestry, engineering and social sciences to deliberate on important issues related to agriculture and agriculture-based livelihoods, agricultural research, education and extension; and offer evidence-based inputs to policy makers and other stakeholders at various levels of governance. The Academy organizes and supports national and international congresses, conferences, seminars, symposia, workshops and brainstorming sessions on contemporary issues in the field of agricultural sciences, and articulates the concerns of agricultural research, education and extension 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 of 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 2019-20, following brainstorming sessions/strategy workshop/ consultation meetings were organized:

S. No	Title	Convener	Date
1.	Vertical Farming	Prof Brahma Singh, Dr T. Janakiram	April 11, 2019
2.	Loan Waiving versus Income Support Schemes: Challenges and way forward	Dr P.K. Joshi, Dr Anjani Kumar	June 24, 2019
3.	Enhancing Science Culture in Agricultural Research Institutions	Dr N.H. Rao	June 25, 2019
4.	Zero Budget Natural Farming- Myth or Reality	Dr H.S. Gupta	August 21, 2019
5.	Tropical Wilt Race-4 Affecting Banana Cultivation	Dr (Ms) Rashmi Aggarwal, Dr S. Uma, Dr R.K. Jain	September 25, 2019
6.	Payment for Ecosystem Services in Agriculture	Dr P.S. Birthal, Dr Saudamini Das	October 31, 2019
7.	Food Borne Zoonotic Diseases	Dr A.K. Srivastava	November 21, 2019
8.	Livestock Improvement through Artificial Insemination	Dr A.K. Srivastava	December 6, 2019
9.	Big Data Analytics in Agriculture	Dr Rajender Parsad	December 18, 2019
10.	Experts' Meet on Seed Policy	Dr D.K. Yadava	February 3, 2020

11.	Experts' Meet on Pesticide Management Bill-2017	Dr B.S. Parmar	February 4, 2020
12.	Roundtable Discussion on Regulatory Framework and Guidelines for Risk Assessment of Genome Edited Organisms	Prof N.K. Singh	February 6, 2020
13.	Experts' meet on Direct Benefit Transfer under Nutrient-based Subsidy Regime	Dr B.S. Dwivedi, Dr. J.P. Mishra	March 11, 2020

Brainstorming Session on Vertical Farming (Convener: Prof Brahma Singh and Dr T. Janakiram)

A Brain Storming Session on Vertical Farming (VF) was organized by the Academy on April 11, 2019 under the Chairmanship of Prof Panjab Singh, President, NAAS. The session was convened by Prof Brahma Singh, Former OSD (Hort.), Rashtrapati Bhawan, New Delhi and Dr T. Janakiram, ADG (Hort.), ICAR, New Delhi. Many experts/ scientists/planners, both from public and private sector, attended the session. Prof Brahma Singh presented the global status of available expertise on different facets of VF of vegetables, ornamental horticulture, micro greens, mushrooms, plant-nurseries, hydroponic-fodder, poultry, fisheries, orchids and herbs. He also highlighted the potential of this technology, especially for the urban and peri-urban areas. The consensus emerged on the following action points:



- 1. Vertical farming needs to be adopted in a wide range of Indian agro-ecologies through innovative research and development (R & D) and human resource development.
- 2. The technology requires perfection for all (small, medium, large and no farm holders), both in urban and rural areas. It needs to cover both high rise buildings and slum dwellers, under open as well as semi/fully controlled environment and with simple or sophisticated (LEDs, sensors, controlled environment etc.) technologies.

- 3. Promotion of human resource development (HRD)/ skill development of vertical farming requires due attention. Designing new academic courses for graduate and post graduate programmes focusing on increasing nutritional contents of produce/value addition is need of the hour.
- 4. Vertical farming including ornamental green walls needs to be promoted with all financial and technological support both from government and non-government organizations (including PPP model). Breeding and identification of varieties/ hybrids suitable for vertical farming in selected crops.
- 5. Initiation of systematic research on media, light requirements, organic inputs, sensors, robots, etc, using local materials to bring down the cost of vertical farming.
- 6. Designing cost effective structures for different type of vertical farming.
- 7. Use of non-conventional sources of energy like solar/wind power to meet the energy requirements of the system.
- 8. Research on pest management and safe production protocols for vertical farming.
- 9. Development of vertical farming models for fodder production under open fields as well as for promoting hydroponic green fodder production.
- 10. Promotion of cluster-approach for vertical farming to facilitate input availability and remunerative disposal/marketing of produce.
- 11. Vertical-walls/ bio-wall/ smart wall/food-walls, etc. should be promoted on large scale with required technology support especially in metro-cities and on major national highways.
- 12. Establishment of Centres for 'Innovative Horticulture' to promote emerging technologies in vertical farming.
- 13. Prioritization of crops for each category of vertical farms (open vertical, semiautomated and fully- automated) should be initiated.

The Academy published the proceedings of this session as Policy Paper 89.

Brainstorming Session on Loan Waiving versus Income Support Schemes: Challenges and Way Forward (Convener: Dr P.K. Joshi and Dr Anjani Kumar)

In recent years, loan waivers have emerged as the prominent policy instrument for addressing the issue of agrarian distress in India. The expansion of the loan waiver policy and the emerging income support schemes has prompted serious discussions and commentaries in the on-going economic and policy discourses in India. In view of the seriousness and complexity of these issues, the National Academy of Agricultural Sciences (NAAS) organized a one-day Brainstorming session on *Loan waiving versus income support schemes: Challenges and the way forward* on 24th June 2019 to deliberate on the efficacy of loan waivers in detail and explore the other alternative options to deal with agrarian distress efficiently and effectively.



Brainstorming Session on Loan Waiving versus Income Support Schemes: Challenges and Way Forward in progress

The session was Chaired by Prof Panjab Singh, President of NAAS and attended by a galaxy of eminent scholars, policy makers, and farmers' representatives. Besides the presentation of the base paper by Dr P.K. Joshi and Dr Anjani Kumar, the presentations by other experts included the efficacy of farm loan waivers, advantages and challenges of income support schemes and farmers' perspective on agricultural subsidies, loan waiving and income support. Several policy options and strategies were proposed to support farmers and ensure sustainable and inclusive agricultural growth in India. Important recommendations, which emerged during the deliberations, are given below:

- 1. Differentiated strategies to be evolved to cater to the needs of different categories and regions of farmers
- 2. Strengths, weaknesses, opportunities, benefits and threats need to be clearly analysed before announcing the loan waiver schemes
- 3. Route of loan waiving should be exercised very cautiously, and it can be announced only in case of really distressed situation
- 4. Emphases on assured markets, prices and risk aversion plans are must
- 5. Direct income support is a better option, but adequate preparation is needed to ensure its efficiency and effectiveness
- 6. Direct income support should not come at the cost of long-term investment in agriculture and, therefore, a fine balance between short term and long-term measures is required
- 7. More emphasis is required on market driven agricultural technologies for better adoption, better productivity, better returns, and ultimately of higher farmers' income
- 8. Structural reforms in land, labour, credit and commodity (inputs and outputs) markets are required for long term sustainable agricultural growth
- 9. Empirical evidences suggest that popular measures such as loan waiving schemes are neither rewarding economically nor politically. Therefore, we must desist from announcing such measures.

The Academy published the proceedings of this session as Policy Paper 91.

Brainstorming Session on Enhancing Science Culture in Agricultural Research Institutions (Convener: Dr. N.H. Rao)

A Brainstorming session on *Enhancing Science Culture in Agricultural Research Institutions* was organized at the Academy on June 25, 2019. The session was Chaired by Prof Panjab Singh, President, NAAS and Convened by Dr N.H. Rao to address recent concerns about aligning the science culture in public agricultural research institutions towards research of higher quality, relevance and impact. Dr Rao provided a perspective on the evolution of science culture to present times in institutional contexts, and proposed a framework for enhancing the science culture defined by its core attributes, and the drivers of change for agricultural research. The following key points emerged from the discussions:



- 1. Science culture can be defined in terms of its three core attributes research integrity, scientific creativity, and scientific integrity.
- 2. Science culture needs to be nurtured, not managed through a joint effort by individual scientists, research institutions and external stakeholders to ensure and sustain it in research organizations.
- 3. The agricultural research needs to be not only interdisciplinary but also a convergence of all the four paradigms of science (*theory, experiment, modelling and simulation, and data driven knowledge discovery*), with the co-evolution of problems and solutions in continuous cycles with feedbacks programmed into the research and technology transfer processes. Research institutions can be an ideal ecosystem for scientific creativity and innovation, provided the leadership prioritizes the creation of such a working environment.
- 4. Traditional passive apprenticeship model of nurturing young researchers by association with established research groups and mentors over extended periods is not sufficient in the current context of institutional expansion, research needs, and multiple demands on both mentor and mentee's time.
- 5. Present personnel policies and performance evaluation systems encourage side stepping questions of research relevance, research and scientific integrity, and scientific creativity in pursuit of short term career objectives.

Keeping the above in view, enhancing the science culture in agricultural research institutions requires fast tracking active adoption of research integrity practices, scientific

creativity and continuous learning, a scientific integrity policy code of conduct for access and use of scientific information and knowledge for public policy, improving science communication and performance evaluation, recruitment, and incentive systems to reflect on research excellence, quality/ rigour, creativity, learning, risks/uncertainties, and intellectual and innovation impact from the research.

The Academy published proceedings of the session as Policy Paper 93.

Brainstorming Session on Zero Budget Natural Farming-Myth or Reality (Convener: Dr H.S. Gupta)

Taking note of the recent concerns from various corners on the issue of promoting Zero Budget Natural Farming (ZBNF) as a new/alternate technology for sustainable agriculture growth and also climate change management, the National Academy of Agricultural Sciences (NAAS), New Delhi organized on August, 21 2019 a Brainstorming session on the subject, chaired by Prof Panjab Singh. About 70 experts representing scientists across disciplines and organizations, policy makers, industrialists (*fertilizer, chemicals and pesticide, seeds*), Government Departments, NGOs, farmers and other stakeholders participated. After day-long marathon deliberations, the following recommendations emerged:



- 1. The Academy endorses that India will have to prevent overuse and promote efficient use of chemicals as well as integrated nutrients (*chemical and non-chemical based fertilizers*) or pesticides (*bio-pesticides*) for minimizing pollution and soil degradation for productive agriculture.
- 2. The Academy recognizes that the concept of Natural Farming is very old. It is to be realized that Indian food grain requirement cannot be supplemented through technologies which do not have the productivity potential, already achieved. There is no rationale in compromising in the name of unproven eco-safe claims on promoting or evaluating a technology that is bound to reduce productivity of food grains below the current level and jeopardizing the nation's hard earned food security.
- 3. Agricultural production is based on the natural resources and balanced nutrient inputs along with plant protection technologies against biotic and abiotic stresses

as required by a crop based on location and production system. There cannot be a single recommendation, ZBNF notwithstanding, which fits every location and production system in agriculture belying the science-led differentiated and disaggregated approach.

- 4. The Academy has reviewed the protocols and the claims of the ZBNF methodology and it was concluded that scientifically the protocol had no logical explanation or a technically definable basis for it to be considered as a feasible technological option in current agriculture. The scope of feeding the plants their requirements to maintain current productivity does not exist through the protocol of ZBNF/ SPNF being proposed.
- 5. The data points measured during the validation process of the ZBNF technology being carried out by Indian Council of Agricultural Research and State Agricultural University have shown up that it is a non-starter for better farm income per unit area.
- 6. The survey in Karnataka among already established ZBNF farmers by ICAR has brought out that the farmers have already adopted the use of farm yard manure/ compost/vermicompost, etc., all of which are prohibited in the protocol, and consequently, cannot be considered a validation of adoption of ZBNF.
- 7. India's agricultural success has essentially been due to the quality seed of new improved varieties replaced periodically as and when newer varieties are bred. Therefore, in crops like rice, wheat, bajra, maize, mustard, chick pea, arhar, mung, etc., the productivity increment has been more than doubled over the traditional varieties. The ZBNF bans the high yielding new varieties and only recommends traditional varieties or land races. The Academy recognizes that this shall be the biggest undoing of the phenomenal success achieved by Indian Agriculture, if all the production zones of the country were to adopt ZBNF with traditional varieties (whose genuine quality seeds are not available in bulk). This is likely to result into a significant drop down of the national food grain production over the years, and with increasing pressures of climate change may even drop below the half mark, landing the nation into scenarios of severe food shortages.
- 8. While the current projects by the *NITI Aayog* on validation of the technology or survey of impact on agriculture may be taken to its logical conclusion, it is the firm opinion of the Academy that promoting technologies which essentially rely on crop varieties that have inherently low yield potential would be detrimental to the India's resolve of meeting the SDGs, especially 1 and 2, as well as meeting the aim of doubling farmers' income.
- 9. The food grain produced from traditional varieties, that too under low nutrient inputs, will be characterized by low nutrient uptake-led low productivity per unit area. For example, the protein harvested from the crop will be directly affected because of low nitrogen availability under ZBNF, further reducing the already low grain protein content in the traditional varieties as can be visualized in the case of wheat. A traditional wheat variety with less than 2 tons/ha potential

will provide less than 200-250 kgs of protein per hectare under ZBNF, while the improved wheat varieties under recommended fertilizer dose shall be producing 450-700 kgs/ha of protein. The country cannot afford to compromise on the nutrient supply needed to overcome the silent hunger and the unethical perpetuation of high concentration of stunted and wasted children and anaemic mothers.

10. In conclusion, the Academy is of the considered opinion that there is no scope for an incremental value gained by the farmer or the consumer through ZBNF that represents one of the many such practices followed in India prior to the 1960s when no more than 60 million tons of food grains were produced, making ZBNF a technology that lacks rationale or acceptability as a production technology. Therefore, it is recommended that the Government of India should not needlessly invest capital, efforts, time and human resources towards promoting the ZBNF on the grounds of technical infeasibility for India to explore this unproven and unscientifically proposed technology.

The Academy published the proceedings of this session as Policy Paper 90.

Brainstorming Session on Tropical Wilt Race-4 Affecting Banana Cultivation (Convener: Dr (Ms) Rashmi Aggarwal, Dr S. Uma and Dr R.K. Jain)

The Academy organized a BSS chaired by Prof Panjab Singh on September 25, 2019 on the topic *Tropical Race 4 Affecting Banana Cultivation* to understand the etiology and devise suitable management strategies against the virulent strain of *Fusarium* wilt of banana. The session was co convened by Dr Rashmi Aggarwal with Dr S. Uma and Dr R. K. Jain.





