

ANNUAL REPORT 2020-2021



**National Academy of Agricultural Sciences
New Delhi**

ANNUAL REPORT

2020-21



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

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PREFACE

It is a privilege for me to place before the esteemed Fellowship a synopsis of the activities undertaken and the objectives achieved during the year 2020-21. This period has witnessed a new world altogether, characterised by unanticipated disruptions and transformations. It is gratifying to report that the Fellowship, in spite of these never-before-seen challenges, worked dedicatedly to accentuate successfully the role of the Academy as a proactive think-tank of the nation in the agriculture sector.



During the year, when digital communication has become the new normal, the Academy adjusted well in tune with the requirement. The Academy organized sixteen events consisting of Brainstorming Sessions, Strategy Workshops, Experts' meet and Expert Consultation Meetings as well as lectures, all in virtual mode at the national level. The focus of the deliberations was on the contemporary issues of Indian agriculture, which generated specific recommendations with action points for policy makers, government, institutions of higher learning, farmers and other stakeholders. Nine Policy Papers and Policy Briefs were the outcomes of these events.

The Foundation Day Celebration is considered as one of the most significant events of the Academy. It gives an opportunity to entire Fellowship to join together with dignitaries from different walks of life and share ideas for adoption of new strategies commensurate with the vision of the Academy. Keeping in view with the prevailing restrictions, the tradition of celebrating the Foundation Day in physical format was avoided. Instead, a virtual Panel Discussion was organized on the theme "COVID 19: Impacts and New Normal in Agriculture". It focussed on the consequences of the Covid-19 crisis on agriculture and the technological and policy solutions for sustaining post-pandemic agricultural growth, wherein the issues related to Indian agriculture and mitigation measures to overcome bottlenecks for ensuring sustainable food system were deliberated upon in detail.

The efforts made by the Regional Chapters of the Academy during these trying times merit special mention. The Regional Chapters organised more than 29 events. These were highly successful in encouraging exchange of scientific and academic ideas through brainstorming sessions, webinars etc. Some of these events also focussed on students. The high school, graduate, and post graduate students were exposed to different facets of agriculture such as rural bio-entrepreneurship, opportunities in agriculture under *Atma Nirbhar Bharat* scheme, and other contemporary issues related to health, nutrition and environment. I express my deep appreciation and profusely thank all the Conveners of the Regional Chapters for their valuable efforts.

Endorsing its position as a think tank in agriculture and allied sectors, the Academy also played a significant role in providing vital and timely inputs to many critical policy issues under active consideration of the government.

It is heartening to share that Academy has brought out all issues of the NAAS-News regularly, and the NAAS Yearbook 2021 and NAAS Yearly Planner were also published on time. Special thanks to Prof Anupam Varma, Editor-in-Chief of the NAAS journal, *Agricultural Research*, for his untiring efforts in bringing out all issues of the Journal timely.

I place on record my gratitude to Dr Panjab Singh, Immediate Past President; Dr J.C. Katyal and Dr Anil K. Singh (w.e.f. 1.1.2021), Vice-Presidents; Dr P.K. Joshi and Dr K.C. Bansal (w.e.f. 1.1.2021), Secretaries; Dr U.S. Singh, Foreign Secretary; Dr P.S. BIRTHAL and Dr Malavika Dadlani (w.e.f. 1.1.2021), Editors; and Dr R.K. Jain, Treasurer for their guidance and contributions. A special word of thanks to the outgoing office bearers and EC members (up to 31.12.2020) namely Dr A.K. Srivastava, Vice President; Dr Anil K. Singh, Secretary; Dr Kusumakar Sharma, Editor, and members - Dr B.S. Dwivedi, Dr Ashwani Kumar, Dr V. Prakash and Dr D.D. Patra.

My sincere thanks are also to the colleagues in NAAS Secretariat, Shri Sanchal Bilgrami (up to 31.05.2020), 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 all the day-to-day activities of the Secretariat. The financial and logistics support of the DARE and ICAR is gratefully acknowledged.



(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 1990 to be an interactive forum for agricultural scientists from different disciplines - crop husbandry, animal husbandry, fisheries, forestry, engineering and social sciences to deliberate on important issues related to agriculture and agriculture-based livelihood, agricultural research, education and extension; and facilitate evidence-based inputs to policy-makers and other stakeholders at the various levels of governance. The Academy organizes and supports national and international congresses, conferences, seminars, symposia, workshops and brainstorming sessions on the contemporary issues in agricultural sciences, and articulates concerns on the visibility of agricultural research, education and extension in various fora.

The Academy has emerged as a vibrant national-level body on 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:** This Body of the Academy comprises of all the Fellows.
- **The Executive Council (EC):** It 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 Barapani, Bengaluru, Bhopal, Coimbatore, Cuttack, Hyderabad, Karnal, Kolkata, Lucknow, Ludhiana, Pune and Varanasi.

SCIENTIFIC ACTIVITIES

Brainstorming Sessions/Strategy Workshops/Consultation Meetings

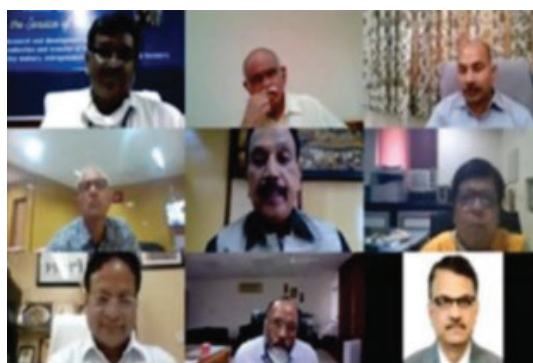
During the year, following brainstorming sessions/strategy workshops/ consultation meetings were organized.

Sl. No	Title	Convener/ Co-Convener	Date
1	Foundation Day Celebration- COVID 19: Impacts and New Normal in Agriculture	Dr P.K. Joshi and Dr P.S. BIRTHAL	June 5, 2020
2	Potential of Non-bovine Milk	Dr M.S.Chauhan	June 29, 2020
3	Enhancing Soil Organic Carbon for Food Security and Climate Action	Dr Ch Srinivasa Rao and Dr Anil K. Singh	August 21, 2020
4	Anti-Microbial Resistance (AMR)	Dr A.K. Srivastava and Dr Anil Kumar Arora	August 29, 2020
5	Revision of Biological Diversity Act: Rules and Guidelines	Dr Kuldeep Singh	September 1, 2020
6	Sugarcane Based Ethanol Production for Sustainable Fuel Ethanol Blending Programme	Dr Bakshi Ram	September 18, 2020
7	One World One Health	Dr A.K. Srivastava, Dr R.S. Aulakh and Dr R.K. Singh	September 19, 2020
8	Agriculture and Food Policy for Five Trillion Dollar Economy	Dr Suresh Pal	October 14, 2020

Sl. No	Title	Convener/ Co-Convener	Date
9	Transforming Higher Agricultural Education in India	Prof R.B. Singh	October 20, 2020
10	Innovations in Potato Seed Production and their Adoption	Dr S.K. Chakrabarti	October 27, 2020
11	Utilization of Wastewaters in Urban and Peri-urban Agriculture	Dr J.C. Dagar	November 17, 2020
12	Need for Breeding Tomatoes Suitable for Processing in India	Dr A.T. Sadashiva	November 24, 2020
13	Emergency Preparedness for Prevention of Transboundary Infectious Diseases in Indian livestock and Poultry	Dr Parimal Roy	December 19, 2020
14	Contract Farming for Transforming Agriculture: Challenges and Way Forward	Dr Anjani Kumar	March 10, 2021
15	Potential of Transgenic Poultry for Biopharming	Dr Tarun Kumar Bhattacharya	March 15, 2021
16	Biofortification to Address Hidden Hunger and Nutritional Security: Present Status and Way Forward	Dr U.S. Singh	March 26, 2021

Potential of Non-Bovine Milk (Convener: Dr M.S. Chauhan)

The non-bovine milk and its products are gaining importance in people's diet because of their nutritional and health benefits. An online Brainstorming Session was organized to reflect on its nutritional and health attributes, and also how to have sustainable increase in non-bovine milk production. Dr T. Mohapatra, President, NAAS, chaired the session. In his opening remarks, he emphasized the



need to undertake research to bring out breed differences in quality attributes of milk from bovine and non-bovine species, besides characterization of bio-actives claimed for human health benefits. Some of the key issues and recommendations emerged were as follows.

Value-added products from non-bovine milk have tremendous demand in the national and international markets, and may emerge as superfoods.

- Research on “Non-bovine Milkbiome and Metabolome” needs to be intensified to work on collating information on microbiological profiles of all non-bovine species using ‘metagenomics’ and ‘culturomics’ approaches.
- A comprehensive catalogue on milk microbiota and whole genome sequencing of selected bacterial species is required to strengthen non-bovine milk production.
- Non-bovine milk and milk products are nutritionally superior and have high commercial and economic value. Hence, identification of unique metabolites to be used as biomarkers for monitoring their quality are important.

Strategies for Enhancing Soil Organic Carbon for Food Security and Climate Action (Conveners: Dr Ch Srinivasa Rao and Dr Anil K. Singh)

To discuss importance of soil organic carbon (SOC) in food security, environmental sustainability and climate adaptation and mitigation, the Brainstorming Session was organized and chaired by Dr T. Mohapatra, President of the Academy.

Following recommendations emerged from the discussion.



- Reduce output losses by holistic land management through conservation and with a harmonious blend of farmers’ land- use practices.
- Provide subsidies on carbon- smart agriculture practices to farmers.
- Establish a ‘National Mission on Carbon Sequestration’, and also create platforms on ‘Farmers’ Innovation and Cross-Learning’ for carbon sequestration.

Anti-Microbial Resistance (Convener: Dr A.K. Srivastava, Co-Convener: Dr Anil Kumar Arora)

Antimicrobial resistance (AMR) is a cross-boundary challenge influenced by clinical, biological, social, political, economic, and environmental factors, and it affects humans, domestic/non-domestic animals and ecosystems. It has emerged as the most critical threat to global public health, food security and development. A brainstorming session under the chairmanship of Dr T. Mohapatra was organized to discuss issues

related to AMR. Dr Mohapatra stressed the need to reorient efforts targeting factors cutting across different sectors to build resistance.

Following were the key recommendations.

- A policy on judicious and prudent use of Antibiotics in Human and Veterinary Medicine along with a standard and evidence-based treatment guidelines and protocols for targeted disease(s) with lesser critical but sensitive antibiotic should be immediately developed.
- An 'AMR Regulatory Platform' should be established at the National level, and a coordinated 'Regional Network Programme' to track and detect antimicrobial resistance at the human, animal and environment interface should be launched.

Revision of Biological Diversity Act: Rules and Guidelines (Convener: Dr Kuldeep Singh)

The Biological Diversity Act (BDA) – 2002 was primarily promulgated to address issues of conservation of biological diversity, sustainable use of its components and for equitable sharing of benefits from use of biological resources. However, it was felt that objectives of the Act cannot be realised unless the lacunae in the Act are rectified. In view of the importance of the BDA-2002, a brainstorming session was organized.



Following recommendations were emerged from the brainstorming session.

- The powers and responsibility to regulate all activities related to agro-biodiversity may be delegated to the Secretary, DARE & DG, ICAR u/s 16 of the BD Act. It is because DARE has the mandate for international cooperation and assistance in the field of agricultural research and education
- A national mechanism for exchange of agro-biodiversity genetic resources needs to be provided on the basis of reciprocity between India and other providing countries.
- Harmonize PPVFRA, 2001 and BDA, 2002 on a priority basis.
- Expand repositories of agro-biodiversity for agriculturally important plants, animals, insects, fish, and microbes.
- Exempt Inter-governmental, Inter-regional and India-CGIAR institutions collaboration from NBA regulations.
- Facilitate access to microbial cultures to foreign researchers for non-commercial purpose.
- Consensus needs to be obtained on the issue of access and benefit sharing on Digital Sequence Information (DSI) at the national level.

Sugarcane- based Ethanol Production for Sustainable Fuel Ethanol Blending Programme (Convener: Dr Bakshi Ram)

Under the co-chairmanship of Dr Mangala Rai and Dr T. Mohapatra, a brain-storming session was organized. Dr Mohapatra highlighted on renewable energy targets, Standard Operative Procedures (SOPs) for bioethanol production and processing and creation of value chains.

The salient recommendations emerged were as follows.

- Include ethanol transportation cost from production to blending for fixing prices of fuel ethanol.
- Fix ethanol price 1.6 times more than the price of white sugar for better economics.
- Encourage sugar industries for ethanol production during low recovery phase in a sugar season.
- Adopt and promote sugarcane varieties for ethanol production during off- season of sugar complex.

One World - One Health (Convener: Dr A.K. Srivastava and Co-Conveners: Dr R.S. Aulakh and Dr R.K. Singh)

A multi-sectoral 'One Health' approach has been advocated as a meaningful strategy for timely and effective response to zoonotic disease events based on accurate and shared assessments of the situation. Keeping in view the need for a strategic and comprehensive policy of One World-One Health, the Academy organized a brainstorming session under the chairmanship of Dr T. Mohapatra. In his opening remarks, Dr Mohapatra emphasized on the relevance and importance of forging a global alliance for better public health to realize One World - One Health vision.

Following were the salient recommendations.

- Inclusion of "One Health" concept is required in course curriculum at the graduation level of MBBS, BVSc & AH, B.Sc. (Ag.) and BSc (environmental science).
- Mass Public campaigning must be done to control and eradicate zoonotic and food- borne diseases.

Agriculture and Food Policy for Five Trillion Dollar Economy (Convener: Dr Suresh Pal)

A brainstorming session was organized to discuss the potential of agriculture and needed policy reforms to achieve the target of making India a five trillion dollar economy.

The recommendations emerged were as follows.

- For achieving five trillion dollar economy by 2024-25, doubling of agricultural growth would be required.

- Public investment has been a major source of growth in Indian agriculture. Thus, rate of investment growth needs to be doubled. Subsidies to agricultural sector should be reoriented to focus on productivity, sustainability, and improved environmental outcomes. Similarly, an incentive mechanism should be developed in agriculture for generating ecosystem services. The diversification towards high-value commodities would continue to be the main source of growth in agriculture and farm income. Technology, institutions and market infrastructure must support this diversification.
- Land reforms and land-lease markets are necessary to attract farm household investment and increase the scale of operation in agriculture. For this, modernizing land records, adopting Model Tenancy Act, and resolving conflicts in the contracts are necessary. Similarly, leasing of common and degraded lands should be accorded high priority for their restoration and generation of useful services for local communities.
- A long-term strategy should be in place focusing on assessment of global market and competitiveness, modernization of infrastructure, good practices for food safety along supply chains, and application of digital technology to manage supply chains and trace the origin.
- Interface between science and policy should be stronger and therefore evidence-based policy making should be strived for.
- Business opportunities, ease of doing business, risk management, and rural infrastructure like road, electricity and digital connectivity, shall play a greater role, therefore they must be given due priority.
- The Centre and the States should work together and involve participation of farmers in the local governance of development programs on the pattern of participatory management of irrigation and community forests.



Transforming Higher Education in India (Convener: Prof R.B. Singh)

The Academy organized a brainstorming session on Transforming Higher Agricultural Education in India to align agricultural education with the New Education Policy.

The recommendations emerged are as follows.

- Embrace agricultural education as an integral component of the national agricultural policy.
- Create a world-class agricultural university system attuned to face local, national, and international challenges and opportunities.

- Establish large Multi-disciplinary Educational and Research Universities (MERUs), ensure and institutionalize transparent governance, autonomy, meritocracy, judicious allocation of resources, and accountable systems for evaluation (measure to manage), monitoring, and impact assessment.
- Minimize inbreeding and promote institutional linkages, focusing on standards, norms, and accreditation; strengthen basic and emerging sciences in agricultural education and research; nurture centers of excellence.
- Revamp curricula, teaching/learning processes, and pedagogy to attract best of talents and prepare Youth for Leadership in Agriculture.
- Support development of active and long-term international cooperation, rejuvenate and replicate successful collaboration models, and launch South-South, South-North and trilateral collaborations.
- Agriculture (in a comprehensive sense) should be an important part of education in Primary and Secondary Schools.

Innovations in Potato Seed Production and their Adoption (Convener: Dr S.K. Chakrabarti)

A brainstorming session was organized under the chairmanship of Dr T. Mohapatra. In his opening remarks, he highlighted key challenges associated with potato seed production.

Following are the key recommendations.

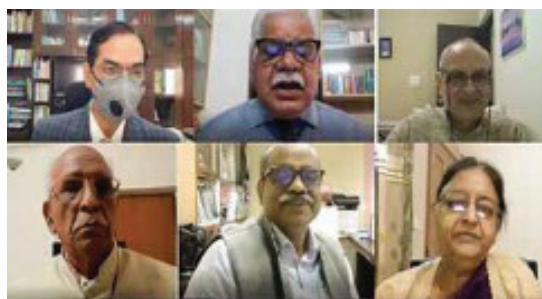
- Work- out effective alternative seed production models, including innovative techniques like Apical Rooted Cuttings (ARC) to ensure certified grade potato seed to farmers.
- Create necessary infrastructure to produce certified potato seed of global standard to facilitate export of potato and its products.



Utilization of Wastewaters in Urban and Peri-urban Agriculture (Convener: Dr J.C. Dagar)

A strategy workshop was organized, which was chaired by Dr T. Mohapatra. He pointed out the challenges of ever-increasing demand for water, food and other essential commodities, which may accentuate further.

The following issues and recommendations came out of deliberations.



- Develop low-cost and user- and environment-friendly techniques for wastewater treatments.
- Evolve guidelines and critical limits of heavy metals for safe utilization of such waters.
- Classify wastewaters for different uses, such as forestry, aquaculture, livestock, horticulture and re-use in non-food crops.
- Identify economically viable plant species for growing with different qualities of water.
- Link Government Schemes such as Smart City Development Program and Swachh Bharat with programs for effective utilization of wastewaters.

Need for Breeding Tomatoes Suitable for Processing in India (Convener: Dr A.T. Sadashiva)

A strategy workshop was organized to assess present status and future scope of processing tomatoes in India.

Key recommendations that emerged are as follows.

- Need to develop high yielding, multiple disease resistant processing tomato varieties and F1 hybrids with Concentrated Fruit Maturity (CFM) and jointless pedicel for machine harvesting (MH).
- The Indian tomato processing sector needs to look at the value-added products for pharmaceutical and nutraceutical industries.
- Identify areas/districts for establishing tomato processing industries and develop region specific tomato cultivars with processing qualities.