Dr R.K. Jain while presenting the genesis of the BSS, mentioned about a few silent intruders or invasive pests in the recent past affecting field and horticultural crops. He expressed his concern about the sudden epidemic of *Fusarium* wilt of banana in parts of UP and Bihar in 2017, which has been attributed to tropical race 4 (TR 4) that needs further confirmation. Dr Rashmi Aggarwal presented the global status of *Fusarium* wilt

of banana encompassing history of *Fusarium* wilt, race profiling and their distribution, epidemiology and management including global initiatives. This was followed by several other presentations by the experts. The key action points that emerged are:

Immediate

- 1. A networking project needs to be formulated on *Fusarium* Wilt of banana to assess distribution profile of the disease, to develop methodology for race identification and to devise suitable management options including GM technology. For this, funding from National Agricultural Science Fund or DAC, Govt. of India may be explored (**Action: NRCB / IARI**).
- 2. Policy guidelines to contain the disease need to be formulated, such as,
 - (i) Take only one crop of banana in disease prone areas
 - (ii) Field sanitation by burning diseased plant debris
 - (iii) Use of certified planting material and hardening by the producer company in coco- pit or solarite with amendment (Action: NPPQS).
- 3. Field sanitation must be strictly implemented. Destroy the harvested plants. Diseased plant debris should also be burnt.
- 4. Soil amendments used for disease management should be tested at multi locations.

Long-term

- 1. Regular disease monitoring in banana growing areas involving tissue culture companies and Krishi Vigyan Kendras. Remote sensing using drones could also be deployed for disease monitoring.
- 2. Race identification and distribution in banana growing areas to demarcate disease free areas. Training courses on advanced technologies for race identification need to be arranged in well equipped labs for the scientists engaged in Foc wilt research.
- 3. ICAR-FUSICONT technology (bio-formulation using the eco-friendly effective antagonistic microbes on unique IPR protected bio-media with the defined protocol of application) needs to be validated in larger area. For managing *Foc* TR4, major emphasis needs to be given on the development of resistant cultivars with International collaboration. Develop suitable integrated disease management options including genetically modified technologies.
- 4. Epidemiological study should be conducted on pathogen survival in the soil, role of irrigation on the disease spread in scientific manner.
- 5. Pathological determinants for *Foc* TR4 need to be identified.

The Academy published the proceedings of this session as Policy Paper 92.

Brainstorming Session on *Payment for Ecosystem Services in Agriculture* (Convener: Dr P.S. Birthal and Dr. Saudamini Das)

A Brainstorming session was organized on Payment for Ecosystem Services in Agriculture on October 31, 2019 by NAAS to explore its potential to add to the existing system of incentives to agriculture. The session was convened by Dr P.S. Birthal, ICAR National Professor, National Institute of Agricultural Economics and Policy Research, New Delhi, jointly with Dr Saudamini Das, NABARD Chair Professor, Institute of Economic Growth, New Delhi. The session was chaired by Dr A.K. Srivastava, Vice President of the Academy and was attended by eminent agricultural economists and scientists. Dr Birthal highlighted the likely benefits from a change in existing system of Government incentives in agriculture to a regime of incentives based on the values of the ecosystem services provided by agriculture. Besides a presentation on the concept of payment for ecosystem services and a framework of their valuation by Dr Saudamini Das, a few more papers on specific ecosystem services were presented by the experts. Agri-ecosystems offer valuable non-market services to the Society, such as climate regulation, water purification, managing surface water flow, maintaining groundwater level, assimilation and breakdown of wastes, conservation of bio-diversity, nutrient recycling, etc. The expert discussion led to the following conclusions.



- 1. The Government incentives (*output support prices and input subsidies*) that helped boost agricultural productivity and food supplies have led to damage to natural capitals, sustainability of production systems, and social equality, and need to be repackaged as *payment to ecosystem services*.
- 2. Agricultural systems are undervalued because of a lack of reliable data on their invisible services, especially on scientific parameters against which ecosystem services are to be valued. It is suggested that a few inter-disciplinary research platforms including biological scientists and economists may be formed to identify key ecosystem services from agri-space and generate reliable scientific parameters for putting monetary values on the ecosystem services.
- 3. From policy perspective, valuation of ecosystem services will provide an empirical basis for devising regionally differentiated income support systems for farmers.

The present income supports or incentives to farmers are arbitrarily decided for a political economy perspective, ignoring largely the ecological concerns.

- 4. The system of payment for ecosystem services is likely to create a competitive market. In the existing WTO regime there are frequent allegations and counterallegations by member countries on market support provided to agriculture through output price support and input subsidies. The policy regime based on ecosystem services complies with *green box* provision of WTO.
- 5. Finally, the payment for ecosystem services will create incentives for the adoption of technologies and practices that contribute towards conservation of natural capital, i.e., land, water, forests, etc. And, it is likely that such compensation may cause reduction in cost of production, and improvements in farm profits. This will also lead towards improving quality of food and other agricultural commodities contributing to better human health, nutrition and labour productivity.

Strategy Workshop on *Food Borne Zoonotic Diseases* (Convener: Dr A.K. Srivastava)

A Strategy Workshop on *Food Borne Zoonotic Diseases* was organized by NAAS on November 21, 2019. The workshop was convened by Dr A.K. Srivastava, Vice President of Academy, chaired by Prof R.B. Singh, Past-President, NAAS and attended by many eminent experts. The presentations made by experts highlighted the threat of Food borne zoonotic diseases (FBDs) to public health, cause huge morbidity and mortality, pose obstacles to socio economic development and international trade worldwide. However, lack of accurate epidemiological data on incidence and cost of FBDs, particularly in the developing countries has delayed the setting up of suitable policies and allocation of resources to mitigate the spread of FBDs. Since the risk of food borne illness has been rising at an alarming pace during the last two decades due to factors such as globalization of food supplies, increased international travel, pathogen behavior and rapid growth of population with demographic shift towards an aged group of inhabitants, preventing illness and death through FBDs remains a major public health challenge across the globe. The salient recommendations of the workshop are as under:



- 1. Implement integrated *One health* approach to food safety throughout the food chain from *Farm to fork* to prevent FBDs by developing a close network involving veterinarians, microbiologists, medicos, environmentalists, food industry and most importantly consumers. Since the food borne diseases and their causative agents differ between the regions, preventive approach should be tailor-made to each region at national or global levels.
- 2. Strategic key interventions such as Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP), Good Agricultural Practices (GAP) and most importantly "HACCP" regulations need to be uniformly and strictly enforced in the food industry at all stages of food production (initial stages of production to the finished product).
- 3. For control and prevention of food borne zoonotic diseases, it is essential to identify priority zoonoses for appraisal of their risk assessment as well as strengthening of effective disease surveillance systems including strategies for trans-boundary disease monitoring by participation in global disease intelligence systems such as Global Outbreak Alert and Response Network (GORAN) of WHO, Emergency Preventive System for Trans-boundary Animal Diseases (EMPRES) of FAO and GLEW (Global Early Warning Systems) of OIE.
- 4. It is time that a national plan is made and law-enforcement of food safety standards based on risk assessment done more effectively to address the issue of Food Borne Zoonotic Diseases.

Brainstorming Session on *Livestock Improvement through Artificial Insemination* (Convener: Dr A.K. Srivastava)

A brainstorming session on *Livestock Improvement through Artificial Insemination* was organized by the NAAS on December 6, 2019. The workshop was convened by Dr A.K. Srivastava, Vice President of Academy and chaired by Prof R.B. Singh, Past-President, NAAS. Dr Srivastava highlighted the several strides made by Indian livestock sector in recent past, the visibility of which is very much evident from dairy production. In this context, he mentioned that analysis of milk production based on animal population-based increase and animal productivity-based increase indicated that a significant



portion of enhancement in milk production was contributed by scientific advancements in the technologies of breeding, feeding and management led by application of artificial insemination. Discussants also pointed out that although there were 130.5 million breedable cattle and buffaloes in the country during 2017-18, the total AIs done were 75.6 million with an overall AI coverage and conception rate as 29.7% and 35% only, respectively. It was indicated that, in spite of possessing huge AI network, the coverage of AI is still far less and uneven across states than required. Some of the factors limiting AI coverage highlighted by experts included lack of proximity of AI service to farmers; lack of availability of timely and quality AI service at the doorstep as well as poor fertility and conception rates in animals covered by artificial insemination. The following recommendations and conclusions emerged from the BSS:

- 1. Poor conception rate is one of the major reasons for poor adoption of AI by farmers. In the given situation, genetic improvement of Indian livestock through AI could be achieved by (i) extensive use of semen from high genetic merit and high fertile bulls (ii) expanding the AI to entire breedable bovine population and to non-bovine species and (iii) improving the conception rates with AI.
- 2. Regarding increasing the coverage of AI in other food producing animals, priorities should be given to expand the AI coverage to small ruminants and pigs. With the developments in technologies and establishment of several commercial units, it is high time for concerted efforts to expand the realized benefits of AI in bovines to these species by technological backstopping and establishment of an effective AI delivery mechanism.
- 3. It is imperative to shift to *Technology based semen quality control tests* from the *Traditional semen analysis*.
- 4. Increasing the number of skilled AI technicians is the need of the hour. A mechanism should be in place for rigorous training of AI technicians. Next generation AI delivery systems should ensure timely services at farmers' doorsteps, maximize efficiency (*penetration rates, conception rate, data retrieval, etc.*), abide to breeding policies and goals of respective state, and be cost effective. Several protocols have been developed and/or modified to allow timed inseminations so as to circumvent the practical difficulties associated with oestrus detection. Some of the protocols have advantage of synchronizing ovulation as well and they can be applied on large scale to improve the fertility in dairy animals.

Brainstorming Session on *Big Data Analytics in Agriculture* (Convener: Dr Rajender Parsad)

A brainstorming session on *Big data Analytics in Agriculture* was organized by National Academy of Agricultural Sciences on December 18, 2019 under the chairmanship of Prof Panjab Singh, President, NAAS. The session was convened by Dr Rajender Parsad and well attended by the researchers from several Institutions of ICAR, CSIR, NIC, DST, CGIAR and representative from industry.



Dr Rajender Parsad presented the historical and current perspective of the term big data, sources of data in agriculture and its management, ICAR Research Data Repository for Knowledge Management, data availability in KRISHI portal, AICRP information systems, potential applications of big data analytics in agriculture such as in phenomics, bioinformatics, high throughput field phenotyping, faster technology development and adoption, precision agriculture, mega environment mapping of crops, crop planning, location specific advisories, personalized advisories to the farmers, quality assessment of produce, block chain for traceability, certification, international trade for food products, expected growth in data size, advances in data analytics and statistical issues. Subsequently eight other presentations were also made on Big data in Government, Integrated hybrid analytic platform for sustainable farm management, Big data analytics in agriculture: Industry perspective, Big data analysis in bioinformatics, Big data analytics: CGIAR perspective, Big data: value chain analytics towards doubling farmer income, Smart data powered farming, etc. The following key points emerged from the panel and open house discussions during the session:

- 1. Establish an Innovation Centre/ Center of Excellence for Big Data Analytics in Agriculture with adequate funding and trained manpower for facilitating the collaborations and working of multidisciplinary teams.
- 2. A National Seminar should be organized to brainstorm and identify use cases, prioritize potential areas to work upon and draw future roadmap. Everyone from private, public, Government, international organizations should be brought on board. Some applications such as providing location specific on-time and data driven information/advisories, crop mega environment mapping, crop planning, predicting phenology, generation of sowing schedules and contingency plans, etc. using AI /ML may be developed.
- 3. ICAR Research Data Management initiative should be strengthened on a continuum basis incorporating ontologies wherever feasible. Standard Operating Procedures/Community of Practices (SOPs/COPs) should be developed on defining data standards, interoperability protocols, security and privacy concerns; data capture, data storage, data transformation and data analytics along with suitable data governance mechanism and technical and business metadata management

framework. There is also a need to develop standards and frameworks to harvest data from various data assets and identified sources within country.

- 4. National Open Data Framework should be established with metadata catalogue of all the major potential shared entities along with matrix for cross linking metadata that is available across the NARES community. The framework for *Labeling* for any image or video streaming data collection should also be initiated with a central server as a repository.
- 5. Efforts should be made to establish AgTech innovation center in Public-Private-Partnership mode on the lines of AgTech Unit being established by North Carolina State University in collaboration with SAS Institute Inc along with other stakeholders. Ready use cases such as devices for monitoring the tail movement of cows for timing the artificial insemination for female calf birth as in Netherlands to be explored and rolled out for pilot studies in India under the AgTech Innovation Center.
- 6. Big data analytics, Artificial intelligence, etc. would require prescriptions from experimental data as an integral component of agricultural research and to understand biological system. Therefore, judicious blend/ amalgamation of experimental data, traditional survey data, historical data along with data from IoTs, drones, remote sensing, smart phones, crowd sourcing, administrative data, Government data, etc. needs to be thought of.
- 7. Identification of relevant sources and quality data from historical data sets from research, socio-economic, markets, live streaming data sets from sensors, robotics, satellite imageries, etc. needs attention. Bringing data from silos to useable and shareable, machine readable formats is the key concern. Understanding the problem under context and selection of appropriate analytical techniques are going to be key factors for successful applications in agriculture
- 8. Establish/strengthen Big Data Analytics platform for data management including data fabric, persistent memory servers, forgetting insights, etc. Cloud based computing wherein services can be used based on requirement should be the way forward. Available infrastructure and resources in Government such as Meghraj, ICAR Data Centre, ASHOKA, Open Government Data Platform should be exploited, used and strengthened for the purpose.
- 9. System dynamic approach to be used to understand the system as a whole (*soil, water, crop, weather, socio-economic, associated environment etc.*) and derive useful information for crop management. Integrated hybrid analytic platform should be established to understand the dynamics of ecosystems in agriculture.
- 10. Capacity building of the human resources on big data analytics is essential and needs to be further strengthened.

Experts' Meet on Seed Policy (Convener: Dr D.K. Yadava)

The Ministry of Agriculture and Farmers' Welfare has drafted the *Seed Bill, 2020* and placed it in the public domain for inviting suggestions from various stakeholders. The Bill aims

to regulate the seed industry in India and ensure the welfare of farmers through regulating the prices of hybrid seeds, seed certification, and accountability of seed companies if seeds don't perform according to the expectations, etc. Since seeds occupy a paramount importance to scale up agricultural outputs, food security, livelihood and innovation, the NAAS organized an Experts'



Meet on *Seed Policy* on February 3, 2020 at NASC Complex, New Delhi by inviting all stakeholders to express their views and provide inputs for the proposed Draft Seed Bill 2020 being examined by the Parliament. The meeting was chaired by Dr Trilochan Mohapatra, President. Dr D.K. Yadava, ADG (Seed) and convener of the meet gave a brief account of the background of the *Seed Bill* and various developments that has taken place since it was conceived in the year 2004. The salient recommendations that emerged include formation of a National Authority to deal with all seed related issues, development of a fool proof data system through National Agricultural Research System, harmonization of existing Acts on seed and germplasm, provision to encourage the new developments by use of cutting edge technologies, facilitate seed exports, enhance share of Indian seed industry in international seed market and prescribe graduation in agriculture as minimum qualifications for seed dealers.