Emergency Preparedness for Prevention of Transboundary Infectious Diseases in Indian Livestock and Poultry (Convener: Dr Parimal Roy)

Transboundary and emerging diseases are the greatest threat to livestock production. The Academy organized a brainstorming session, which was chaired by Dr T. Mohapatra. In his opening remarks, he emphasized the need for rapid communication of new outbreaks, strengthening international borders for prompt screening and redressal of the related issues concerning veterinary public health, pathogenesis, epidemiology, statistical modelling, diagnostics, biosecurity, genomics and vaccine development.

The key recommendations of the brainstorming session are as follows.



- Strengthen international border areas with required quarantine facilities and infrastructure for diagnosis of Transboundary Animal Diseases (TADs).
- Develop active national disease surveillance mechanism.
- Persuade international collaboration for control and eradication of TADs.
- Harmonize SOPs and guidelines for emergency preparedness

Contract Farming for Transforming Agriculture: Challenges and Way Forward (Convener: Dr Anjani Kumar)

A brainstorming session was organized to discuss the new Farm Act on contract farming. The new Contract Farming Act itself may not be able to create a surge in contracts. The Act offers tremendous opportunities for FPOs to engage in trading and enter into contracts with corporate buyers and firms. But more steps are needed to make it effective. For facilitating contract farming, a few structural issues need to be addressed.

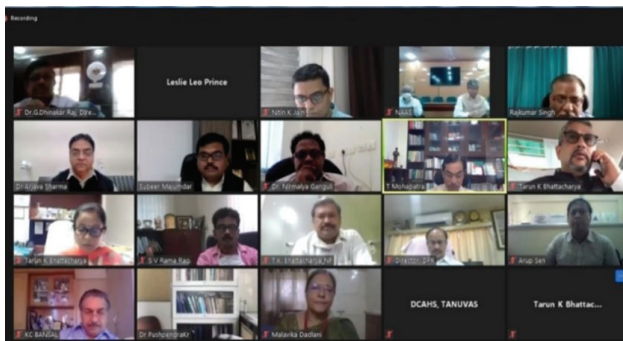
Some strategies suggested are as follows.

- Ensure competition and better price discovery by strengthening the APMC system through upgradation of infrastructure and governance reforms.
- Create decentralised storage, quality control infrastructure and low- capital processing facilities at village or cluster level to improve holding capacity of the farmers, improve their bargaining capacity and thus better price realisation.
- Develop market intelligence system and tools to correct some of the issues of asymmetry in the market information.
- Improvement in financial inclusion is critical to enable smallholder farmers to choose from multiple marketing channels and avenues.

Potential of Transgenic Poultry for Biopharming (Convener: Dr T.K. Bhattacharya)

A strategy workshop was organized under the chairmanship of Dr T. Mohapatra. He stressed that biopharming is the need of the hour for pharmaceutical industry. The production cost of pharmaceuticals needs to be reduced for treatment of needy people. He said utilization of transgenic animals and poultry may produce therapeutics in bulk, as compared to the traditional cell line-based system, which has limited production capacity.

The following recommendations emerged from this:



- Transgenic poultry platform may be given preference for production of biopharmaceuticals, including biosimilars, immunoglobulins and cytokines.
- Awareness may be created among scientists, policy-makers and other stakeholders to adopt technologies for production of therapeutics at affordable prices from transgenic animals.
- Biosafety guidelines prepared by DBT (RCGM) and Ministry of Environment & Forest (GEAC) for development of transgenic animals need to be simplified to develop transgenic animals.
- There is a need to create sufficient infrastructure for transgenic animal research, and collaborations for developing transgenic animal platforms for production of low-cost therapeutics.

Policy Dialogue on Biofortification to Address Hidden Hunger and Nutritional Security: Present Status & Way Forward (Convener: Dr U.S. Singh)

Biofortification is the process by which the nutritional quality of food crops is improved through agronomic practices, conventional plant breeding, or modern biotechnology. Biofortification aims to increase nutrient levels in crops during plant growth rather than manually. Therefore, biofortification of staple crops is an effective option to reach large numbers of rural poor. The approach is cost-effective to reach a large number of poor on a sustainable basis.

A Policy Dialogue on “*Biofortification to Address Hidden Hunger and Nutritional Security: Present Status & Way Forward*” was organized by the Academy on March 26, 2021. The Session was Chaired by Dr T. Mohapatra, President, NAAS and Co-chaired by Dr Hugo Campos, Director Research, CIP, Lima, Peru. The Session was attended by many national and international participants. Policy dialogue was planned in two sessions. The first session dealt with the present status and way forward of biofortification of important crops. The crops covered were sweet potato, potato, rice, wheat, millets, pulses and quinoa. Biofortification of rice and wheat, the two important staple crops, through chemical means was also highlighted. A special presentation was made on the scope of biofortification of animal products. The second session focused on solving the hidden hunger problem and addressing the nutritional security in terms of strategies needed for out-scaling biofortified products and policies required for achieving them.

Panel Discussion on “International Women’s Day: Role of Women in Agricultural Sciences” (Convener: Prof K.C. Bansal)

The Academy celebrated the International Women’s Day on March 8, 2021 by organizing a virtual panel discussion on the ‘Role of Women in Agricultural Sciences’ under the Chairmanship of Dr Trilochan Mohapatra, the President, with Dr J.C. Katyal, the Vice-President of the Academy as co-chair.

In his opening remarks, Dr T. Mohapatra mentioned that the Academy is celebrating Women’s Day for the first time. Conveying his personal regards to women scientist

leaders, he emphasized the need to honour and acknowledge the contributions of women. He appreciated the way women have been performing in every field, including agriculture sciences. Women scientists and workers in agriculture play a key role in nation-building. He appreciated the vision of ICAR to have a separate institute for women in agriculture, one of its kind in the world.

However, he expressed concern about the low number of women scientists in the ICAR system. He said that among different Science Academies in the country, the proportion of women Fellows in the NAAS is only 6.5%, as compared to 9% in INSA, 8.9% in IASc, and 12% in NASI. He reiterated the role of the Academy in mentoring the girl students right from their entry-level to groom them to the leadership positions. However, he also pointed out that a large number of women have broken the shell and have made laudable contributions to science and provided able leadership.

Dr Jacqueline d' Arros Hughes, Director General, ICRISAT, Hyderabad presented the keynote lecture. She appreciated the step taken by the Government of Telangana by declaring a holiday for women on this day. She said, 'I have never been a pro-women or pro-gender; I am for the best, and the only thing we need to give an extra boost to the women'. She emphasized productivity, equity, and prosperity with a special reference to India, and pointed out the role of women in enhancing productivity and production both in research and on the farm.

Dr Rupamanjari Ghosh, Vice-Chancellor, Shiv Nadar University, Noida stated that each individual is different from another and possesses uniqueness making our society a diverse space, and hence we should respect that uniqueness be it a man or woman. In higher education system, we need to deal with this diversity fully by understanding the differences in a rational manner. Confident that each woman is a wonder woman inside, she emphasized that there should be zero tolerance for gender bias in an institution.

The panel discussion on "Enhancing the Role of Women in Agricultural Sciences" was co-chaired by Dr J.C. Katyal and Dr A.K. Singh. Ms. Subhra Priyadarshini, the Chief Editor of Nature India, detailed the journey of this prestigious journal. She emphasized the importance of science communication and encouraged women to play an active role. Science communication is about informing, educating, raising awareness of science-related topics, and increasing the sense of wonder about scientific discoveries and arguments, and thus inspiring individuals, especially youth about science. Dr S. Uma, Director, ICAR-NRC for Banana, Trichy narrated several examples of women being at the higher position in the NARS. She said that women in agricultural research need to put more efforts to climb up the professional ladder compared to their male counterparts and require firm family support too. She stated that more efforts are needed to suitably recognize women scientists by the system. Dr Sunita Grover, former Head, Dairy Microbiology, NDRI, Karnal, elaborating on the role of women in agriculture said that women are playing a very important role in agriculture. She said

that women are now excelling in every field, which is evident from the fact that about 60 women have already received the coveted Nobel Prize till now. She also narrated the example of Dr Gagandeep Kang, a well-known virologist, the first Indian woman to receive a Fellowship of the Royal Society.

Dr PK Joshi, Secretary, suggested for constituting a 'Taskforce of Women Scientists' at NAAS on promoting the role of women scientists in agricultural development. The Taskforce may prepare a position paper.

The following points emerged in the panel discussion:

- An innovative and transparent system is required to identify uniqueness of women.
- Despite the increased proportion of girl students pursuing agriculture education, in the ARS system, only 2 of 4% of scientists are women and of these, hardly 1% reach leadership positions. The low proportion of women professionals could be due to government measures to enforce women reservation in the education system, but not in services. However, gradually the situation is improving with some states bringing reservations for women in services.
- Similar to the International Women Day celebration, NAAS may also start celebrating National Women's Day.
- Indian society has always given respect to women, but better professional recognition is also desired.

In his concluding remarks, Dr J.C. Katyal said that ICAR has constituted a Women Young Scientist Award. It is also true that women show less interest in agriculture science compared to medical, ICT, and other sciences, so we need to motivate them. For this, he recommended a brainstorming session on the strategies to bring women in the ARS system.

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

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

REGIONAL CHAPTERS

Regional Chapters organized following events addressing agricultural issues of national and regional importance.

Event	Date and Venue
Barapani Chapter	
Brainstorming Session on “Integrated Agriculture for Rural Bio-entrepreneurship” in collaboration with the College of Agriculture, Central Agricultural University, Imphal, Kyrdemkulai, Ri-Bhoi District, Meghalaya.	February 8, 2021 Nongstoin College, Nongstoin, West Khasi Hills District, Meghalaya
Brainstorming-cum-workshop on “Atma Nirbhar Bharat through Integrated Agriculture”.	March 9, 2021 CAU, Imphal
Bengaluru Chapter	
A Talk on “Environment and our immune system: What has the pandemic taught us?” by Dr Srinivasa V. Kaveri, Director, CNRS Office in India, New Delhi	February 26, 2021
A Lecture organized on “Post-COVID-19: Lessons and Strategies for Advancing Global Food Systems for Climate-Resilient Food Security and Health” by Dr Kalidas Shetty, Associate Vice-President for International Partnerships & Collaborations and Founding Director of the Global Institute of Food Security and International Agriculture, North Dakota State University, USA.	March 27, 2021
Bhopal Chapter	
Dr Rattan Lal, World Food Prize 2020 Laureate was virtually felicitated by the Bhopal Chapter with the ICAR-Indian Institute of Soil Science.	July 21, 2020
A webinar on “Future of Science and Technology on Natural Resources Management in Agriculture”, jointly organized with ICAR-Indian Institute of Soil Science.	February 28, 2021
Coimbatore Chapter	
Brainstorming Session on “Impact of Climate Change on Abiotic and Biotic Stresses in Crop Plants” in association with the Indian Society of Plant Physiology, New Delhi and ICAR-SBI, Coimbatore.	March 11, 2021
Cuttack Chapter	
An online COVID-19 Pandemic General Awareness Quiz was organized for the students of the CRRI High School, Cuttack.	September 18-19, 2020

Hyderabad Chapter

A virtual interaction of Shri Govinda Rajulu Chintala, Chairman, NABARD with Fellows and Associates of Hyderabad Chapter was organized.	ICAR-NAARM August 27, 2020
Sankalp 2020: National Business Festival. A two-day national level Business-Fest (Sankalp-2020) was organized by the Post Graduate Diploma Agribusiness Management (PGD-ABM) students of ICAR-National Academy of Agricultural Research Management, Hyderabad, in collaboration with NAAS-Hyderabad Chapter, Sammunati Financial Services, Tata Rallis India Limited, SAVE Foundation and a-IDEA (Agri-Business Incubator) of the NAARM.	October 4-5, 2020
A scientific essay- writing competition on “Balanced animal protein consumption for improved nutrition and implications to human health in India” was organized in collaboration with ICAR-National Research Centre on Meat and ICAR-National Academy of Agricultural Research & Management, for the undergraduate and post- graduate students of State Agricultural/Veterinary Universities in Telangana and Andhra Pradesh.	November, 2020
An Academia-Government consultative workshop on “Scientific Interventions and Policies for Strengthening of Buffalo Meat Sector: Catalyst for Boosting India’s Agro-Economy” was organized by the ICAR-National Academy of Agricultural Research & Management (NAARM), Hyderabad, jointly with NAAS-Hyderabad Chapter, Indian Meat Science Association (IMSA), and ICAR-NRC on Meat.	January 19, 2021
A five-day student mentoring training program was organized on “Entrepreneurial and Communication Skill Development” jointly with ICAR-National Academy of Agricultural Research Management and PV Narsimha Rao Telangana State Veterinary University.	March 12, 2021. College of Veterinary Science, Hyderabad
The ICAR-NAARM conducted two days training program on “Competency Enhancement and Student Mentorship in Agricultural and Allied Sectors” in collaboration with Acharya N G Ranga Agricultural University and NAAS Hyderabad Chapter for the students of the Agricultural College, Mahanandi.	March 5-6, 2021 Agricultural College, Mahanandi
A training program was conducted in collaboration with Acharya N G Ranga Agricultural University for the students of the Agricultural College Rajamahendravaram.	March 9-10, 2021

Karnal Chapter	
A meeting of NAAS Fellows and Associates was organized Chapter under the chairmanship of Dr M.L. Madan to review the previous year's activities and chalk out the plan for 2021.	January 28, 2021
Kolkata Chapter	
Organised a Webinar on "Biodiversity and Soil Functions" jointly with the Society for Fertilizers and Environment.	December 5, 2020
Lucknow Chapter	
Two important publications of NAAS (Policy Papers 90 and 91) were translated into Hindi and published.	
In collaboration with ICAR-CSSRI Karnal Regional Station, Lucknow, a webinar on "Management of Waterlogged Sodic Soils for Livelihood Security of Resource Poor Farmers" was organized.	October 13, 2020
Ludhiana Chapter	
Online Panel Discussion on National Educational Policy-2020 and Agricultural Education and Research was organized in collaboration with PAU, Ludhiana.	September 16, 2020
The Punjab Agricultural University's Krishi Vigyan Kendra, Ropar, organized a webinar on Crop Residue Management" in collaboration with Ludhiana Chapter.	September 29, 2020
Organized an online lecture on "Modern Tools and Techniques in Today's Digital World of Communication" by Dr Atul, Former Director of Extension Education, CSK Himachal Pradesh Krishi Vishvavidyalya (HPKV), Palampur.	October 1, 2020
PAU's Krishi Vigyan Kendra at Budh Singh Wala, Moga, organized a webinar on Role of school/college students in curbing the menace of residue burning under the aegis of Ludhiana Chapter.	October 13, 2020
Ludhiana Chapter conducted a Crop Residue Management campaign through school students in district Hoshiarpur.	December 7, 2020
Pune Chapter	
A panel discussion on "Abiotic Stress Management in Maharashtra Agriculture" was organized jointly with ICAR-National Institute of Abiotic Stress Management (NIASM), and Society for Abiotic Stress Research in Agricultural Sciences (SARAS).	February 20, 2021
Varanasi Chapter	
Awareness programme for the B. Sc. (Ag) students of Microtek College of Management and Technology, Varanasi, focusing on the roles and activities of the National Academy of Agricultural Sciences.	August 31, 2020

An awareness programme among the Scheduled caste farmers was organized to adopt the scientific cultivation practices.	Block Narayanpur of Mirzapur district on November 19, 2020
A science awareness campaign on Career Opportunities in Agriculture and Allied sciences was organized for more than 150 students of Science and Agriculture students in 11th and 12th standard.	December 22, 2020 Government Inter College, Jakhini, Varanasi

Highlights of the Activities of the Regional Chapters during 2020-21

Notwithstanding the grave situation arising due to COVID 19 pandemic, the Regional Chapters of the NAAS made commendable efforts in promoting scientific activities for addressing regional issues. Barring a few, most of the activities were held on virtual platforms.

Barapani Chapter organized a Brainstorming Session on **“Integrated Agriculture for Rural Bio-entrepreneurship”** and a Brainstorming-cum-workshop on **“Atma Nirbhar Bharat through Integrated Agriculture”** in collaboration with the College of Agriculture, (Central Agricultural University, Imphal, Meghalaya) which attracted a large number of local youth, besides many agricultural scientists and officials of the Government departments. Creation of awareness about the agri-business opportunities and spreading of knowledge of new technological innovations among the local people were highly acclaimed.

Bengaluru Chapter organized a guest lecture by Dr Srini V. Kaveri, Director, CNRS Office in India, New Delhi, on **“Environment and our immune system: What has the pandemic taught us?”** It was attended by more than 90 participants. It highlighted the lifestyle and unique food habits of Indian population, including beneficial spices in everyday meals (which could be contributing towards better immunity to Indians). He also pointed out that detailed scientific investigations are needed on whether or not the greater genetic diversity of the Indian population contributes to better immunity.

Bengaluru Chapter organized another lecture by Dr Kalidas Shetty, Associate Vice-President for International Partnerships and Collaborations and Founding Director of the Global Institute of Food Security and International Agriculture, North Dakota State University, USA, on **‘Post-COVID-19 lessons and strategies for advancing global food systems for climate-resilient food security and health’**. He emphasized the benefits of traditional food habits, and recommended reintroduction of traditional crops with known health benefits to combat diet-linked chronic diseases.

Bhopal Chapter felicitated Dr Rattan Lal, 2020 World Food Prize Laureate, through a virtual function, jointly organized with ICAR-Indian Institute of Soil Science and Indian Society of Soil Science. Dr Rattan Lal, an Indian-American soil scientist, has played a major role in developing and mainstreaming a soil-centric approach to

increase food production that conserves natural resources and also mitigates climate change. Three separate United Nations Climate Change Conferences have adopted his strategy of restoring soil health as a means to sequester carbon and combat climate change. The programme was chaired by Dr S.K. Chaudhari, DDG (NRM), ICAR. In his address, Dr Rattan Lal proposed to strengthen research on soil degradation that is resulting in low yield of several crops in India as compared to that in other countries. He cautioned that over-emphasis on the input-based agriculture leads to low crop yield, besides several environmental problems and further deterioration of soil health. He emphasised that the COVID-19 crisis necessitates implementation of One Health strategy.

On the occasion of the National Science Day on February 28, the *Bhopal Chapter* and the ICAR-Indian Institute of Soil Science, Bhopal, jointly organized a webinar on **Future of Science and Technology on Natural Resources Management in Agriculture**. In this, role of natural resources in sustainable agriculture, of soils in food and nutrition security and of futuristic technologies like AI and cooling technologies in addressing problems in utilization of natural resources and reducing post-harvest losses was highlighted.

Coimbatore Chapter organized a Brainstorming Session on **Impact of Climate Change on Abiotic and Biotic Stresses in Crop Plants** at ICAR-SBI in association with the Indian Society of Plant Physiology, New Delhi, and ICAR-SBI, Coimbatore. It was chaired by Prof S. R. Sree Rangaswamy, FNAAS; about 25 participants including NAAS Fellows attended the programme in person, and 114 participated online.