The detailed recommendations have been forwarded by the Academy to the Ministry of Agriculture and Farmer's Welfare for consideration to add further value to the *Draft Seed Bill* 2020.

Experts' Meet on Pesticide Management Bill-2017 (Convener: Dr B.S. Parmar)

An Experts' Meet on Pesticide Management Bill, 2017 was organized by NAAS on February 4, 2020, to seek views from various stakeholders and brainstorm over the points of concern proposed in the Bill under the chairmanship of Prof R.B. Singh,



former President, NAAS before it is put to the Cabinet Committee on February 12, 2020. The session was convened by Dr B.S. Parmar, Fellow, NAAS and former Joint Director (Research), IARI New Delhi. Representatives from the industry, namely Crop Life India, Crop Care Federation of India, Pesticides Manufacturers and Formulators Association of India, besides present key officials/ experts from both the public and private sectors, and autonomous research and academic bodies like ICAR, ICMR, and NAAS participated in the meeting. The Convener highlighted salient provisions of the Bill *visavis* the Insecticides Act, 1968, and made some suggestions for initiating the discussion followed by presentations by the representatives of industry associations and individuals.

The key points of discord were identified that include vague definition of the terminologies used, discrepancies in the scope, lack of provision for encouraging indigenous research and development for newer technologies and molecules, bottlenecks in the registration process, data protection, quality of test laboratories, manpower, testing and analysis, spurious pesticides, punishments, lack of provisions on workers' safety, bio-pesticide quality, crop groupings and their importance, resistance management, malpractices by inspectors, other officials and test laboratories etc. A small committee of NAAS fellowship comprising Drs B.S. Parmar, Gita Kulshreshtha, and Anupama Singh was constituted to study, analyse and authenticate the issues and prepare a policy brief to address the concerns related to the draft Bill.

Roundtable Discussion on *Regulatory Framework and Guidelines for Risk Assessment of Genome Edited Organisms* (Convener: Prof N.K. Singh)

In the wake of the recent developments in the field of Genome Editing Technologies, a need was felt to bring out some guidelines. DBT had prepared draft guidelines on *Genome Edited Organisms: Regulatory Framework and Guidelines for Risk Assessment* accommodating applicable laws, Acts, and procedures governing Genome Editing, general considerations and tiered approach for risk assessment of genome edited organisms and products derived thereof, regulatory approval road map, data requirement for risk assessment and institutional mechanism for governance and oversight. The Department of Biotechnology (DBT) invited comments on the draft from



researchers/institutions and other stakeholders. Accordingly, a roundtable discussion involving a range of stakeholders including Fellows of the Academy, representatives from seed industry, progressive farmers and other relevant experts was organized by NAAS on February 6, 2020 to give its feedback to the Ministry on the proposed draft. The discussion was co-chaired by Dr T. Mohapatra, President, NAAS and Dr R.S. Paroda and Dr R.B. Singh, past-Presidents of the NAAS. The group unanimously resolved to submit the following key points for consideration by the DBT:

- 1. There is a need to have separate guidelines for genome edited plants by exempting them from regulation and risk assessment within the existing provision under Rule 20 of the *Rules for the manufacture, use, import, export and storage of hazardous microorganisms / genetically engineered organisms or cells, Rules 1989.*
- 2. For commercial release of the final product, which is devoid of any foreign DNA, evaluation for trait efficacy and field performance should be carried out as per the ICAR-AICRP protocol, and release and notification as per the legislations for seed quality regulations (*Seeds Act 1966, Seeds (control) order 1983, Seeds Rules, PPVFRA Act 1986, National Seed Policy and the proposed New Seeds Bill*).
- 3. The NAAS may play a key role in facilitating dialogues and communications with the general public, policy makers and farmers about the tremendous benefits offered by the new genome editing technology and related safety issues in a simplified manner.
- 4. Since India has already made good investment in the area of genome editing, it will be prudent to create a policy environment that enables use of such technologies by scientists and students in the country for achieving sustainable food, nutritional, and income security and ultimately meeting the SDGs.

Experts' meet on *Direct Benefit Transfer under Nutrient-based Subsidy Regime* (Convener: Dr B.S. Dwivedi and Dr J.P. Mishra)

An Experts' Meet on *Direct Benefit Transfer under Nutrient-based Subsidy Regime* was organized by the Academy on March 11, 2020 to discuss challenges and complexities associated with Direct Benefit Transfer (DBT)/Direct Cash Transfer (DCT) of fertilizer



subsidy. The meet convened jointly by Dr B.S. Dwivedi, Head, Division of Soil Science and Agricultural Chemistry, ICAR-IARI, New Delhi and Dr J.P. Mishra, OSD (PPP), ICAR, New Delhi, was chaired by Dr T. Mohapatra, President, NAAS. Representatives from ICAR, Department of Fertilizers, GoI, CGIAR, fertilizer industry and farmers' organizations attended the event. The convenors flagged the issues for discussion to seek opinions of the stakeholders, which was followed by a panel discussion chaired by Shri J.N.L. Srivastava, Ex-Secretary, GoI and co-chaired by Dr Chhabilendra Raul, Secretary, Department of Fertilizers. It was pointed out that the Government of India initiated DBT for disbursement of fertilizer subsidy in the year 2018. However, the subsidy is still not transferred directly to farmers, but rather being disbursed to fertilizer industry on real-time sale basis. The group was of the opinion that implementation of DBT/DCT of fertilizer subsidy is complex, involving several challenges such as the identification of beneficiaries, entitlements for subsidy, limited digitization of land records, differential rate of subsidy across different types of fertilizers, etc. The following key recommendations emerged out of the deliberations:

- The effective implementation of DBT requires identification of beneficiaries for fertilizer subsidy, thus the need to define the beneficiary, that is, land owner or cultivator. The definition proposed by National Commission on Farmers, 2006 may be considered for this purpose. The issue of tenancy also needs to be addressed by the states by enacting tenancy act and updating existing laws based on the Model Act on Agricultural Land Leasing, 2016.
- Digitization of land records should be completed by the States at the earliest.
- Fertilizer subsidy should be given on per hectare basis across holding size, states, agro-climatic conditions or crops grown. Yet, the DCT should be performance-based and not unconditional.
- The subsidy amount may be paid to the farmers in advance through e-wallet giving farmers a menu of different fertilizers including the organic manures, seed of green manure crops etc.
- Highly subsidized provision of urea under Nutrient-based is one of the major reasons for overuse of nitrogenous fertilizer. Reducing subsidy on urea is a pre-requisite for the success of DBT/DCT.
- Linking DCT with soil health cards (SHC) is likely to encourage balanced use of plant nutrients and restoration of soil health. For this, it is essential to correctly assess the soil health status, and customize provision of different types of fertilizers as per the recommendations.
- Provide fortified urea in regions with widespread deficiency of Zinc and Boron.
- R&D on fertilizer products need to be encouraged to bring out novel fertilizers with higher use efficiency.
- Sequential reforms to decontrol fertilizer sector and improve the health of domestic fertilizer industry by correcting its back-end problems.

• Undertake extensive field demonstrations and farmer education programmes involving state extension machinery, KVKs and fertilizer industry to enhance farmers' awareness regarding benefits of balanced fertilization and effective use of subsidy remitted through DCT.

XV Agricultural Science Congress –Energy and Agriculture: Challenges in 21st Century

The NAAS in collaboration with the Banaras Hindu University, Varanasi will be organizing XV Agricultural Science Congress (ASC) at BHU, Varanasi from November 13-16, 2021 on the theme *Energy and Agriculture: Challenges in 21st Century*. The four-day event will include technical sessions, plenary sessions, public lectures, farmers sessions, poster presentations, inter-university student elocution contest, panel discussions and number of satellite meetings. Moreover, ASC-AgriTech-2021 will be a major associated event. A large number of participants cutting across the disciplines of researchers, faculty, policy makers, farmers, entrepreneurs, development departments, corporate and private sector leaders, NGOs, and students shall be attending this biennial congress of the Academy.

Chapter	Event	Date & Venue
Bhopal	Workshop on Improving Soybean Yield in Central India	October 1, 2019 at IISS, Bhopal
Coimbatore	A meeting of NAAS Fellows in Coimbatore was held to discuss the issues pertaining to the region	August 24, 2019 at ICAR-SBI, Coimbatore
	Workshop on <i>Post-Harvest</i> <i>Technology and Value Addition</i> was organized in association with Society for Sugarcane Research and Development (SSRD)	December 4, 2019 at ICAR-SBI, Coimbatore
Hyderabad	Discussion on emerging issues related to Agricultural Research	April 4, 2019 at NAARM, Hyderabad
	A five-day <i>Krishi Kala Utsav (KKU)</i> was conducted jointly with ICAR- NAARM, Hyderabad	November 4-8, 2019 at NAARM, Hyderabad
	A panel discussion on <i>Challenges</i> and Opportunities in Meat Sector was organized in association with National Research Centre on Meat, Hyderabad	January 20, 2020, Hyderabad

REGIONAL CHAPTERS

	Guest lecture on NAAS and Science Excellence in Agriculture by Dr A.K. Singh, Secretary, NAAS	February 7, 2020 at NAARM, Hyderabad
Karnal	Seminar on <i>Restructuring of primary</i> and secondary education to address the issue of education curriculum weaning students from farmers and farming community away from Agriculture	December 20, 2019 at ICAR- NDRI, Karnal
Lucknow	Brainstorming meet to <i>commemorate</i> <i>the success of ICAR-FUSICONT</i> <i>technology</i> was organized in collaboration with ICAR-CISH, Lucknow under the chairmanship of Dr P.K. Chakrabarty, Member, ASRB, New Delhi	August 20, 2019 at ICAR-CISH
Ludhiana	Lecture on <i>Self Propelled Active</i> <i>Living Matter'</i> by Dr Jatinder Vir Yakhmi, FNASI, the former Associate Director of Physics (BARC)	April 11, 2019 at PAU, Ludhiana
Mumbai	Lecture on <i>India's Journey from Food</i> <i>Security to Nutritional Security</i> by Dr A.K. Srivastava, Vice President, NAAS, New Delhi, on the occasion of Fish Farmers Day	July 10, 2019 at the CIFE, Mumbai
	Lecture on <i>Combating Zoonoses -</i> <i>One Health Approach</i> by Dr R. K. Singh, Director & Vice Chancellor, ICAR-IVRI, Izatnagar, UP	December 21, 2019 at CIFE, Mumbai
Varanasi	Special lecture on Molecular Breeding for Development of Climate Smart Rice Varieties by Dr A.K. Singh, Director, ICAR-IARI	January 30, 2020, at ICAR-IIVR, Varanasi

Bhopal Chapter

On the occasion of the launching of the NAAS Bhopal Chapter and keeping in view the concerns of climate change and risks associated with soybean production in central India, a one-day workshop on "Improving Soybean Yield in Central India" was organized under the aegis of the National Academy of Agricultural Sciences (NAAS) - Bhopal chapter on 1st October, 2019 at the Indian Institute of Soil Science. Dr Anil K. Singh, Secretary, NAAS and former Vice Chancellor, Rajmata Vijayaraje Scindia Krishi Viswa Vidyalaya, Gwalior graced the occasion as Chief Guest. In his address, he highlighted the policy implications of stagnation in soybean yield on the farm economy, soil health and overall economy of the country. In presence



of progressive farmers of the region, officials from Government of Madhya Pradesh, researchers and policy makers from ICAR Institutes and SAUs, have called for adopting a holistic strategy involving crop improvement, soil nutrient management and pest control methods to improve soybean production in central India. On this occasion, the NAAS-Bhopal Chapter was formally launched.

Dr S.K. Rao, Vice Chancellor, Rajmata Vijayaraje Scindia Krishi Viswa Vidyalaya, Gwalior and an acclaimed plant breeder, stressed on the fact that soybean in India has a narrow genetic base. For improving yield under climate change conditions, one of the major options would be to enhance genetic pool of the crop. India has about 110 varieties of soybean having only 8-10 parents. In an elaborate technical presentation, he said new varieties resistant to erratic climate should be developed.

The workshop also witnessed technical presentations by Dr Sanjay Gupta and Dr A.N. Sharma from Indian Institute of Soybean Research, Indore; Dr A.K. Tiwari from Directorate of Pulse Mission, Govt. of India and Dr Pradip Dey from Indian Institute of Soil Science, Bhopal. A brainstorming session was also held where the progressive farmers and the State Government officials put forth their views on current constraints and strategies for improved soybean production.

Coimbatore Chapter

A meeting of NAAS Fellows in Coimbatore was held on 24.08.2019 at ICAR-SBI, Coimbatore. Dr S.R. Sree Rangaswamy, Dr C. Ramasamy, Dr Bakshi Ram, Dr R. Visvanathan and Dr R. Viswanathan attended the meeting. The issues pertaining to the region were discussed during the meeting. The following major issues were identified:



- 1. Depletion of ground water and increasing salinity of soil and water,
- 2. Climate change issues especially on unpredictable North East monsoon,

- 3. Developments in food processing and value addition,
- 4. Agri Start-ups

NAAS Coimbatore Chapter organized one day meeting on *Post-Harvest Technology and Value Addition* on 04.12.2019 in association with Society for Sugarcane Research and Development (SSRD) at ICAR-SBI, Coimbatore.

Apart from NAAS Fellows, about 80 delegates from various institutions viz. ICAR-SBI, Coimbatore, ICAR-CIAE RS, Coimbatore, TNAU, Coimbatore, Veterinary College, TANUVAS, Namakkal, KVK, Erode, Suguna Institute of Poultry Management, Farmers organizations, NGOs and entrepreneurs participated in the meeting.