Following were the main recommendations.

- Different crops face climate issues differently, hence climate change needs to be studied holistically by a team of experts in different cropping systems.
- The severity of epidemics is much influenced by abiotic stress conditions. Hence, the extent of changes in climatic factors on evolution of new races of pathogens, biotypes in insects, adaptive changes in the pests' phenotype, invasion of new pests and diseases, etc need detailed investigations.
- Understanding the molecular ecology of host-pathogen interactions needs a new thrust elucidating impact of climate on the expression of genes to alter host-pathogen interactions.

An online COVID-19 Pandemic General Awareness Quiz was organized by the *Cuttack Chapter* of the National Academy of Agricultural Sciences for the students of the CRRRI High School, Cuttack on September 18-19, 2020 to enhance awareness on the causes, effects and some remedial measures to control the gravity of corona pandemic.

Hyderabad Chapter organized several activities, besides a virtual meeting of NAAS Fellows and Associates based in Telangana and Andhra Pradesh to review and

plan future activities. The meeting was attended by 30 Fellows and Associates from Telangana and Andhra Pradesh. Dr T. Mohapatra, President, and Dr A.K. Singh, Vice-President, NAAS, graced the occasion. A publication on the **Inventory of NAAS Hyderabad Chapter** was released by Dr Trilochan Mohapatra.

Shri Govinda Rajulu Chintala, Chairman, NABARD, virtually interacted with the Fellows and Associates of **Hyderabad Chapter** at ICAR-NAARM on August 27, 2020. He highlighted various programmes of NABARD on agricultural development and stressed the need for reforms in research, education and extension. He strongly recommended agri-entrepreneurship for fulfilling Prime Minister's call for doubling farmer's income.

An Academia-Government consultative workshop on 'Scientific Interventions and Policies for Strengthening of Buffalo Meat Sector: Catalyst for Boosting India's Agro-Economy' was organized by the ICAR-National Academy of Agricultural Research & Management (NAARM), Hyderabad, on January 19, 2021 jointly with Hyderabad Chapter, Indian Meat Science Association (IMSA), and ICAR-NRC on Meat.

Key recommendations that emerged are as follows:

- Studies are needed on preventing early age mortality in male buffalo calves and development as well as promotion of low-cost milk replacers and calf starters.
- Research is needed to understand muscle growth and possible improvements in production systems to improve per day body weight gain and carcass yield.
- Monitoring of chemical residues in meat products, and development of high-value by-products.
- Development of DNA/Protein-based methods to determine age of buffaloes.
- Farming system models need to be evolved for buffalo production under different situations. In real time, on-farm economics of male buffalo calf production need to be demonstrated.
- Universities and ICAR Institutes need to start certificate and diploma courses on clean meat production and value addition for producers, processors, retailers, butchers and conduct consumer awareness programs about food safety, health, and diet risks.
- Animal preservation acts need to be amended. Male buffalo calf salvaging and rearing for meat production needs to be promoted.
- Livestock markets need to be developed for different species to raise farmers' income.
- FMD free zones need to be established in buffalo population rich states—Uttar Pradesh, Maharashtra, Telangana, Andhra Pradesh, Gujarat, Rajasthan, Punjab, Haryana, Delhi and Madhya Pradesh —to enhance export of meat and milk products.

- Two-day training program on '**Competency Enhancement and Student Mentorship in Agricultural and Allied Sectors**' was organised in collaboration with ICAR-NAARM and Acharya N G Ranga Agricultural University for the students of Agricultural College, Mahanandi to sensitize them about career opportunities, prospects in agricultural education, agri-preneurship and other agri-allied sector opportunities.

Karnal Chapter organized a meeting of the NAAS Fellows and Associates under the chairmanship of Dr M. L. Madan to review programs organized during the past quarter, and activities proposed to be taken up in 2021.

Kolkata Chapter celebrated the World Soil Day on December 5, jointly with the Society for Fertilizers and Environment and organized a webinar. Considering the theme of the year's Soil Day – "Keep Soil Alive - Protect Soil Biodiversity", Dr T.K. Adhya, Professor, School of Biotechnology, KIIT, Bhubaneswar delivered a lecture on '**Biodiversity and soil functions in a changing scenario**'.

Two important publications of NAAS (Policy Papers 90 and 91) were translated into Hindi by the *Lucknow Chapter* for wider circulation and effective implementation.

In collaboration with ICAR-CSSRI Regional Station, the *Lucknow Chapter* organized a webinar on '**Management of Waterlogged Sodic Soils for Livelihood Security of Resource Poor Farmers**', highlighting a new approach for management of waterlogged sodic soils through land modification model (LMM), comprising raised bed and pond (1:1 ratio) for improving soil and water productivity.

Ludhiana Chapter organized an online panel discussion on '**National Education Policy-2020 and Agricultural Education & Research**'. Following were the key observations:

Agricultural universities (AUs) cannot be equated with traditional universities as mandates are different. Given that more than half of the budget is spent on research, AUs are as much educational institutions as research, having a focus wider than traditional multiple stream universities.

Agricultural research does not always generate publishable output, though technologies generated have huge transformative role in agricultural development. Thus, metrics heavily based on scientific papers are often not applicable.

The NEP-2020 does not lay adequate emphasis on agriculture, considering its relevance to Indian society, and makes only a scant mention of agricultural education with no new impetus to agricultural education.

The existing agricultural education system honours the fundamental principles laid in the NEP-2020. However, increasing gross enrolment ratio in agriculture may not be achievable as AUs are professional degree granting institutes. Given the triple mandates (research-teaching-extension) of AUs the student-teacher ratio recommended by NEP -2020 needs a relook.

The virtual platforms cannot replace the class room teaching as most of the skill learning in agriculture involves hands-on training.

Formal linkage of SAUs with traditional universities must be encouraged to enable students to enrol in different universities for transferrable credits to earn a degree.

Under the aegis of *Ludhiana Chapter*, the Punjab Agricultural University's Krishi Vigyan Kendras at Ropar, Doaba, Moga and Hoshiarpur organized webinars on '**Crop Residue Management**' to sensitize school- students on the issue of stubble burning and natural resource management. Students were apprised of the remedial measures that can be undertaken without compromising sustainability of agricultural systems.

Pune Chapter organized a panel discussion on '**Abiotic Stress Management in Maharashtra Agriculture**' with ICAR-National Institute of Abiotic Stress Management (NIASM), and Society for Abiotic Stress Research in Agricultural Sciences (SARAS). The discussion was chaired by Dr Y.S. Nerkar, former Vice-Chancellor, MPKV, Rahuri, and the Fellow of the Academy.

The following recommendations emerged from the discussion.

- Impacts of abiotic stresses on quality and value addition in floriculture should be assessed and technologies be developed.
- Drought and water logging tolerance in onions should be enhanced using recent advances in research.
- Sensor-based irrigation and fertigation technologies for export quality pomegranate production should be standardized.
- Image-assisted technologies should be developed for mitigation of abiotic stresses in grapes.
- Livestock contingency plans should be developed for mitigation of abiotic stresses.
- Abiotic stress responses of different crops in protected cultivation environment should be assessed and mitigation strategies developed.
- Microbial interventions should be standardized for stress-prone areas to enhance soil organic carbon and stress relieving compounds.
- Traits and genes specific to abiotic stresses and the use of machine learning and artificial intelligence tools for management and analysis of data should be identified.
- Complementation of conventional breeding approach with advanced technologies such as gene-editing and marker-assisted technologies for abiotic stress tolerance needs to be promoted.

Varanasi Chapter organized an awareness programme for the B.Sc. (Ag) students of Microtek College of Management and Technology, Varanasi. On this occasion, a talk was organized on the scope and role of under-exploited and minor vegetables towards

increasing farmers' income and nutritional security, particularly during Covid-19 pandemic. A science awareness campaign on Career Opportunities in Agriculture and Allied sciences for Science and Agriculture students in 11th and 12th standard at Government Inter College, Jakhini Varanasi was also organized.

LINKAGES

The Academy implements most of its programmes through the ICAR Institutes, State Agricultural Universities, and other Research Organizations/NGOs with whom it has strong linkages. These linkages are nurtured and strengthened by its Fellows working in these organizations. The Academy also joined the initiative taken recently to establish linkages with other science Academies of India, such as the Indian National Science Academy (INSA), Indian Academy of Sciences, Bengaluru, Indian National Academy of Engineering, National Academy of Sciences, Allahabad, and National Academy of Medical Sciences, to address issues concerning (a) better public understanding of science in the country, and (b) identification of frontline issues facing the country in which science and scientists have a stake. The Academy provided inputs to the Department of Science and Technology in formulating Science, Technology and Innovation Programme 2020 (STIP 2020). The inputs were related to (i) Reforms in science, technology and innovations, (ii) Reform in agricultural education system for meeting the current and future challenges, and (iii) administrative and governance reform.

Institutional Membership

The Institutions of repute, which are involved in activities aligned to the objectives of the Academy, are eligible to become an Institutional Member of the Academy. For this, they need to make a contribution of Rs 10 lakh towards the NAAS Corpus Fund for its sustained long- term support to different activities. As on March 31, 2021, 35 Institutional Members have been inducted.