Prof S. R. Sree Rangasamy chaired the Inaugural session and welcomed the delegates. After the ICAR song a video message from Prof M.S. Swaminathan founder of NAAS was played, in which he congratulated the NAAS for instituting Coimbatore Chapter and wished good future for the regional chapter. Dr C. Anandharamakrishnan, Director, IIFPT, Thanjavur delivered the inaugural lecture on *Future Foods*. Before the Group Discussion on Sugarcane Products, and Brainstorming session on Post-Harvest Technology and Value Addition, Dr Bakshi Ram, Director, ICAR-SBI, Coimbatore welcomed all the delegates. The following points emerged after brainstorming session and discussion:

- 1. To create awareness about the farmers and conduct training programme on value addition technologies to farmers and entrepreneurs.
- 2. To create awareness about start-ups/ first generation entrepreneurs to avail incubation facilities created in the Institutions.
- 3. Standards to be fixed for the traditional foods for commercialization.
- 4. To develop technologies for utilization of non-utilization of non-edible portions and by-products towards commercial venture, eg bagasse from sugar industry for disposal plate/ jack fruit waste to edible plates, etc.
- 5. To create awareness among the farmers and entrepreneurs on traceability in farm level value addition process.
- 6. Need to establish specifications for multiple grades for various agricultural produce to meet edible and other requirements.
- 7. Importance of trust in the value added products, non-tangible value addition and the future of block chain management

Hyderabad Chapter

A meeting of Fellows and Associates of NAAS based in Hyderabad was held on April 4, 2019 at ICAR-NAARM, Hyderabad to discuss emerging issues related to Agricultural Research, review the on-going activities and plan future activities of NAAS Regional Chapter, Hyderabad. The meeting was attended by a total of 22 Fellows and 4 Associates of NAAS belonging to the



States of Telangana and Andhra Pradesh. Prof Panjab Singh, President, NAAS and Dr Anil K. Singh, Secretary, NAAS graced the occasion.

During the meeting, Prof Panjab Singh, President, NAAS felicitated Dr P. Appa Rao, Vice Chancellor, Central University of Hyderabad and Fellow, NAAS for the prestigious B.N. Mehta Award of NAAS. Dr Raman Meenakshi Sundaram, Principal Scientist (Biotechnology), ICAR-IIRR, Hyderabad and Associate, NAAS was also felicitated for being elected as Fellow of the Academy in the last year.

Two eminent NAAS Fellows gave their perspective on a couple of contemporary issues concerning the agricultural sector. Padmashri Prof E.A. Siddiq, Hony. Professor, PJTSAU and former, DDG (Crop Sciences), ICAR delivered a talk on *Way Forward for Genomics in Agriculture: Policy Needs.* Prof Siddiq highlighted the achievements in terms of significant increase in food production and productivity in last sixty years and called for redressal of nutritional security in the right perspective through modern technologies. As far as transgenic approach is concerned, Prof Siddiq opined that even though the technology has tremendous potential in tapping the genetic variation in the entire biological gene pool, the major impediment are policy issues related to the bio-safety and regulation of genetically modified (GM) products. He was hopeful that the proposal of the Union Government to constitute a Biotech Regulatory Authority of India will turn out to be a positive step in this direction to address the regulatory and policy issues related to GM crops. He complemented NAAS for being always at the forefront in terms of addressing the policy issues with respect to regulation and cultivation of GM crops.

Dr Anil K. Singh, Secretary, NAAS gave a talk on *Drought proofing policy in India*. Dr Singh highlighted the steps taken by ICAR and Govt. of India with respect to drought proofing agricultural production like contingency plans, relief employment in rural areas, water resource management at both macro and micro levels, fine-tuning institutional response coupled with input subsidies during the period of drought.

Prof Panjab Singh in his remarks as a chief guest of the meeting complemented the talk given by the eminent speakers and appreciated each of the expert members for their contribution to charting the actionable points on the identified theme areas. He also lauded the efforts of the Regional Chapter under the leadership of Dr Ch. Srinivasa Rao, Director, NAARM for its dynamism and multi-pronged activities. He opined that resource use efficiency of various crops needs significant improvement and value addition can play a vital role in increasing the income of farmers. He also mentioned that NAAS is a vocal advocate for popularization of GM crops in the country and has been contributing in building the opinion and a favourable ecosystem towards this, in the past three decades.

Dr Ch. Srinivasa Rao briefly summarized the actionable points that emerged during the discussion and called for greater support from the Academy for strengthening its activities. The meeting ended with the formal vote of thanks by Dr Raman Meenakshi Sundaram, Treasurer, Hyderabad Regional Chapter of NAAS.

A five-day *Krishi Kala Utsav (KKU)* was conducted jointly by Hyderabad Chapter of NAAS and ICAR-NAARM, Hyderabad during 4-8 November 2019. Twenty-four students of the famous Sir J.J. School of Arts, Mumbai were invited to create paintings and works of art on agriculture and allied sector. Forty-eight paintings including a stone craft mural work were completed



during the said days. Dr T. Moĥapatra, Secretary DARE and Director General, ICAR and Vice-President of NAAS visited the KKU workshop hall when the artists were at work on November 8, 2019 and appreciated the initiative taken by NAAS Chapter along with NAARM and the talent of the artistes. He interacted with artists on their innovative presentation on various important aspects of agriculture and farmers' welfare.

Artists displayed their work highlighting the different components of agriculture viz. modern technologies, virtues of traditional agriculture practices, environmental aspects, youth in agriculture, rural markets, critical role of women in agriculture, soil and water conservation, importance of trees, integrated farming systems, human health from healthy foods, mechanized agriculture systems etc. They also depicted critical role of Agri-education in sustainable development in India. Dr Ch. Srinivasa Rao, Director, ICAR-NAARM and Convener of Hyderabad Chapter underlined the potential of this form of communicating agricultural science and technology to the students, youth and seniors who regularly visit the academy and become a part of science communication strategy through paintings.

A panel discussion on *Challenges* and *Opportunities in Meat Sector* was organized by Hyderabad Chapter of NAAS in association with National Research Centre on Meat, Hyderabad on January 20, 2020. More than 100 delegates including representatives from the meat industry and government departments, entrepreneurs and



processors took active part in the discussion. Dr Ch. Srinivasa Rao, Director ICAR-NAARM and Convener, Hyderabad Chapter chaired the session. Several issues related to availability and requirement of veterinarians to carry out meat inspection, newly designed vehicles for animal transport, animal market infrastructure, meat retailing requirements, popularization of animal sourced foods to reduce malnutrition and hunger, funding opportunities for start-up entrepreneurs in meat processing business were deliberated

Dr A.K. Singh, Secretary, NAAS delivered a guest lecture on NAAS and *Science Excellence in Agriculture* on February 7, 2020 at NAARM, Hyderabad. He covered various activities of NAAS since its inception on June 5, 1990. His lecture benefited the 135 young scientists of ICAR representing 28 disciplines. Several NAAS Fellows and Associates from Hyderabad also attended this event.

Karnal Chapter

The National Academy of Agricultural Sciences, Haryana Chapter, Karnal organized one day Seminar on *Restructuring of Primary and Secondary Education* to address the issue of education curriculum weaning students from farmers and farming community away from Agriculture at ICAR-National Dairy Research Institute, Karnal on December 20, 2019 to seek views from subject experts,



scientists, educators, school and college teachers, students and farmers on including agriculture as a mandatory subject of study in school curricula in line with other traditional subjects. The seminar was convened by Dr M.L. Madan, and Dr Sunita Grover, NAAS Fellow and Dr A.K. Mohanty, Principal scientist, Animal Biotechnology, ICAR-NDRI jointly coordinated this event. Around 100 participants including NAAS Fellows and Associates of the Academy, scientists of ICAR institutes located in Karnal, principals, teachers, officers from the state education department and students from various local schools participated in the event.

Prof Panjab Singh, President NAAS and Chief Guest in his address greatly appreciated the initiative of the Haryana Chapter for having organized a session on a very vital issue of education for youth. He lauded the role of the Academy to provide a forum to Agricultural Scientists to deliberate on important issues of agricultural research, education and extension and present views of the fellowship as policy inputs to planners, decision/opinion makers at various levels. He emphasized that agriculture in present time needs multi-dimensional talented students to bridge the gap between future demand and supply as well as for food security. Sequel to the presentations and the discussions held, following action points emerged from the seminar:

- 1. Urgent need for changes in the school education from the primary school level and integration of agriculture in school and college syllabus to connect students from farming system and help attract more youth towards agriculture sector.
- 2. A need for educating the parents and youth towards agriculture sector as a carrier opportunity.
- 3. Agriculture should be a compulsory subject in school from 5th-12th class with provision of regular farm visits, organic waste use, and impact of organic manure on crops.
- 4. Provision of agricultural land to the schools to teach organic farming. Girls should be taught kitchen garden maintenance in rural areas.
- 5. Channelize children's vision with inclusion of learning of crops and cropping system, soil-plant-animal—man relationship in production system, rural resource management and concepts of profit and loss in agriculture.
- 6. Creation of necessary infrastructure in schools for teaching agriculture science including facilities like protein gardens, vitamin galleries, etc. and trips to agricultural universities.
- 7. The policy issue of Agriculture education may be taken up with the Ministry of HRD, UGC, NCERT, Board of school education etc.

Lucknow Chapter

NAAS Lucknow Chapter in collaboration with ICAR-CISH, Lucknow organized a brainstorming meet on August 20, 2019 at ICAR-CISH to commemorate the success of ICAR-FUSICONT technology developed for the management of Fusarial wilt of banana and further strengthen the technology for registration, licensing and large scale adoption under the Chairmanship of Dr P.K. Chakrabarty, Member, ASRB, New Delhi. More than 70 participants including senior NAAS Fellows, former VCs, Directors of the ICAR institutes, scientists from ICAR-IISR, ICAR-CISH, Lucknow, ICAR-CSSRI Regional Station, Lucknow, progressive banana farmers from Uttar Pradesh and Bihar, President, Uttar Pradesh Kela Utpadak Sangh, Nodal officer, RKVY, Officials of State Department of Agriculture, U.P., District Horticultural Officers of state department from 20 districts of Uttar Pradesh, President, MATI Foundation, Sant Kabir Nagar, U.P. and students participated in the session.

Dr S.K. Pandey, Convener, NAAS Lucknow Chapter while welcoming the participants highlighted the importance of NAAS Lucknow Chapter. Dr S. Rajan, Director, CISH, Lucknow briefly presented the journey of ICAR-FUSICONT technology developed by the combined efforts of CISH, Lucknow and CSSRI Regional Station, Lucknow.



Some of the recommendations emerged after a thorough discussion on the issues addressing the disease survey and management in the region included:

- 1. Creation of State Level Disease Management Committee (SLDMC) to create alert, awareness and restrict disease spread in the state of Uttar Pradesh and Bihar.
- 2. Financial support to ICAR-CISH and ICAR-CSSRI institutes by National Horticulture Board through MIDH schemes for large scale technology transfer and implementation of ICAR-FUSICONT technology, awareness and community enabled disease management in the affected districts.
- 3. Advise nurseries to use bio-hardening technology developed by ICAR-CSSRI and ICAR-CISH using ICAR-FUSICONT through MoU.
- 4. Raising of disease free tissue culture plantlets in soil less media (using coir pith), disinfestations of vehicle carrying the planting material, field sanitation must be strictly implicated through official order of the State Horticulture Departments of respective States for all the nursery men and tissue culture laboratories.
- 5. The bio-formulation ICAR-FUSICONT may be considered by the Ministry of Agriculture and Farmers' Welfare for providing provisional license at the earliest based on preliminary data to enable the protection of IPR of the technology and also facilitate commercialization.

Ludhiana Chapter

The Ludhiana Chapter of the National Academy of Agricultural Sciences (NAAS) organized a lecture on *Self Propelled Active Living Matter* from a renowned scientist, Dr Jatinder Vir Yakhmi former Associate Director of Physics (BARC) on April 11,

2019 at Punjab Agricultural University, Ludhiana. The lecture was attended by Dr B.S. Dhillon, Vice Chancellor PAU and Convener of the Ludhiana Chapter, NAAS Fellows, Deans, Directors and officers from the PAU, faculty from GADVASU and the PAU and by the students.

DrYakhmishared that the quest for new functional material is moving increasingly from conventional hightechnology material like steel and plastics towards the study of the large variety of remarkably robust and


hierarchical material used by Nature in the living world in the 21st century. Bio-material with diverse characteristics is produced by Nature by adopting different arrangements and combinations of the same universal motifs. With the increasing availability of new tools to investigate the structure of all forms of matter at the smallest levels (*sub-nano scale*), there are attempts obviously to examine if one could design autonomous active matter, with capability of self-propulsion, using nature's principles of self-assembly and self-organization. Through examples from the living world, he discussed research and trials on the development of artificial muscles for movement, bionic and magnetic devices that can be linked to brain and heart signals, simulation of lung surfactant films, synthetic material with homeostatic abilities and creation of an entire living organ grown from lab created cells. Dr Yakhmi concluded that with capabilities of self-organization, self-repair and self-replication, nature's assembly doesn't make a mistake and this is the difference between man and nature.

Mumbai Chapter

Under the auspices of the Western Chapter, Dr A.K. Srivastava, Vice President, NAAS, New Delhi, delivered a lecture on India's Journey from Food Security to Nutritional Security at the Central Institute of Fisheries Education, Mumbai, on July 10, 2019 on the occasion of Fish Farmers Day. Dr Gopal Krishna, Director/ Vice-Chancellor of the Institute, welcomed the Speaker, Guests, Faculty and students highlighting the importance of the occasion being celebrated all over the country by the Fisheries Departments, Colleges and Institutes. Dr Srivastava introducing the subject, dwelt on the remarkable performance by the farmers who transformed the *Food Deficient* and *Food Import* country in 1947 to Food Self-sufficient and Food Export country by 1980 by adopting the Technology-driven practices that have brought about Green, White, Blue and Yellow revolutions within the last four decades. The food grain, pulses, horticulture, milk and fish production, having increased to 281.37 million tons (mt), 24.51 mt, 314.67 mt, 176.35 mt and 12.60 mt respectively, besides meat 7.7 mt and eggs 95.2 billion by 2017-18 has brought about a tremendous change in its per capita availability. While the National Food Security Act of India (2013) ensures food availability to both rural and urban population, the need now is to go ahead and target the nutritional security for all Indians.

Further, it is essential to note that climate change may lead to a reduction in agricultural productivity by 25%, decrease in per capita availability of arable land (0.09 ha by 2050), depleting water table and nutritional status of soil, increasing incidence of pests and lack of hygiene in production, storage, processing and marketing of foods would be a perennial threat involving an outbreak of food borne zoonotic diseases. There would thus be a need to produce more from less for more.

Despite significant increase in agricultural production and productivity, very high levels of under nutrition and malnutrition continue to persist in India in various forms such as stunting, wasting, anaemia, vitamin deficiency, obesity, etc. According to a recent estimate by UN-FAO, around 854 million people worldwide are undernourished of which about 200 million, constituting around 18-19% of the total population, are in India.

According to UNICEF-WHO-WBG Joint Report (2017), the number of stunted children decreased from 198.4 million to 154.8 million during the last two decades across the world, while the number of those suffering from wasting diseases increased from 30.4 million to 52 million. Children with low weight-for-height (wasting) have an increased risk of mortality.