RECOGNISING EXCELLENCE (2021)

New Fellowship

Section I: Crop Sciences

Dr S. Gopala Krishnan

Principal Scientist (Rice Breeding),
Division of Genetics, ICAR-Indian
Agricultural Research Institute (New
Delhi)

Dr Sanjeev Gupta

Assistant Director General (OP), Indian
Council of Agricultural Research (New
Delhi)

Dr F. Hossain

Principal Scientist and Programme
Leader (Maize), Division of Genetics,
ICAR-Indian Agricultural Research
Institute (New Delhi)

Dr D.R. Malaviya

Former Head, ICAR-Indian Institute of
Sugarcane Research, Lucknow (Uttar
Pradesh)

Dr (Ms) N. Sarla

ICAR National Professor (Retired)
Hyderabad (Telangana)

Dr Ram Kewal Singh

Assistant Director General (Commercial Crops), Indian Council of Agricultural Research (New Delhi)

Section II: Horticulture Sciences

Dr N. Rai

Principal Scientist, Division of Crop Improvement, Indian Institute of Vegetable Research, Varanasi (Uttar Pradesh)

Dr Brajesh Singh

Principal Scientist & Head, CPB & PHT Division, ICAR-Central Potato Research Institute, Shimla (Himachal Pradesh)

Dr (Ms) S. Uma

Director, ICAR-National Research Centre for Banana, Trichy (Tamil Nadu)

Section III: Animal Sciences

Dr A. Mitra

Director, ICAR-Central Institute for Research on Cattle, Grass Farm Road, Meerut (Uttar Pradesh)

Dr B.M. Naveena

Principal Scientist, ICAR-National Research Centre on Meat, Chengicherla, Boduppal Post, , Hyderabad (Telangana)

Dr Ashish K. Singh

Principal Scientist, Dairy Technology Division, ICAR-National Dairy Research Institute, Karnal (Haryana)

Dr D. Singh

Head, Animal Biochemistry Division, ICAR-National Dairy Research Institute, Karnal (Haryana)

Section IV: Fisheries Sciences

Dr Pandian Krishnan

Principal Scientist (Agril. Research Mgmt), Division of Research Systems Management, ICAR-National Academy for Agril. Research Management, Hyderabad (Telangana)

Dr S. Mathew

Principal Scientist & Head, Biochemistry & Nutrition Division, ICAR-Central Institute of Fisheries Technology, Cochin (Kerala)

Section V: Natural Resources Management Sciences

Dr D.R. Biswas

Principal Scientist, Division of Soil Science & Agricultural Chemistry, Indian Agricultural Research Institute (New Delhi)

Dr Prameela Krishnan

Head, Division of Agricultural Physics, ICAR-Indian Agricultural Research Institute (New Delhi)

Dr V.K. Mishra

Director, ICAR Research Complex for NEH Region, Umiam (Meghalaya)

Dr M. Mohanty

Principal Scientist, ICAR-Indian Institute of Soil Science, Bhopal (Madhya Pradesh)

Dr C.M. Parihar

Senior Scientist, Division of Agronomy, ICAR-Indian Agricultural Research Institute (New Delhi)

Section VI: Plant Protection Sciences

Dr S. Jogaiah

Assistant Professor and Co-ordinator, Plant Healthcare and Diagnostic Center, PG Department of Biotechnology and Microbiology, Karnatak University, Dharwad (Karnataka)

Dr P.K. Mukherjee

Director, Inst. of Bioresources and Sustainable Development, Ministry of Science and Technology, GoI, Takyelpat Imphal (Meghalaya)

Dr M.K. Naik

Vice Chancellor, University of Agril. and Horticultural Sciences, Shivamogga (Karnataka)

Dr M.S. Saharan

Principal Scientist, Division of Plant Pathology, ICAR-Indian Agricultural Research Institute (New Delhi)

Section VII: Agricultural Engineering and Technology

Dr Dilip Jain

Head, Division of Agricultural Engineering and Renewal Energy, ICAR-Central Arid Zone Research Institute, Jodhpur (Rajasthan)

Dr H. Raheman

Professor, Agricultural & Food Engineering Department, Indian Institute of Technology, Kharagpur (West Bengal)

Section VIII: Social Sciences

Dr R.C. Agrawal

Deputy Director General (Agricultural Education), Division of Agriculture Education, Indian Council of Agricultural Research (New Delhi)

Dr Naveen P. Singh

Member (Official), Commission for Agricultural Costs & Prices, Ministry of Agriculture & Farmers Welfare (New Delhi)

Dr G.M. Subbarao

Scientist E & Head, Nutrition Information, Communication & Health Education (NICHE) Division, ICMR-National Institute of Nutrition, Hyderabad (Telangana)

Pravasi Fellows

Dr Vijai Kumar Gupta

Senior Fellow and Group Leader, Center for Safe and Improved Foods & Biorefining and Advanced Materials Research Centre, Scotland's Rural College, Scotland, UK

Dr Indrajeet Chaubey

Dean and Director, College of Agriculture, Health and Natural Resources, Professor – Department of Natural Resources and the Environment, University of Connecticut, USA

Foreign Fellows

Dr Ravi Naidu

CEO and Managing Director, CRC CARE and Global Innovation Chair and Faculty of Science, The University of Newcastle, Callaghan, Australia

Dr Hugh W. Pritchard

Principal Scientific Leader, Royal Botanic Gardens, Kew, Wakehurst Place, Ardingly, UK

Associateship

Dr V. Acharya

Senior Scientist, Biotechnology Division, CSIR-Institute of Himalayan Bioresource Technology, Palampur (Himachal Pradesh)

Dr B.B. Basak

Scientist, ICAR-Directorate of Medicinal and Aromatic Plants, Research, Boriavi, Anand (Gujarat)

Dr K. Chakraborty

Scientist (Senior Scale), Division of Crop Physiology & Biochemistry, ICAR-National Rice Research Institute, Bidyadharpur, Cuttack (Odisha)

Dr K. Chakraborty

Scientist (Senior Scale), Division of Crop Physiology & Biochemistry, ICAR-National Rice Research Institute, Bidyadharpur, Cuttack (Odisha)

Dr D.M. Firake

Senior Scientist (Agril. Entomology),
ICAR-Directorate of Floricultural
Research, Mundawa, Pune (Maharashtra)

Dr R. Giri

Assistant Professor, School of Basic Sciences,
Indian Institute of Technology, Mandi,
Kamand Campus, Distt. Mandi (Himachal
Pradesh)

Dr S. Hati

Assistant Professor, Department of Dairy
Microbiology, SMC College of Dairy
Science, Anand Agricultural University,
Anand (Gujarat)

Dr S.L. Jat

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

Dr S.K. Jha

Senior Scientist, Division of Genetis, ICAR-
Indian Agricultural Research Institute
(New Delhi)

Dr T.K. Koley

Scientist, Division of Socio-Economics
& Extension, ICAR-Research Complex
for Eastern Region, ICAR Parisar, Patna
(Bihar)

Dr S. Mandal

Scientist (SG), ICAR-Central Institute
of Agricultural Engineering, Nabibagh,
Berasia Road, Bhopal (Madhya Pradesh)

Dr Surender Singh

Associate Professor, Department of
Microbiology, Central University of
Haryana, Mahendergarh (Haryana)

Academy Awards for the Biennium 2019-2020

Following awards will be given during XV ASC at BHU, Varanasi on November 13, 2021 by NAAS

Memorial/ Lecture Award	
Dr B.P. Pal Award	Prof Rattan Lal , Distinguished University Professor of Soil Science, The Ohio State University, Columbus, USA
Dr K. Ramiah Award	Dr Gyanendra Pratap Singh , Director, ICAR-Indian Institute of Wheat & Barley Research, Karnal, Haryana
Dr K.C. Mehta Award	Prof S.R. Niranjana , Ex-VC & Professor and Chairman, Department of Studies in Biotechnology, University of Mysore, Manasagargotri, Mysore, Karnataka
Dr M.S. Randhawa Award	Dr Rakesh Chandra Agrawal , DDG (Agricultural Education) & National Director, National Agricultural Higher Education Project, ICAR, New Delhi
Dr N.S. Randhawa Award	Dr Himanshu Pathak , Director, National Institute of Abiotic Stress Management, Barapani, Pune, Maharashtra

Dr P. Bhattacharya Award	Dr Manmohan Singh Chauhan , Director, ICAR-National Dairy Research Institute, Karnal, Haryana
Dr A.B. Joshi Memorial Lecture Award	Dr R.S. Paroda , Chairman, Trust for Advancement of Agricultural Sciences, New Delhi

Endowment Awards

Dr L.C. Sikka Endowment Award	Dr C.N. Ravishankar , Director, ICAR-Central Institute of Fisheries Technology, Kochi, Kerala
Dr (Ms.) Prem Dureja Endowment Award	Dr Subbaraya Uma , Director, ICAR-NRC on Banana, Trichy, Kerala
Dr N.G.P. Rao Endowment Award	Dr Ram Kewal Singh , ADG (Commercial Crops), Indian Council of Agricultural Research, New Delhi

Recognition Awards

Plant Improvement	Dr Sudesh Kumar Yadav , Scientist-F, CIAB, Mohali
Plant Protection	Dr Supriya Chakraborty , Professor (Virology), JNU, New Delhi
Soil, Water & Environmental Sciences	Dr Arvind Kumar Shukla , Project Coordinator (Micronutrients), IISS, Bhopal
Animal Sciences	Dr Kajal Chakraborty , Senior Scientist, CMFRI, Kochi
Agricultural Engineering & Technology	Dr C.R. Mehta , Director, CIAE, Bhopal
Social Sciences	Dr A.R. Rao , ADG (PIM), ICAR, New Delhi