Addressing the burden of wasting will require a multipronged approach including prevention, early identification and treatment. Malnutrition is the leading cause of death worldwide in children under the age of five and accounts for deaths of 2.6 million children every year and leaves millions more with life-long impairments.

Summing up, Dr Srivastava concluded that while science-led growth and development in food and agriculture will continue to feed future India, a *Mission Mode* action is required to address malnutrition. In this regard, dairy, fishery and horticulture may play a major role as the focus now needs to shift from calorie centric to balanced nutritional diet. Lastly, he urged the stakeholders to work together towards the common National goal to provide food and nutritional security to every Indian citizen.

Under the auspices of NAAS (Western Chapter), a lecture was delivered by Dr R.K. Singh, Director, ICAR-Indian Veterinary Research Institute, Izatnagar on *Combating Zoonoses* - One Health *Approach* at CIFE, Mumbai on December 21, 2019. Dr Singh highlighted the zoonotic diseases and the interaction of humans, animals, fish and environment in the development of diseases especially due to bacteria.



He also highlighted the different factors influencing the prevalence of zoonotic diseases *viz* ecological changes in man's environment, handling animal by-products & wastes (occupational hazards), increased movements of man, increased trade in animal products, increased density of animal population, transportation of virus infected mosquitoes and cultural anthropological activities.

Dr Singh also emphasised on commonly recognized food-borne infections and different ways and means of combating those diseases. The predisposing causes and their prevalence in different parts of India and the world were also presented along with case studies. The approaches in combating and reducing the diseases through *One Health* were emphasised. The talk triggered an active discussion with the participants about one health.

Varanasi Chapter

National Academy of Agricultural Sciences - Varanasi Chapter organized a special lecture on Molecular Breeding for Development of Climate Smart Rice Varieties by Dr

A.K. Singh, Director, ICAR-IARI, New Delhi on January 30, 2020, at ICAR-Indian Institute of Vegetable Research, Varanasi. During his deliberation, Dr A.K. Singh shared the success story of improvement of basmati rice and informed that annual export earnings from basmati rice alone have reached US \$ 2.5 billion. He emphasized on biotic stress breeding of rice and development of Non-GM



herbicide resistance rice. He also elaborated about the importance of social media on popularization of improved varieties. He advised scientists to use new molecular techniques and breeding methods, which may be helpful to sustain the food production to feed the increasing population.

LINKAGES

Academy's Collaborative Activities

Seminar on Social Transfers to Revitalize Rural India and New Delhi Launch of Global Food Policy Report 2019

Amid the hustle and bustle of the world's largest democracy going to polls, the IFPRI launched its *Global Food Policy Report* (GFPR) 2019 at New Delhi, on the sidelines of a day-long policy seminar on *Social Transfers to Revitalize Rural India*, on April 26, 2019 jointly organized with the National Academy of Agriculture Sciences and the Indian Council of Agricultural Research.



IFPRI's new Director for South Asia, Dr Shahidur Rashid, emphasized that India and the entire region have made incredible progress on food security front since 1970s. He expressed a need to now refocus rural development policy to address emerging issues such as those related to climate change, urbanization, prevalence of rural poverty, and strategies to deal with them. Dr Shenggen Fan, IFPRI Director General recalled that challenges to ensure food security and reducing poverty have evolved over the last few years and need to be addressed based on data and evidence in a way that nobody is left behind. Dr P.K. Joshi, IFPRI Senior Adviser focused on the continuous malnutrition leading to high child mortality, stunting and wasting besides the acute problem of anaemia among women; agrarian distress, and lack of basic amenities in rural areas, as major challenges that need immediate attention. Drawing on the report for specific lessons for India, Dr Mahendra Dev, Director and Vice- Chancellor, Indira Gandhi Institute of Development Research, emphasized on the requirement to focus on six key areas viz. rural non-farm sector; investments in basic infrastructure; empowering women; promoting information technology; social transfers to rural household; and governance and implementation efficiency for rural development in India. Dr Suresh Pal, Director of the ICAR-National Institute of Agricultural Economics and Policy Research, underlined the importance of strengthening rural-urban links for rural revitalization. Summing up the proceedings of the panel, Dr Raj Paroda, Founder and Chairman, Trust for Advancement of Agricultural Sciences (TAAS) called for urgent attention to achieve UN Sustainable Development Goals (SDGs) by India to be able to achieve these goals faster globally.

International Collaboration under South-South Cooperation

A meeting on the Role of NAAS in International Collaboration under South-South Cooperation (SSC) with focus on Africa and BIMSTEC was held on June 18, 2019 in NAAS Secretariat under the Chairmanship of Prof Panjab Singh, President, NAAS. The meeting commenced with a brief background by Dr Anil K. Singh, Secretary, NAAS, about potential opportunities for agricultural research and higher education for development in countries of Africa and BIMSTEC with suitable interventions of NAAS for the cause. The President highlighted that the major strength of the Academy is its highly competent, multi-disciplinary and experienced human resource that could be utilized for the benefit of African and BIMSTEC countries towards capacity building, institutional and human resource development. The participants shared their working experience and expressed views about different modes of International Cooperation for development. Dr Arun K. Joshi, Country Rep, CIMMYT, India and MD, BISA cited several examples of international cooperation in ARD. The potential areas of cooperation suggested were Capacity Building, Seed & Breed, Water Management, Digital Agriculture, Institutional and Policy Arrangement. Based on our long connection with African countries, NAAS needs to explore what can be done there on these areas of interest to both India and Africa. A possible way could be to connect with CG centres or BISA in their activities in Africa and vice versa. CIMMYT-BISA will be happy to assist NAAS in this regards. The Secretary, NAAS, proposed a vote of thanks to the Chair and the participants for their valuable inputs.

Eighth International Conference on Agricultural Statistics (ICAS-VIII)

ICAS-VIII was organized during 18-21 November 2019 by the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers' Welfare (MoA & FW), Government of India with active participation from Department of Agriculture Cooperation & Farmers Welfare (DAC & FW) under MoA & FW and in close collaboration with the Food and Agriculture Organization of the United Nations, the US Department of Agriculture, ISI-CAS, EUROSTAT, Ministry of Statistics and

Programme Implementation and many other international and national organizations. It is emphasized here that, the DARE, under its valuable guidance, entrusted the task of organizing this mammoth event to ICAR-Indian Agricultural Statistics Research Institute, New Delhi, to jointly work with Indian Society of Agricultural Statistics and National Academy of Agricultural Sciences, New Delhi for smooth conduct of the event.

The Conference was inaugurated by Shri Bill Gates, Co- Chair, Bill & Melinda Gates Foundation in the presence of Shri Narendra Singh Tomar, Union Minister of Agriculture & Farmers' Welfare, Rural Development and Panchayati Raj who presided over the inaugural function of the conference with Guest of Honour Shri Kailash Choudhary, Union Minister of State for Agriculture & Farmers'



Welfare. Shri Tomar stressed on the importance of agricultural statistics in realizing the Government of India's various agricultural-centric schemes. While applauding the various statisticians and scientists working in the field of the Agricultural Statistics, Shri Kailash Choudhary, Union Minister of State for Agriculture & Farmers' Welfare highlighted about the Government's various schemes that are aimed at doubling the farmers' income.

Shri Bill Gates, Co-Chair, Bill & Melinda Gates Foundation, addressed the audience on the theme of improving agricultural productivity using data and innovative technologies. In his speech on the occasion, he said, *"In the hands of a single smallholder, the right information can lead to a 20% revenue increase for one farm."* He further added, *"We can help the world's two billion smallholders to adapt to climate change much quicker if everybody in the agriculture sector has access to quality information."*

While delivering welcome address during the inauguration of the ICAS event, Dr Trilochan Mohapatra, Secretary, DARE and Director General, ICAR accentuated that prompt management of agricultural statistics is vital for agriculture-centric country like India. Dr Mohapatra stressed that in order to deal with the challenges posed due to climate change, enhancing the farmers' income, eradicating poverty and malnutrition and meeting the vision of sustainable development goals, joint efforts are required for strengthening the statistical system which in turn will pave way for achieving these targets. He opined that integration and triangulation of data coupled with modern techniques of remote sensing and GIS has become the order of the day. He quoted the words of the legendary and world renowned agriculturist Prof M.S. Swaminathan that *"It is the effective use of tools of statistical design of experiments that paved the way for green revolution"*. He suggested that we need to rededicate towards strengthening the statistical system so that the statistical quality of data in real time is ensured and work towards designing cloud computing, use of Artificial Intelligence and Big Data analytics which has become highly necessary in this digital era. Highlighting the importance of Sustainable Development Goals, he mentioned that it will help in eradicating the problems and challenges of malnutrition in an effective manner and that we are committed towards achieving these goals.

Shri Pietro Gennari, Chief Statistician, FAO, Rome, Ms Mariana Kotzeva, Director General, EUROSTAT and Prof Ramesh Chand, Member, NITI Aayog, India were some of the keynote speakers during the conference. Dr Michael Steiner, ISI CAS and World Bank and the Chair for the Scientific Programme Committee of ICAS emphasized on the importance of managing the agricultural statistics for the overall development of agriculture-centric countries like India. Shri Ugo Astuto, Ambassador- Designate, European Union to India highlighted the role of statistical data to realize the sustainable development goals. It plays a crucial role to monitor the progress of the country. The presentations made in the plenary sessions along with the thematic sessions laid the foundation for building the beautiful monument of achieving SDGs with mutual partnerships, collaboration and understanding.

In his Valedictory address, Dr Trilochan Mohapatra underlined the prospects of enhancing the capacity building in data interpretation and data analysis than in data collection through the global partnership. He urged the countries for identifying their special strengths and sharing them with others where ever the deficiencies are present to create a Global Knowledge Hub for Agricultural Statistics (GKHAS). Shri Jose Rosero Moncayo, Director, Statistics Division, FAO, Rome urged the agricultural statisticians to come together and identify the gaps between the data collection and maintenance. The 2030 Agenda encompasses a far broader ambition requiring better, more timely and reliable data on a wider variety of indicators for evaluating and monitoring of SDGs. Thus its adoption by countries around the world necessitates an even more significant increase in the data that is available to, and used by governments, civil society, the private sector, academia and international organizations to begin tracking progress towards the achievement of the SDGs.

Fostering India-Africa Collaboration in Agricultural Biotechnology

The NAAS hosted an eight-member high-level delegation from seven African countries on February 10, 2020 as a part of 10-day Agricultural Biotechnology and Biosafety Study tour organized by Michigan State University in collaboration with African Union Development Agency (AUDA-NEPAD), The Energy and Resources Institute, New Delhi and Bejo Sheetal Biosciecnes Foundation, Jalna.



Dr Trilochan Mohapatra, President NAAS welcomed the participants and shared India's experiences in agricultural biotechnology, particularly Bt cotton technology. Underpinning the vital role of genetic engineering in agricultural transformation, he elucidated the impact of Bt hybrid cotton in the national economy, the possibility of release of herbicide tolerant Bt cotton hybrids, and the national institutional and regulatory mechanisms to promote frontline research and technology transfer. He assured the delegation of all possible scientific support of NAAS and DARE/ICAR in fostering mutual learning and collaboration.

Led by Prof. R.B. Singh, former President NAAS, the host scientists comprising Drs K V Prabhu, Chairperson PPVFRA, Anil K Singh, Secretary NAAS, N K Singh, National Professor B P Pal Chair, ICAR-NRC on Plant Biotechnology, Kuldeep Singh, Director, ICAR-National Bureau of Plant Genetic Resources, C Viswanathan, Head, Division of Plant Physiology, ICAR-Indian Agricultural Research Institute, Shelly Praveen, Head, Division of Biochemistry, ICAR-Indian Agricultural Research Institute and B. Choudhary, South Asia Biotechnology Centre gave glimpses of cutting edge biological sciences, technologies, especially biotechnology and innovations being pursued in the area of genomics, gene editing, biosafety, bioinformatics, biofortification, bionutrients, nutritional security, food safety and quality, climate smart agriculture, public-private partnership, functional regulatory mechanisms, Seed Bill, harmonization of national and international laws, rules, regulations, and collaborations. The delegation showed keen interest in gene editing, regulatory mechanisms, sharing of genetic resources, regular flow of adequate quality seed from breeders' plots to farmers' fields, nutritional security, food safety (freedom from aflatoxin), and human resources development. The meeting recommended that a tripartite India-Africa-MSU (USA) collaborative project with defined outcomes, timeframe, and financing mechanism should be formulated and implemented soon to enable proven modern, safe, bio-secure, productive and remunerative technologies reach the unreached, ensuring that no one in the line is left out.

Empowering Youth in India, Africa and Michigan-USA

The National Academy of Agricultural Sciences (NAAS), under the leadership of Dr T. Mohapatra, President NAAS, and chairmanship of Prof R.B. Singh, hosted an eight-member delegation from Michigan State University at the National Agricultural Science Complex in New Delhi on February 20, 2020. Drs J.C. Katyal, Vice-President NAAS, Anil K Singh, Secretary NAAS, J.P. Sharma, Joint Director Extension,



ICAR-IARI, Rashmi Aggarwal, Dean, ICAR-IARI, and other senior officials representing the Indian Council of Agricultural Research (ICAR) and Indian Agricultural Research Institute (IARI) participated in this meeting. The members representing Michigan State University (MSU) College of Agriculture and Natural Resources (CANR) included Dr Jeffrey Dwyer, Director of MSU Extension and Senior Associate Dean, Mr Brian Wibby, MSU Extension Specialist and Coordinator of Michigan Borlaug Youth Institute, Dr Dru Montri, Director of Government and Stakeholder Relations, Dr Karim Maredia, Professor and Director of International Programs in Agriculture and Natural Resources, Dr Ruth Mbabazi, Assistant Professor and Assistant Director of International Programs in Agriculture and Natural Resources, Mrs Nancy Dwyer, Professional Nurse, Mr Adam Montri, Farmer, Michigan, USA, besides Dr Vibha Dhawan, Director of Biotechnology and Bioresources at TERI and MSU Consul General for India.

The participants of this joint meeting fully supported the idea of a joint event involving youth from India, Africa and Michigan-USA for active dialogue and networking on global issues related to food security and sustainable development. It was decided to have further discussions with the World Food Prize Foundation to make this joint India-Africa-Michigan program a reality in establishing the youth forum.

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 institution has become the Institutional Member of the Academy during year 2019-20:

1. Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Srinagar, J&K

RECOGNISING EXCELLENCE (2019)

New Fellowship

Section I: Crop Sciences

Dr Pawan Kumar Agrawal

Vice Chancellor, Orrisa University of Agriculture and Technology, Bhubaneswar, Odisha

Dr (Ms) Govinda Kurup Hemaprabha

Principal Scientist & Head I/c, Division of Crop Improvement, ICAR-Sugarcane Breeding Institute, Coimbatore, Tamil Nadu

Dr Lakshmi Kant

Head & Principal Scientist, Division of Crop Improvement, ICAR-Vivekananda Parvatiya Krishi Anusandhan, Sansthan, Almora, Uttarakhand

Dr Dharam Pal

Principal Scientist (Plant Breeding) & In-Charge, ICAR-Indian Agricultural Research Institute, Regional Station, Shimla, H.P.

Dr (Mrs) Gurinderjit Randhawa

Principal Scientist & Head, Division of Genomic Resources, ICAR-National Bureau of Plant Genetic Resources, New Delhi

Dr Murugasamy Sivasamy

Principal Scientist & Head, ICAR-Indian Agricultural Research Institute, Regional Station, Wellington, Tamil Nadu

Section II: Horticulture Science

Dr Dangar Ram Bhardwaj

Principal Scientist (Vegetable Science), ICAR-Indian Institute of Vegetable Research, Varanasi, U.P.

Dr Anilabha Das Munshi

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

Dr Duraisamy Prasath

Principal Scientist (Horticulture), Division of Crop Improvement and Biotechnology, ICAR-Indian Institute of Spices Research, Kozhikode, Kerala

Section III: Animal Sciences

Dr Raghavendra Bhatta

Director, ICAR-National Institute of Animal Nutrition and Physiology, Adugodi, Bengaluru, Karnataka

Dr Naresh Kumar

Principal Scientist & Nodal Officer, NRC, Microbial Biosensors, Food Safety & Q.A. Lab, ICAR-National Dairy Research Institute, Karnal, Haryana

Dr Anil Kumar Puniya

Principal Scientist (Dairy Microbiology), Anaerobic Microbiology Lab, Dairy Microbiology Division, ICAR-National Dairy Research Institute, Karnal, Haryana

Dr Pinaki Prasad Sengupta

Principal Scientist, ICAR-National Institute of Veterinary Epidemiology & Disease Informatics, Yelahanka, Bengaluru, Karnataka

Section IV: Fisheries Sciences

Dr Bimal Prasanna Mohanty

Principal Scientist and Head, Fishery Resource and Environmental Management Division, ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, W.B.

Dr Kalkuli M. Shankar

ICAR Emeritus Scientist; Greeshma, Neelameghum Layout, Gopal Gowda Extension, Shimoga, Karnataka

Section V: Natural Resources Management Sciences

Dr Saroj Kanta Barik

Director, CSIR-National Botanical Research Institute, Lucknow, U.P.

Dr Desouza Blaise

Head, Division of Crop Production, ICAR-Central Institute for Cotton Research, Nagpur, Maharashtra

Dr Dinesh Mohan

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

Dr Rajeev Pratap Singh

Assistant Professor, Institute of Environment and Sustainable Development, Banaras Hindu University, Varanasi, U.P.

Dr Yash Pal Singh

Principal Scientist, ICAR-CSSRI, Lucknow, U.P.

Section VI: Plant Protection Sciences

Dr Arunava Goswami

Professor, AERU, Biological Sciences Division, Institute of National Importance, Indian Statistical Institute, Kolkata, W.B.

Dr Senthil-Kumar Muthappa

Staff Scientist, National Institute of Plant Genome Research, New Delhi

Dr Mahendrakar Sreenivasa Rao

Former Head, ICAR – IIHR; #623, A Block, 19th Main, 20th Cross, A Block, Sahakaranagar, Bengaluru, Karnataka

Dr Pratyoosh Shukla

Professor & Head, Department of Microbiology, Maharshi Dayanand University, Rohtak, Haryana

Section VII: Agricultural Engineering and Technology

Dr Madan Kumar Jha

Professor (HAG), Agricultural and Food Engineering Department, Indian Institute of Technology Kharagpur, Kharagpur, W.B.

Dr (Ms) Neelam Patel

Principal Scientist & In-Charge, Water Technology Centre, IARI, New Delhi

Section VIII: Social Sciences

Dr Shalander Kumar

Principal Scientist, International Crop Research Institute for Semi-Arid Tropics, Patancheru, Hyderabad, Telangana

Dr Anil Rai

Head & Principal Scientist, Centre for Agricultural Bioinformatics, ICAR-Indian Agricultural Statistics Research Institute, New Delhi

Dr Ashok Kumar Singh

Deputy Director General (Agril. Extn.), Indian Council of Agricultural Research, New Delhi

Pravasi Fellows

Dr Prabhu Lakshminarayana Pingali

Professor of Applied Economics & Director, Tata-Cornell Institute, Cornell University, New York, USA

Dr Rakesh Kumar Singh

Professor and Head, Department of Food Science & Technology, University of Georgia, Athens, GA, USA

Prof Krishna V. Subbarao

Professor, University of California, Davis, C/o U.S. Agricultural Research Station, Salinas, CA, USA

Foreign Fellows

Dr Peter Carberry

Director General, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Telangana

Dr Henry T. Nguyen

Curators' Distinuished Professor, Division of Plant Sciences, University of Missouri, Columbia, Missouri, USA

Associateship

Dr Bhanu Prakash

Assistant Professor, Department of Botany, Institute of Science, Banaras Hindu University, Varanasi, U.P.

Dr (Ms) Ch. Jyotiprava Dash

Scientist, ICAR-Indian Institute of Soil and Water Conservation, Research Centre, Sunabeda, Koraput, Odisha

Dr Shyam Sundar Dey

Senior Scientist, Division of Vegetable Science, ICAR-Indian Agricultural Research Institute, New Delhi

Dr Mir Asif Iquebal

Senior Scientist, Centre for Agril. Bioinformatics, ICAR-Indian Agricultural Statistics Research Institute, New Delhi

Dr S.L. Krishnamurthy

Scientist (Plant Breeding), Division of Crop Improvement, Central Soil Salinity Research Institute, Karnal, Haryana

Dr Bhupender Kumar

Scientist (Senior Scale), ICAR-Indian Institute of Maize Research, IARI, New Delhi

Dr Vijay Singh Meena

Scientist (SS), Crop Production Division, ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, Uttarakhand

Dr Naresh Lalji Selokar

Scientist, Division of Animal Physiology and Reproduction, ICAR-Central Institute for Research on Buffaloes, Hisar, Haryana

Dr Mohammad Shahid

Senior Scientist, Soil Science & Microbiology, Crop Production Division, ICAR-National Rice Research Institute, Cuttack, Odisha

Dr Shiva Pratap Singh

Senior Scientist, Animal Physiology and Reproduction Division, ICAR-Central Institute for Research on Goats, Makhdoom, Mathura, U.P.

Dr Johnson Stanley

Senior Scientist (Agri. Entomology), Crop Protection Section, ICAR-Vivekananda Parvatiya Krishi Anusandhan, Sansthan, Almora, Uttarakhand

Academy Awards for the Biennium 2019-2020

The Academy has instituted the following awards to recognize scientists for excellence in research in Agricultural and Allied Sciences. From the year 2018, Dr N.G.P. Rao Endowment Award for outstanding research in area of Crop Sciences is instituted, thus raising the number of Endowment awards to three. The nominations for the following Academy's Awards for the biennium 2019-2020 have been invited:

- (i) Memorial Award (6 Nos.)
- (ii) Endowment Award (3 Nos.)

- (iii) Recognition Award (6 Nos.)
- (iv) Young Scientists Award (6 Nos.)

The Academy instituted a Memorial Lecture Award in the memory of Late Dr. A.B. Joshi, a distinguished Fellow of the Academy. Dr A.B. Joshi Memorial Lecture Awardee shall be identified by the Executive Council of the Academy.

The Judging Committees of the Academy will consider all the valid nominations in September 2020, and the awards will be presented at XV Agricultural Science Congress scheduled to be held at Banaras Hindu University, Varanasi in November 2021.

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, 2019 in two sessions before the full house of the Academy Fellowship. The Session-1, which was chaired by Dr A.K. Srivastava, Vice President and co-chaired by Dr J.K. Jena, Secretary, 13 Fellows from the sections of Crop, Horticultural and Animal Sciences made presentations of their work, besides the presentations of two foreign fellows. The Fifteen Fellows elected in the



sections of Fisheries, NRM, Plant Protection, Agricultural Engineering and Technology and Social Sciences presented their work in Session-II that was chaired by Dr A.K. Srivastava, Vice President and Dr T. Mohapatra, Vice President and co-chaired by Dr Anil K. Singh, Secretary of the Academy. All the presentations were deliberated with many valuable inputs by the house.

(ii) Presidential Address



Prof Panjab Singh, President, NAAS delivered the Presidential Address on *Feeding 1.7 billion* in the 26th AGM. In his Address, he highlighted that feeding the ever growing population and simultaneously sustaining or improving limited natural resources is a major challenge before the agricultural science and farming community. He stressed the need to adopt an integrated approach to various sectors of agriculture viz., food grain crops, horticulture (fruits and vegetables) and forestry, livestock and fisheries, process engineering and machines as against the major tilt towards food crops over observed in very recent past for Doubling farmer's income and sustaining food and nutritional security. In this context, he delineated population, agricultural and food scenario, area and productivity of different crops, farming systems, profile of energy consumption, potential of horticulture, livestock and fisheries sector, agroforestry etc. to address the challenges. He emphasized on large scale adoption of input use efficient agricultural technologies as the real key to feeding not only India but also the world. He urged to set-up a national mission on precision agriculture including livestock & fisheries with a mandate to utilize cutting edge tools and technologies like Remote Sensing, Drones, Sensors, Decision Support Systems, Robotics, Artificial Intelligence, Internet of Things (IoT), Biotechnology (CRISPR, Gene Editing) etc. to ensure sustainable nutritional security for the 1.7 billion Indian by 2050.

The proceedings of AGM concluded with a vote of thanks from Dr Anil K. Singh, Secretary, NAAS. He expressed gratitude to Prof Panjab Singh, President, NAAS for providing dynamic leadership to implement the mandate and to the esteemed Fellowship for their continued support and active participation in the events organized by the Academy. The contributions of various Committees, Editors and Treasurer of the Academy were gratefully acknowledged. The Secretary also thanked the staff of NAAS Secretariat for efficient discharge of assigned duties and responsibilities.

(iii) Foundation Day Lecture

The NAAS Foundation Day Lecture on *Can India's Success in Agriculture Benefit Africa?* was delivered by Dr Peter Carberry, Director General, International Centre for Research in Semi-Arid Tropics in the afternoon of June 5, 2019. He applauded the contribution of agricultural science to the success of agriculture and society in India and globally that contributed a significant reduction in the number of people living in extreme poverty in India. He expressed



his disappointment over the typical articulation on agriculture today, and into the



future, consistent with a largely negative narrative with little acknowledgement of success despite the decadal contributions of R&D and the continual innovations that have enabled the world to largely feed itself today. In this context, he referred to the tendency for today's researchers to start with an overriding narrative of downside context, often cited without full appraisal. He was of the view that such poorly argued and attributed assertions must be challenged. Dr Carberry expressed a concern over the current promotion of Zero Budget Natural Farming (ZBNF) which, according to FAO implies farming without using any credit, and without spending any money on purchased inputs. He called upon the scientists and the Academy to portray the successes of society and articulate the associated challenges balanced by our current knowledge. He concluded with the hope that India's national initiative to offer greater South-South Collaboration to support development pathways will benefit African farmers and consumers and progressed further.

(iv) Excerpts from the Minutes of the 26th AGM

The 26th Annual General Body Meeting (AGM) of the Academy was convened on June 5, 2019 at NASC, New Delhi under the Chairmanship of Prof Panjab Singh, President of the Academy and was attended by 212 Fellows. The AGM was graced by Past Presidents, Past Vice Presidents and a number of former senior peers and office bearers



of the Academy. A 2-Minute silence was observed by the entire house as a mark of respect prior to initiation of business, in the memory of esteemed Fellows, namely, Dr J.S. Kanwar, Prof H.Y. Mohan Ram, Dr S.V.S. Shastry, Dr H.K. Jain, Dr S.K. Mukerjee, Dr S.R. Poonia and Prof V.S. Vyas since last AGM meet. Thereafter, Dr J.K. Jena, Secretary, NAAS welcomed the dignitaries present on the dais and also Fellowships and Associates present in the GB meeting. The President of the Academy, Prof Panjab Singh also welcomed all the esteemed Fellowship assembled including newly elected Fellows and Associates to the Academy for the Annual General Body meeting. Thereafter, the proceedings of the meeting started with the presentation of the detailed Secretary Report by Dr J. K. Jena, Audit and Accounts Report by Dr R.K. Jain, Editors' Report by Dr V K Bhatia and Foreign Secretary Report by Dr U.S. Singh and Action Taken Report by Dr Anil K. Singh. All these reports including Annual Report 2018-19, Audited Accounts were accepted and adopted by the house after brief interaction by the Fellowship. The AGM also lent its approval to some of the important decisions taken by EC since last AGM that included appointment of auditors for the year 2019-20, selection of Associates under all sections with annual intake of 12, holding of XV ASC at BHU, Varanasi in February, 2021, continuance of Pravasi and Foreign fellowship as per guidelines in vogue and proposed activities of the Academy during the year.

Admission of the Fellows / Associates

Dr J.K. Jena, Secretary conducted the formal admission ceremony of the newly elected Fellowship and Associateship during the year 2018. Respective Conveners of the Sectional Committees and in their absence, Secretary of the Academy, read out the citations of the Fellows. Thereafter, the President admitted them to the Fellowship of the Academy and presented the certificates under different sections.



(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:

- (i) Enhance number of Fellowship under NRM section from existing 5 to 7.
- (ii) NAAS Guidelines on Mentoring Scheme need to be followed up for implementation in institutions for higher education under NARES.
- (iii) Need to increase the time slot for the presentations by newly elected Fellows. The newly elected Fellows may be requested to focus on the work they have cited for the election as NAAS Fellow.
- (iv) Develop links of NAAS with other National Science Academies and those located in Africa and BIMSTEC countries.
- (v) Initiate deliberations on Convergence of R&D Schemes, Agricultural Start Ups, Livestock numbers and the carrying capacity, especially with regard to economic viability, Look/Act East Policy, Policy for Artificial Insemination in indigenous cattle etc.