Young Scientists' Awards

Plant Improvement	Dr Ranjith Kumar Ellur , Scientist, Division of Genetics, IARI, New Delhi
Plant Protection	Dr Susheel Kumar Sharma , Scientist (Plant Pathology), RCNEHR, Imphal
Soil, Water & Environmental Sciences	Dr Vijay Singh Meena , Scientist (SS), VPKAS, Almora
Animal Sciences	Dr Monika Saini , Scientist-I, AIIMS, New Delhi
Agricultural Engineering & Technology	Dr R. Pandiselvam , Scientist, CPCRI, Kasaragod
Social Sciences	Dr Shivendra Kumar Srivastava , Scientist (Senior Scale), NIAP, New Delhi

* The Young Scientists Award would be awarded every year from 2020 onwards

FOUNDATION DAY AND ANNUAL GENERAL MEETING

Foundation Day Celebration

Panel Discussion on COVID 19: Impacts and New Normal in Agriculture (Conveners: Dr P.K. Joshi and Dr P.S. Birthal)

On its Foundation Day on June 5, 2020, the Academy organized a virtual panel discussion on the consequences of the Covid-19 crisis on agriculture and the technological and policy solutions for sustaining post-pandemic agricultural growth. The Panel Discussion was co-chaired by Dr Trilochan Mohapatra, President NAAS, and Dr Mangala Rai, former President, NAAS. There was a consensus that the Covid-19 pandemic has severely affected lives and livelihoods of millions of poor throughout the world. The whole world has been battling to contain its human-to-human transmission through preventive measures, including self-sanitization, face-mask and social distancing. Most countries have imposed lockdowns and severe restrictions on the mobility of people, goods and services to slow down its spread. This led to almost a complete cessation of economic activities. India imposed lockdown on March 25, 2020 and rolled out a three phase un-lock plan from June 1 onwards. The Indian economy is still reeling under the stress of COVID-19 induced slowdown. As a consequence, the economy is predicted to shrink between 3 and 5% in 2020-21. It has been noted that agricultural sector is unlikely to be much affected and predicted to grow at its historical rate of about 3%. In general, agriculture and agri-businesses are expected to confront new challenges related to technologies, support services, marketing, trade, financing, governance, consumer preferences, etc. The key recommendations from the panel discussion were as follows.

The lockdown spurred a large-scale exodus of migrant workers back to their villages, and disequilibrium in regional rural markets would be a new normal post-pandemic. States, like Punjab and Haryana would face severe labour shortage, but it would also offer an opportunity to state governments for incentivizing cultivation of less-labour and low-water intensive crops, replacing paddy. Contrarily Bihar, Odisha and eastern Uttar Pradesh would face excessive employment pressure due to reverse migration. Such states need to promote labour-intensive high-value wellness crops.

An enabling agri-business environment is needed for attracting investment and participation of private sector in agriculture. New opportunities are to be mapped, and accordingly public-private partnership has to be built for need-based agri-infrastructure and value chains. The existing food based MSMEs need to be modernized and linked directly with farmers for raw material. Their branding, packaging and effective supply chains could transform them to a new normal.

The reverse migration would put tremendous employment pressure on agriculture in the regions, where the workers return to. Although, the MGNERGA provides some employment opportunities, it is still not adequate. The need is to create special

income-generating schemes for the reverse migrants. Further, in view of the migration and its reversal, the Government should immediately implement 'One Nation, One Ration Card' scheme that ensures food security to workers anywhere in the country.

Shift research focus from merely increasing production to multiple goals, namely enhancing income, improving nutrition, preserving ecology, and conserving environment. The goal should be to make agriculture a lucrative venture without compromising natural resources and environment.

Reprioritize agricultural research agenda to meet future demands for food, feed and fodder. Role of Artificial Intelligence, agro-robotics, Nano science, cloning, and drone analytics will expand multi-fold in agricultural research for future agro-advisory, disease/ pest monitoring and surveillance. Similarly, plant genomics and genome editing will become important tools for future research. Genetically Modified (GM) foods and bio-fortification will be new normal to breed varieties/ hybrids for developing immunity against various viruses.

Promote the concept of 'One Health' in letter and spirit, that takes into account interaction among humans, animals and plants in their shared environment. Agricultural research should focus on breeding for nutrition and health, and stress management. There should be greater collaboration among crop sciences with animal and medical sciences. Develop common research platforms involving private sector for pooling and sharing all resources including human, financial, and knowledge.

Attract private sector to market- oriented agricultural extension services for making effective backward and forward flow of information and leveraging the power of ICT for timely transmission and diffusion of information, services and technologies.

The Academy has published Policy Brief 8 on "*Covid-19 Pandemic: Impact and New Normal in Agriculture*", based on the deliberations.

Presidential Address

Dr T. Mohapatra delivered the Presidential Address to the 27th AGM. He expressed his appreciation to the Founder Fellows, all the Past Presidents and the entire Fellowship for the stature that the Academy has attained both nationally and internationally. He made a special mention of Prof V.L. Chopra, who left for his heavenly abode during the COVID 19 pandemic. He also greeted Prof M.S. Swaminathan, who completed 95 years on August 7, 2020. He specifically appealed to the Fellowship to be more proactive so that the Academy attains far greater excellence in future. He lauded the Academy's efforts in providing timely inputs to the government on some very key policy issues— Seed Policy, Pesticides Management Bill, Guidelines for Genome Edited Organisms and Direct Benefit Transfer of Fertilizer Subsidy. He highlighted the sustained growth achieved in agriculture sector, which was largely unaffected even during the COVID pandemic. He reminded the fellowship that the nation has set the target of becoming a US\$ 5 trillion economy, which would be possible only if

agriculture contributes US\$ 1 trillion. In this context, he called upon the fellowship to contribute effectively by developing appropriate policies and guidelines. He specifically mentioned the following areas needing attention - exploitation of ocean resources, seaweed cultivation, pearl culture, mainstreaming millets (nutri-cereals), non-bovine milk and related products, selected organic products, diversification and value chains in agriculture, malnutrition, use of advanced tools like AI, and achieving SDGs. He emphasized that the focus has to be on demand-driven agriculture. He congratulated the newly inducted fellows and associates and thanked the entire fellowship.

Presentations by Newly Elected Fellows

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

Excerpts from the Minutes of the 27th AGM

The 27th Annual General Body Meeting (AGM) of the Academy was convened virtually on August 13, 2020 under the Chairmanship of Dr Trilochan Mohapatra, President of the Academy. The AGM was attended by more than 200 Fellows, including Past Presidents, Past Vice Presidents and office bearers of the Academy. A one-minute silence was observed as a mark of respect to the Fellows who left for their heavenly abode since the last AGM—Dr K.S. Gill, Dr C. Gopalan, Dr D.R. Bhumbla, Dr S.M. Virmani, Dr N.N. Singh, Dr S.S. Kadam, Dr D.S. Brar, Dr P.K. Chhonkar, Dr Paul Thomas, Dr V.L. Chopra, Dr P.N. Bhat, Dr Y.P. Abrol and Dr B.D. Kaushik.

Dr Anil K. Singh, Secretary, NAAS, welcomed the dignitaries, Fellowships and Associates present in the virtual GB meeting. The President of the Academy, Dr Trilochan Mohapatra, also welcomed all the esteemed Fellowship assembled, including newly elected Fellows and Associates of the Academy to the Annual General Body meeting. The proceedings of the meeting started with the presentation of the Secretary's Report by Dr Anil K. Singh, Audit and Accounts Report by Dr R.K. Jain, Editors' Report by Dr Kusumakar Sharma and Foreign Secretary's Report by Dr Anil K. Singh (in the absence of Dr U.S. Singh). All these reports, including Annual Report and Audited Accounts 2019-20, were accepted and adopted by the House. The AGM also confirmed the minutes of the 26th Annual General Body meeting held on June 5, 2019, besides some of the important decisions taken by EC since last AGM including appointment of Academy's auditors for the year 2020-21, programmes during 2020 and suggested areas for NAAS activities.

Admission of the Fellows / Associates

Dr Anil K. Singh, Secretary, along with Dr P.K. Joshi, Secretary conducted the formal admission ceremony of the newly elected Fellowship and Associateship during the year 2020. The names of elected Fellows and Associates were called and their citations were read out, and by virtue of the authority vested in the President, NAAS, admitted 29 Fellows, 2 Foreign Fellows, 3 Pravasi Fellows and 11 Associateships on-line in different sections.

General Discussion

The esteemed Fellowship actively participated in general discussion and made suggestions on several pertinent issues. Fellowship proposed some brainstorming sessions, such as 'Sericulture', 'contract farming', 'Direct Benefit Transfer', and PM Garib Kalyan Yojana'. It was also proposed to make efforts to popularize agriculture as a subject of first choice after 12th standard.

PUBLICATIONS

The Academy has brought out the following publications during the year.