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/St	trategy Paper
Policy Paper 89:	Vertical Farming
Policy Paper 90:	Zero Budget Natural Farming - Myth or Reality
Policy Paper 91:	Loan Waiving versus Income Support Schemes: Challenges and Way Forward
Policy Paper 92:	Tropical Wilt Race-4 Affecting Banana Cultivation

Policy Brief

Policy Brief 4:	Uniform Policy for Fish Disease Diagnosis and Quarantine
Policy Brief 5:	Saving the Harvest: Reducing the Food Loss and Waste

News letter

NAAS-News, Vol. 19, Nos. 2 to 4 and Vol. 20, No. 1 (quarterly)

Journal (published by Springer India Pvt. Ltd.)

NAAS Official Journal 'Agricultural Research' Vol. 8, Nos. 2 to 4 and Vol. 9, No. 1 (quarterly)

Other Publications

Presidential Address on '*Feeding 1.7 Billion*' delivered by Prof Panjab Singh at during 26th General Body Meeting 2019

Foundation Day Lecture on *Can India's Success in Agriculture Benefit Africa?* by Dr Peter Carberry, Director General, International Centre for Research in Semi-Arid Tropics, Patancheru, Telangana, India

Abstracts of Presentation by Fellows elected (2019)

Agricultural Transformation – The Road to New India by Prof R.B.Singh

NAAS Year Book and Year Planner 2020

EVENTS AND MEETINGS

Meeting of the Conveners of Regional Chapters

A meeting the Conveners of NAAS Regional Chapters was held on June 4, 2019 under the Chairmanship of Prof Panjab Singh, President, NAAS. The President welcomed the participants and highlighted the need to strengthen the Regional Chapters to manifest and intensify the activities of Academy. He advised NAAS chapters to focus on the issues relevant to agriculture at the regional level and establish links with the State/ Central Government departments and explore possibilities of utilizing the experience and expertise of the NAAS Fellowship located in their region. The President appreciated the recent initiative of Hyderabad Chapter to compile a directory giving specialization and contact details of the entire Fellowship in the region. Subsequently, the progress and financial activities of the Bengaluru, Chennai, Hyderabad, Karnal, Kolkata, Mumbai, Lucknow and Varanasi Chapters were appraised by their respective conveners. The Regional Chapters were also advised to keep updating the Secretariat about the activities planned and undertaken for coverage in NAAS News. It was also decided that from now onwards annual meeting of the all Conveners will be held, preferably in the forenoon of 4th of June preceding the AGM of NAAS, in which the NAAS-Chapters would present their activities. It was also suggested that the new Conveners of the following Regional Chapters may be nominated as follows:

- (i) Regional Chapter Bhopal : Dr A.K. Patra in place of Dr K.K. Singh
- (ii) Regional Chapter Varanasi: Dr Sudhakar Pandey in place of Dr B. Singh
- (iii) Regional Chapter Lucknow: Dr S.K. Pandey in place of Dr P.S. Pathak

New Year Get-together



The Academy organized a get together of Delhi based Fellowship at NAAS Secretariat on January 1, 2020 under the Chairmanship of Dr T. Mohapatra, President of the Academy. Other dignitaries included the immediate past-President Prof Panjab Singh, past-Presidents Dr R.S. Paroda and Prof R.B. Singh, Dr A.K. Srivastava, Vice-President, Dr A.K. Singh, Secretary and Dr P.K. Joshi, newly-elected Secretary. Dr A.K. Singh 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 highlighted the activities and achievements of the Academy during the year 2019.

Dr Mohapatra welcomed the NAAS family and wished a bright and professionally rewarding New Year-2020. He requested the Fellowship to recall Academy's achievements, to which many have contributed by pioneering the new framework to agricultural research and development. Further, he drew attention of the Fellowship towards the need to focus on the national issues related to agriculture and broaden horizons of NAAS to increase its visibility by attracting youngsters and inspired minds. He was of the view that NAAS need to strengthen one of its biggest responsibility to inform the society about the potential of new science for enhancing agricultural growth and improving livelihood of farmers. He wished that Regional Chapters of the Academy shall strengthen their very role in dissemination of policies and knowledge in most effective manner, besides creating awareness about various activities of the Academy. He also proposed frequent interface among scientific academies in the country and abroad to establish a direct link between current global developments and scientific efforts. He appealed and requested the Fellowship to reposition the activities commensurate with Academy's intellectual and other resources.

Dr R.S. Paroda wished that new year will bring new opportunities and challenges for NAAS fellowship, and stressed the need to prepare NAAS to further promote science by engaging stakeholders and working with policy makers, besides coordination, convergence and joint action with scientific societies and other academies. He reminded the fellowship about the resolve set out in Paris inter-government agreement to achieve

sustainable development goals (SDGs) by 2030. He exhorted the fellowship to think globally and act locally to achieve the goal of zero hunger. He was confident that Academy will take necessary steps to bridge the disconnect with policy makers for science-led development of agriculture and farming community.

Prof R.B. Singh, past-President of the Academy also wished the fellowship a happy, healthy and prosperous New Year. He provided an insight into the book Agricultural Transformation – The Road to New India authored by him and released by the President, NAAS on this occasion. The book captures frontier agro-biological, scientific, technological and innovative developments; and highlights major trends, issues and challenges; main messages; policy options strategies, and actions emerging from the Policy Papers, Strategy Papers, Policy Briefs and other publications of the NAAS. Prof Singh expressed the hope that the book will underpin the urgency and importance of breaking the Indian enigma and of transforming Indian agriculture to be more rewarding, resilient, and responsive to free the nation of hunger, under-nutrition and abject poverty and to build an ever-prosperous New India. He also explained how the book internalizes voices and views not only of scientists/ academicians, but also those arising from grassroot levels, besides messages emerging from political thought processes, governmental priorities, policies and initiatives. He expressed his gratitude to the Academy for giving him the opportunity to review the usefulness of NAAS publications in suggesting policy options and research priorities for transforming India's agri-food system with a human face.

Prof Panjab Singh, immediate past-President of NAAS while conveying his warm greetings to NAAS fellowship for participation in the New Year get-together, and expressed his gratitude to entire fellowship for all round support to him during his tenure as President. He also congratulated newly-elected President, Vice-President, Secretary, Editor, Fellows and Associates, and lauded the contribution of the outgoing office bearers and members of Executive Council. He reiterated the need to get associated with development departments through regional chapters for providing science-led solutions to various problems facing agriculture. He pointed out that NAAS has been at the forefront by expressing the views of fellowship through its publications, media and debates on issues like GM, ZBNF, restructuring of ASRB etc. 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. He also highlighted the consultancy approach floated by the Academy to make use of NAAS think-tank to attend to policy issues outsourced by government agencies.

Several fellows expressed their views in the open discussion and gave valuable inputs on various issues related to broadening of the horizon of NAAS in terms of mentoring by fellowship, repositioning of NAAS to increase its visibility and awareness in social arena, marrying scientific excellence with relevance, inter-academy approach and challenges of conservation agriculture and rating of the scientific journals.



On this occasion, Academy's Strategy / Policy Papers, NAAS Yearbook 2020, NAAS-NEWS October-December 2019, and NAAS Planner 2020 were also released.

Executive Council Meetings

During the year 2019-20, four meetings were held on (June 4, 2019, September 13, 2019, November 27, 2019, and February 21, 2020 at New Delhi. Some important items considered and actions taken during the meetings are elaborated as under:

108th Meeting

The 108th Executive Council (EC) meeting of the Academy was held under the Chairmanship of Prof Panjab Singh on June 4, 2019. The Executive Council deliberated and approved the composition of new NAAS Journal Score Committee (NJSC) for assigning NAAS Score to scientific journals effective from 1st January 2020. The evaluation proforma and the guidelines will be revised and uploaded on Academy's website for inviting application for scoring of non-IF journals based on the recommendations of NJSC. EC stressed that the Strategy/Policy papers to be brought out by the Academy must clearly spell out the actionable points with a plausible roadmap. Further, the offer of Vice-Chancellor, BHU to host the XV Agricultural Science Congress in February 2021 was accepted considering the location, accessibility and facilities available at this premier institution. It was suggested that XV-ASC be scheduled in the third week of February, 2021 in consultation with the host university. The EC opined that the Vice-Chancellor, BHU and Director, Institute of Agricultural Sciences may be the Convener and Organizing Secretary of the XV ASC, respectively. The EC approved the nomination of Dr A.K. Patra, Dr Sudhakar Pandey and Dr S.K. Pandey as new convenors of Regional Chapter of Bhopal, Varanasi and Lucknow, respectively. It was decided that both Foreign and Pravasi fellowships be continued as before, however, modified guidelines defining the eligibility and election procedure for Foreign and Pravasi Fellows were approved for greater clarity in nominating the deserving persons. Accordingly, EC also approved the proposal to shift the names of Fellows of Indian origin elected earlier as Foreign Fellows to the list of the National Fellows (if they are now based in India) or Pravasi Fellows (if based outside India) as the case may be. The EC recommended the

proposal for approval of AGM to increase the annual intake of Associates from 10 to 12, following the section-wise distribution to encourage young scientists.

Section	Annual Intake
Crop Sciences	2
Horticultural Sciences	1
Animal Sciences	2
Fisheries Sciences	1
Natural Resource Management Sciences	2
Plant Protection Sciences	2
Agricultural Engineering and Technology	1
Social Sciences	1

The EC reviewed four new themes viz. Zero Budget Natural Farming, Subsidies in Agriculture, Expansion of Agricultural Universities and MSP for Farm Produce proposed for organising Brain Storming Sessions during the year 2019 as per the recommendation of Program Committee. It was agreed to organise Brain Storming Session on Zero Budget Natural Farming with Dr H.S. Gupta as the Convener in near future. However, it was felt that a final decision to convene BSS on Subsidies in Agriculture and MSP for Farm Produce may be taken after the outcome of the deliberations of the forthcoming BSS on Loan Waiving versus Income Support Schemes: Challenges and Way Forward scheduled for 24th June, 2019. Regarding BSS on Expansion of Agricultural Universities, the EC felt that the proposed BSS may be put off to a later stage. The following new programmes were agreed:

- i) Strategy Paper on Food Borne Zoonotic Diseases.
- ii) Strategy Paper on Tropical Wilt Race-4 in Banana Cultivation.
- iii) Strategy Paper on Bio-fortification.
- iv) Policy Paper on Improving Livestock through Artificial Insemination.

109th Meeting

The 109th meeting of the Executive Council (EC) was held on September 13, 2019 under the Chairmanship of Prof Panjab Singh, President, NAAS, New Delhi. After a brief welcome by the President, agenda items were discussed and approval accorded wherever necessary. The EC agreed to hold XV ASC 2021 at BHU, Varanasi during February 20- 22, 2021 on the theme *Energy and Agriculture: Challenges in 21st Century*. Dr A.K. Srivastava, Vice-President of the Academy and Chairman, Conveners' Group presented the recommendations of the Sectional Committees that were endorsed by EC after detailed deliberations. Similarly, the recommendations on Pravasi and Foreign Fellowship for the year 2020 were also accepted. The Executive Council also approved the selection of 11 young scientists working in agriculture related disciplines as Associates of the Academy with effect from January 1, 2020. After examination of suggestions received from Fellowships for various vacant positions in EC w.e.f. January 1, 2020, EC shortlisted the names for seeking votes from the entire Fellowship of the Academy to fill the vacancies as per NAAS guidelines. EC also gave its approval to revise expenditure norms on brain storming sessions, grant to regional chapters, payment of DA to sectional committee members and rates for catering services.

110th Meeting

The 110th Meeting of the Executive Council was held on November 27, 2019 and was chaired by Prof Panjab Singh, President NAAS. After brief welcome by the President all the listed agenda were discussed in detail and approval accorded wherever necessary. Some of the important decisions were; approval of the recommendation of the Programme Committee; and suggestions given by Sectional Committees may be examined further by a large group before finalising the guidelines for selection of Fellows, till then the existing guidelines will be applicable. It was also decided that the recommendations of Journal Score Committee may be submitted to EC for approval. The EC had constituted a committee Chaired by Dr A.K. Srivastava, Vice-President, NAAS to suggest suitable activities to utilize the income accrued from the savings. The members were satisfied with the progress and gave many useful suggestions including approval of activities of the Academy for the year 2020. Some changes in the guidelines of Academy awards were also approved. It was decided that in the next, 111th EC meeting, the Organising Secretary of XV ASC be invited and requested to discuss the planning of the ASC.

111th Meeting

The 111th meeting of the Executive Council of the Academy was held under the chairmanship of Dr T. Mohapatra, President, NAAS on February 21, 2020 at the NAAS Secretariat, New Delhi. It was attended by 17 EC members, besides Prof Anupam Varma, Editor-in-Chief, Agricultural Research and Prof Rakesh Singh, Head, Department of Agricultural Economics, BHU, Varanasi & Nodal Officer for the proposed XV Agricultural Science Congress as special invitees. Dr Anil K. Singh, Secretary extended a very warm welcome to all the participants, especially the newly elected office bearers and members of the Executive Council who joined on January 1, 2020, namely, Dr Trilochan Mohapatra as President; Dr J.C. Katyal as Vice President; Dr P.K. Joshi as Secretary; Dr P.S. Birthal as Editor; and Drs J.S. Chauhan, W.S. Lakra, Rajender Parsad and R. Visvanathan as Members of the EC.

Dr T. Mohapatra in his opening remarks lauded the commendable services of the Academy. However, he expressed the need to expand its outreach both within and outside the country. He requested the EC to critically review, and guide in doing better in the future with a tangible difference by taking its past accomplishments as the base. He called for a proactive approach in providing inputs to policy makers in areas like animal husbandry, input subsidies, water management and new science.

He cited specific examples of the inputs provided by NAAS for Seed Policy, Pesticide Management Bill, and Genome Edited Organisms Guidelines. He requested the Office Bearers to meet more frequently to identify issues of topical importance.

Prof Rakesh Singh provided an update to the EC about the preparations for holding XV ASC-2021 at BHU. He provided a brief about the available facilities in and around the BHU campus. EC advised him to have an interface meet with Dr Ashok K Singh, Director, IARI and Organizing Secretary of XIV ASC-2019, and expedite various activities on priority, particularly creation of a website, designing of logo & flyer of XV ASC and budgetary requirements including sources of funding. He was requested to provide desired details before the next EC meeting.

Thereafter, the items listed in the agenda were taken up for discussion. The notable decisions taken by the EC included approval of the sectional committees for election of fellows and associate fellows for 2021, constitution of Judging Committees for selection of awardees for the biennium 2019-2020, approval of the proposed programme for AGM, extension of the validity of current NAAS Score of 2019 of non-IF journals until December 31, 2020; appointment of Shri S. Bilgrami as Executive Director, besides ratification of the extension of tenure of Budget & Accounts Executive with enhanced emoluments. A proposal for an Inter-Academy Forum on Innovation (IAFI) to be jointly developed by the National Academies of Sciences, Engineering, Medical, Agriculture and others, was deliberated in the meeting and it was decided to circulate it to all the EC members for their inputs before it is finalized. The meeting ended with a vote of thanks to the Chair and all the members by Dr A.K. Singh.

Journal Score Committee

The Academy carries out voluntary evaluation of scientific journals of standing and of relevance to agricultural and allied sciences, every three years. However, the journals left out due to non-submission/incomplete submission of the required information or the journals that become eligible for NAAS score subsequently, are also offered opportunity and evaluated on annual basis. The validity of current NAAS scoring of scientific journals was going to be over on 31.12.2019.

Academy has constituted new NAAS Journal Score Committee (NJSC) under the Chairmanship of Prof Anupam Varma with Dr Anil K Singh as Member Secretary. The newly constituted NJSC met in the NAAS Secretariat on June 6, 2019 to deliberate, *inter alia*, on existing mechanism of evaluation of non-IF journals and revise the guidelines/ evaluation proforma, particularly in order to ensure the adoption of good publishing practices by publishers, and to impose a check in inclusion of predatory journals in the list of NAAS scored journals. Thereafter, applications were invited in revised proforma from the Editors/ Publishers of both NAAS scored non-IF journals and new journals received in the Academy during the year for evaluation and assigning NAAS Scores w.e.f. Jan 1, 2020. The Academy has received applications from 637 journals which include 82 new and 555 existing NAAS scored journals.

The NJSC met twice in the NAAS Secretariat under the chairmanship of Prof Anupam Varma with Dr Anil K Singh, as Member Secretary on December 6, 2019 and again on December 19, 2019 for evaluation and finalization of NAAS Scores of non-impact factor journals received in the Academy during 2019.

The main points of discussion and the decisions taken in the meeting are as under:

- Out of 637 journals received, 140 journals could not be evaluated for NAAS Score as: (a) majority of them primarily found to be not relevant to agricultural and allied sciences; (b) not having adequate reviewing process (c) poor quality of formatting/editing, etc.
- (ii) A need was felt to have a relook at these 140 journals before finally removing them from the evaluation process for NAAS scoring.
- (iii) A suggestion was also made to revisit the Guidelines and the Proforma for Evaluation for NAAS Scoring of Non-IF research journals so that a curb may be imposed on such journals at the 1st phase of evaluation itself.
- (iv) The NAAS Score of most of the journals which have been evaluated were found to be less than their last year's scores.
- (v) The nominations for election of Fellows, selection of Associates and Academy Awards for 2019-2020 will be invited from Jan 1, 2020 to Mar 31, 2020 and therefore Nomination Forms along with list of NAAS scored journals will have to be uploaded on Academy's website.

Keeping in view the above status, the NJSC committee recommended as follow:

- (vi) The evaluation process for assigning NAAS Score to non-IF journals effective from Jan 1, 2020 may be deferred.
- (vii) The current NAAS Score of non-IF journals may remain valid for one more year i.e. from Jan 1, 2020 till 31st Dec 2020.
- (viii) The NAAS Score of journals having Thomson Reuters impact factor may be revised as being done annually on the basis their latest Impact Factor of 2018.

Based on the recommendations at (vii) & (viii) above, the list of NAAS Scored Journals effective from Jan 1, 2020 has been updated and uploaded on Academy's website on Jan 1, 2020.

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.

Consultancy Services by NAAS

Experts Meet on National Soil and Land Use Policy

The National Academy of Agricultural Sciences constituted a Core Group for preparing the National Soil and Land Use Policy at the behest of Department of Agriculture,

Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Govt. of India. The Core Group had four regional consultation meetings with agricultural scientists from NARES, representatives from line departments and progressive farmers at Bengaluru, Kolkata, Bhopal and New Delhi. The draft report prepared by the Core Group was uploaded at the website of NAAS and discussed at the experts group meeting convened under Chairmanship of President, NAAS on April 13, 2019 at New Delhi, in the wake of 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 in the recent past. The recommendations in the areas of policy measures, structural reforms, operational interventions and regulations for initiating appropriate action by the concerned agencies were discussed and finalized. The policy framework envisages efficient use of soil, land and water resources, so that their inherent use potential is handed over undiminished to posterity. It was felt that the draft document will meet the expectations of the DAC&FW in devising soil and land use programmes for sustained growth and development of agriculture sector with the ultimate goal of *Greening India* leading to sustainable land use systems and environment security.

Programmes Planned for 2020

The Academy organizes Brainstorming Sessions (BSS) each year on thematic areas of national importance related to Indian agriculture. For the year 2020, the Executive Council has approved the following programmes:

S. No.	Title of BSS	Convener/Co-Convener	Proposed date
1.	Policy of Gene Edited Agricultural Products	Dr N.K. Singh	Feb 6, 2020
2.	Potential of Non-Bovine Milk	Dr M.S. Chauhan	Jun 29, 2020
3.	Strategies for Enhancing Soil Organic Carbon for Food Security and Climate Action	Dr Ch Srinivasa Rao and Dr Anil K. Singh	Aug 21, 2020
4.	Anti Microbial Resistance	Dr A.K. Srivastava	Aug 29, 2020
5.	Food, Agriculture and Income Policy for the Five Trillion Economy	Dr Suresh Pal	Oct, 2020
6.	Innovations in Potato Seed Production and Its Adoption	Dr S.K. Chakrabarti	Dec, 2020
7.	Emergency Preparedness for Prevention of Transboundary Infectious Diseases in Indian Livestock and Poultry	Dr Parimal Roy and Dr V.P. Singh	To be decided
8.	Wastewater Utilisation in Urban and Peri-Urban Agriculture	Dr J.C. Dagar	To be decided

9.	Need for Breeding Tomatoes Suitable for Processing in India	Dr A.T. Sadashiva	To be decided
10.	Sugarcane based Ethanol Production for Sustainable Fuel Ethanol Blending Programme	Dr Bakshi Ram	To be decided
11.	Bio-fortification	Dr U.S. Singh	To be decided
12.	Ethno Medicine	Dr P.L. Gautam	To be decided

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 2019-20, 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 2019-20 has been submitted to the DARE.

A brief Audited Statement of Accounts and Auditor's Report for 2019-20 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, 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 2019-20.

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) 43507900 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 31st March, 2020 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

- Income Tax order for A.Y 2017-18 passed U/s 143(3) of the Income Tax Act by the Income Tax Officer, Delhi of the trust on dated 30-12-2019 raising the demand of Rs. 1,11,91,925/-, ,Against the same, appeal have been filed before the CIT(A) Delhi and same is pending for disposal. Management is of the view that No Addition should sustain hence, No provisions is made against the demand. However, Rs 22,34,385/- have been deposited, against the grant of stay.
- Accounts are continuously maintained on "cash basis" however TDS by the banks interest. etc. have claimed on accrual basis.
- 3. GST 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 31st March, 2020.
 - ii.) In the case of Income and Expenditure Account, of the excess of Income over Expenditure for the year 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.



NATIONAL ACADEMY OF AGRICULTURAL SCIENCES Year Ended 31st March 2020.

Accounting Policies and Notes to Accounts Forming Part of the Balance Sheet as on March 31, 2020

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 order for A.Y 2017-18 passed U/s 143(3) of the Income Tax Act by the Income Tax Officer, Delhi of the trust on dated 30-12-2019 raising the demand of Rs. 1,11,91,925/-. 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 22,34,385/- have been deposited, against the grant of stay.
- During the year under consideration a sum of Rs. 2,49,81,302/- is proposed to be accumulated u/s 11(2) of the Income Tax Act, 1961.

6.	Payments of Auditors	31/03/2020	31/03/2019
	Audit Fee/GST Fee and expenses	73,000/-	68,120/-

- 7. 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) The necessary action to reconcile the defaults of Rs. 24,860 /- as appearing on the Income Tax Website is still pending.

For Virender K Gupta & Co. National Academy of Agriculture Sciences **Chartered Accountants** Gunta Partner Semy of Agriculture M.No.080585 Secretary Place : New Delhi Dated Treasure S 1 0 JUL 2020

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES

BALANCE SHEET AS ON 31.03.2020

LIABILITIES	AMOUN	IT (Rs.)	ASSETS	AMOUNT	r (Rs.)
CAPITAL FUND Opening Balance Add: Transferred from Accumulated Fund Add: Excess of Income over Expenditure during the year Less: Funds transferred to Specific Reserve Fund	15,35,54,091 2,04,85,674 70,23,988 2,49,81,302	15,60,82,451	FIXED ASSETS Opening Balance Additions during the year Write off during the year Depreciation for the year written off	2,10,36,322 23,969 (23,85,715)	1,86,74,576
SPECIFIC RESERVE FUND Opening Balance Add: Addition during the year Less: Utilized during the vear	15,39,20,056 2,49,81,302 2.04,85,674	15.84 15.684	Deposits in Approved Securities CURRENT ASSETS Bank Balances		28,09,47,311
ENDOWMENT FUND Opening Balance Received during the year	20,00,000	20,00,000	Cash Balances (Imprest A/c)		3,552
CURRENT LIABILITIES National Soil & Land Use Policy Developing Proforma Rank ICAR Institutions Compendium on Impact of NARS Earnest Money (MM ACTIV) GST Payable (CGST+SGST)		4,70,524 5,45,506 17,88,000 5,00,000	ADVANCES Advances with NAAS Regional Chapters Tax Deducted at Source Payment to Income Tax Department (AY 2016-17 & 2017-18) GST Receivable		4,76,804 93,97,936 49,12,779 1,09,958
TOTAL		31,98,16,988	TOTAL		31,98,16,988

Refer Notes Attached To and forming part of Accounts. As per our report of even date attached

For Virender K Gupta & Co



National Academy of Agricultural Sciences



INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31ST MARCH, 2019 NATIONAL ACADEMY OF AGRICULTURAL SCIENCES

EXPENDITURE	AMOUNT (Rs.)	INCOME	AMOUNT (Rs.)
To Expenditure towards NAAS activities	1,95,87,968	By Grant-in-Aid from D.A.R.E.	1,36,00,000
To Expenditure towards XIV ASC	36,03,032	By Interest on Investment	1,38,16,062
To Depreciation	23,85,715	By Interest, Contribution from Subscriptions, Publications and Other receipts towards NAAS activities	43,74,788
To Excess of Income over Expenditure transferred	70,23,988	By Sponsorship & Other Miscellaneous Income towards XIV ASC	8,09,852
Total:	3,26,00,702	Total:	3,26,00,702

Refer Notes Attached To and forming part of Accounts. As per our report of even date attached

For Virender K Gupta & Co Chartered Accountants

1 0 JUL 202 Place: New Delhi N.K. Gupta) M.No.-080585 Partner Dated:

National Academy of Agricultural Sciences



Secretary

Annexure-III

EXECUTIVE COUNCIL

Position	2019	2020
President	Prof Panjab Singh	Dr T. Mohapatra
Immediate Past President	Dr S. Ayyappan	Prof Panjab Singh
Vice-President	Prof A.K. Srivastava	Prof A.K. Srivastava
Vice-President	Dr T. Mohapatra	Dr J.C. Katyal
Secretary	Dr Anil K Singh	Dr Anil K Singh
Secretary	Dr J.K. Jena	Dr P.K. Joshi
Foreign Secretary	Dr U.S. Singh	Dr U.S. Singh
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LIST OF ACRONYMS

AI	Artificial Insemination
AICRP	All India Coordinated Research Project
ASC	Agricultural Science Congress
AUDA-NEPAD	African Union Development Agency
BARC	Bhabha Atomic Research Centre
BHU	Banaras Hindu University
BIMSTEC	Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BISA	Borlaug Institute for South Asia
CANR	Agriculture and Natural Resources
CGIAR	Consultative Group on International Agricultural Research
COPs	Community of Practices
CRISPR	Clustered regularly interspaced short palindromic repeats
CSIR	Council of Scientific and Industrial Research
DARE	Department of Agricultural Research and Education
DBT	Direct Benefit Transfer
DCT	Direct Cash Transfer
DST	Department of Science & Technology
EMPRES	Emergency Preventive System for Trans-boundary Animal Diseases
FBDs	Food borne zoonotic diseases
FRS	Fellow of the Royal Society
GADVASU	Guru Angad Dev Veterinary and Animal Sciences University
GAP	Good Agricultural Practices
GFPR	Global Food Policy Report
GHP	Good Hygiene Practices
GIS	Geographic Information System
GKHAS	Global Knowledge Hub for Agricultural Statistics
GLEW	Global Early Warning Systems
GMP	Good Manufacturing Practices
GORAN	Global Outbreak Alert and Response Network
НАССР	Hazard Analysis Critical Control Point
HRD	Human Resource Development

ICAR	Indian Council of Agricultural Research
ICAR-CIAE	Central Institute of Agricultural Engineering
ICAR-CIFE	Central Institute of Fisheries Education
ICAR-CISH	Central Institute for Subtropical Horticulture
ICAR-CSSRI	Central Soil Salinity Research Institute
ICAR-IARI	Indian Agricultural Research Institute
ICAR-IIRR	Indian Institute of Rice Research
ICAR-IISR	Indian Institute of Sugarcane Research
ICAR-IIVR	Indian Institute of Vegetable Research,
ICAR-NAARM	National Academy of Agricultural Research Management
ICAR-NDRI	National Dairy Research Institute
ICAR-SBI	Sugarcane Breeding Institute
ICAS-VIII	Eighth International Conference on Agricultural Statistics
ICMR	Indian Council of Medical Research
IFPRI	International Food Policy Research Institute
IoTs	Internet of things
IPR	Intellectual Property Rights
KVKs	Krishi Vigyan Kendras
MoU	Memorandum of Understanding
MSU	Michigan State University
NABARD	National Bank for Agriculture and Rural Development
NARES	National Agricultural Research and Education System
NCERT	National Council of Educational Research and Training
NIC	National Informatics Centre
NPPQS	National Plant Protection Quarantine Stations
ICAR-NRCB	National Research Centre for Banana
OIE	World Organization for Animal Health (Office International des Epizooties)
PAU	Punjab Agricultural University
PJTSAU	Professor Jayashankar Telangana State Agricultural University
SHC	Soil Health Cards
SLDMC	State Level Disease Management Committee
SOPs	Standard Operating Procedures

SPNF	Subhash Palekar Natural Farming
SSC	South-South Cooperation
SSRD	Society for Sugarcane Research and Development
TAAS	Trust for Advancement of Agricultural Sciences
TANUVAS	Tamil Nadu Veterinary and Animal Sciences University
TERI	The Energy and Resources Institute
UGC	University Grants Commission
VF	Vertical Farming
WTO	World Trade Organization
ZBNF	Zero Budget Natural Farming
MIDH	Mission for Integrated Development of Horticulture

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