Policy/Status/Strategy Papers

Policy Paper 93: Enhancing Science Culture in Agricultural Research Institutions

Policy Paper 94: Payment for Ecosystem Services in Agriculture

Policy Paper 95: Food-borne Zoonotic Diseases

Policy Paper 96: Livestock Improvement through Artificial Insemination

Policy Briefs

Policy Brief 6: Better Management of Pesticides in India: Policy Perspectives

Policy Brief 7: Regulatory Framework for Genome Edited Plants: Accelerating the Pace and Precision of Plant Breeding

Policy Brief 8: Covid-19 Pandemic: Impact and New Normal in Agriculture

Policy Brief 9: Direct Benefit Transfer of Fertilizer Subsidy: Policy Perspectives

Policy Brief 10: Harmonization of Seed Regulations for Sustainable Food Security in India

Newsletter

NAAS-News, Vol. 20, Nos 2 to 4 and Vol. 21, No. 1 (quarterly)

Journal (published by Springer India Pvt. Ltd)

NAAS Official Journal 'Agricultural Research' Vol. 9, Nos2 to 4 and Vol. 10, No. 1 (quarterly)

Other Publications

Agricultural Transformation-A Road to New India

Presidential Address delivered by Dr T. Mohapatra during 27th Annual General Body Meeting 2020

Abstracts of Presentations by the elected Fellows (2020)

NAAS Year Book and Year Planner 2021

EVENTS AND MEETINGS

New Year Get-together

The Academy organized a New Year Get-together on January 1, 2021 under the chairmanship of Dr T. Mohapatra. The other dignitaries were office-bearers of the Academy, including Dr P.K. Joshi, Secretary, and newly-elected Vice-President, Dr A.K. Singh, and Secretary Dr K.C. Bansal. Dr P.K. Joshi extended warm welcome to the President, Vice-President, newly elected members of the Executive Council, and all Fellows and Associates.

Dr T. Mohapatra wished all a happy, safe and healthy New Year. He expressed his concern regarding COVID-19 pandemic and appreciated the efforts of the Government of India to contain it. He hoped that the New Year would be safe for everyone, and urged all to take necessary preventive measures against the disease.

Dr Mohapatra applauded Academy's achievements in 2020, and thanked all members of the EC and Secretariat staff for their untiring efforts. He highlighted the significant role played by the Academy in providing inputs to the Government of India on the Pesticide Bill, the Seed Bill and the Biodiversity Act (Revision). He pointed out some key areas for immediate action. These are, recognition and adequate representation of women in agricultural sciences; visibility of the Academy at the global level, especially in the SAARC countries, and need for managing transboundary diseases. He reiterated that Academy should identify gaps in implementation of agricultural and rural development policies and suggest ways to bridge the gaps and align policies with the changing socio-economic environment. The Academy needs to highlight relevant scientific issues conveying importance of agricultural sciences to the society at large, and school children in particular through print and social media. He also desired that the Academy should build a strong knowledge-base relevant to the society. He stressed the Fellowship to use its vast experience to disseminate knowledge through Regional Chapters. He congratulated the newly elected members of the EC, and reposed faith in them to take the Academy to greater heights. Later, newly elected Fellows and Associates were welcomed and introduced. The Fellowship and Associateship certificates 2020 were awarded in person during the function.

Dr A.K. Singh discussed priority areas for 2021. He invited suggestions from the esteemed Fellowship for further improving the functioning of the Academy. The

distinguished Fellows who were present in the meeting and who were virtually present shared their views on making Academy more visible at the national and the international level.

Dr P.K. Joshi thanked the outgoing office-bearers and members of the EC for their administrative and academic support. He reiterated that only science and innovation-led agriculture has the potential to enhance farmers' income and make India '*Atma Nirbhar*' and a global leader in agriculture. He also gave a brief account of the following innovative programs envisaged by the Academy for 2021— (i) more number of intellectual debates on topical issues; (2) interaction with international organizations; (3) mainstreaming of NAAS activities with government programs; (4) visibility of NAAS in print and electronic media; and (5) XV Agriculture Science Congress.

Prof K.C. Bansal proposed a vote of thanks to the august audience. He highlighted the need for a virtual science academy to improve partnership and interaction of fellows. He strongly felt that the benchmark be raised to achieve excellence, and working groups be formulated for brainstorming specific contemporary issues, and develop opinion papers, which can then be published in the reputed national and international journals, addressing Academy's visibility in scientific and policy issues.

On this occasion, Academy's Strategy / Policy Papers, NAAS Yearbook 2021, NAAS-NEWS October-December 2019, and NAAS Planner 2020 were also released.

Meeting of the Conveners of Regional Chapters

A meeting of the Regional Chapters' Conveners was organized in a hybrid mode (both physical and virtual) on 15th February 2021. Dr T. Mohapatra, chaired the meeting. All Conveners made presentations on the activities suggested for 2020 by the headquarters, and also on the activities to be taken up in 2021. The Conveners were suggested that they may organise brain storming sessions on the common themes to document regional perspectives such as (1) perspectives on three Farm Acts announced by the Government, (2) identification of commodities which can be part of local-to-global, and (3) abiotic and biotic stress-related aspects concerning climate change.

The President appreciated activities carried-out by the Regional Chapters. He suggested that more effective and impact- oriented activities may be taken up to make Regional Chapters more vibrant as they represent Academy in the region. He proposed following activities as part of the work-plan of the Regional Chapters for 2021.

Regional Chapters need to make more efforts for increasing visibility of the Academy in their respective regions. This can be achieved by communicating with policy-makers, administrators, and other stakeholders, including representatives of industry, media and farmers.

Organize brainstorming sessions/lectures in contemporary issues by inviting experts.

Adopt some schools to inspire young students for pursuing their career in agriculture sector. In addition, provide students with information about universities/institutions and admission procedure. And interact with drop-outs in rural areas to prepare them to earn their own livelihood or take-up agriculture as an enterprise.

Most of the agricultural universities are short of faculty. Therefore, fellows may be engaged with agricultural universities to volunteer their services for teaching and research program.

Develop evidence-based documents for sharing with high-level officials like Secretaries in respective state governments to address topical issues for immediate attention and solutions.

Translate relevant Policy Papers/Briefs of the Academy in regional languages, and distribute to different stakeholders.

A section on the Academy's website can be for the translated policy documents, highlighting key points as summary for catching attention of the policy-makers at the regional and national levels.

Executive Council Meetings

During the year, six meetings were held on June 19, 2020, August 10, 2020, November 12, 2020, December 26, 2020, February 19, 2021 and March 11, 2021 at New Delhi. Some important items considered and actions taken during the meetings are elaborated as follows.

112th Meeting

It was held online on June 19, 2020 under the chairmanship of Dr T. Mohapatra, the meeting was attended by 20 members of the Council. A one-minute silence was observed to pay homage to Dr V.L. Chopra, Dr Paul Thomas, Dr P.K. Chhonkar and Dr P.N. Bhat—the distinguished fellows of the Academy, who had passed away during the quarter.

Dr T. Mohapatra in his opening remarks mentioned disruptions caused by the Covid-19 pandemic. He highlighted the role of agriculture in meeting requirements of essential food commodities during the lockdown. He said that despite labour shortage and post-harvest losses, the *rabi* production was not affected much and *kharif* sown area was higher over last year. He touched upon the challenges to be tackled in attaining SDGs by 2030. He expressed exigency to address problems faced by displaced migrant workers and also for making sufficient efforts to contribute significantly towards *Atma Nirbhar Bharat* mission of the Government of India through agricultural research and development. He complimented timely interventions by the Academy by forwarding its suggestions in framing the Pesticide Management Bill, Seed Bill, Gene Editing guidelines and Direct Benefit Transfer in Fertilizers.

Prof Ramesh Chand, Organizing Secretary, XV ASC, requested to reschedule dates of ASC as not much progress could be made due to the lockdown. He conveyed the assurance of the Vice-Chancellor, BHU, to extend full support for organizing successfully the proposed event. Keeping in view the likely Covid-19 situation and availability of accommodation for delegates, the Organizing Secretary was advised to explore possibility of re-scheduling the Congress during second/third week of November 2021. The EC thanked Prof Ramesh Chand and Dr Rakesh Singh for their inputs.

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

The Executive Council organized AGM 2020 in an alternative way. The presentations of newly elected Fellows were done through WEBINARS from June 22 to June 25, 2020. The Fellowship Certificates were conferred online.

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

113th Meeting

It was organized on-line on August 10, 2020 under the chairmanship of Dr T. Mohapatra. After a brief welcome by the Secretary and the President, agenda items were discussed in detail and were approved. Dr J.C. Katyal, Vice-President of the Academy made a brief presentation on the proposed review of actionable points emerging from the policy and strategy papers of the Academy for preparation of a roadmap for future agriculture. The Executive Council approved the draft resolution for adoption of the Annual Report and Audited Statement of Accounts for the year 2019-20. Further, the Executive Council considered the constitution of Judging Committees for selection of the Awardees amongst the nominees for Memorial, Endowment, Recognition and Young Scientist Awards of the Academy for the biennium 2019-2020 and accorded its approval. The EC was also informed about the NAAS's inputs on formulation of India's new Science, Technology, and Innovation Policy (STIP 2020), status of Fellowship/ Associates nominations received, revised NAAS Scoring of Journals for the year 2021, filling- up of the position of Executive Director and the vacancies of Office-bearers and Members of the Executive Council from January 1, 2021, proposed activities of the Academy for the current year, AGM/Foundation Day Programme 2020 and XV Agricultural Science Congress 2021.

114th Meeting

It was held virtually on November 12, 2020 under the Chairmanship of Dr T. Mohapatra. Dr A.K. Singh, Secretary, 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 2021 were accepted. The Executive Council also approved selection of 11 young scientists working in agriculture related disciplines as Associates of the Academy with effect from January 1, 2021. After examination of suggestions from the Fellowship for various vacant positions in EC w.e.f. January 1, 2021; EC shortlisted names for seeking votes from the entire Fellowship to fill vacancies as per NAAS guidelines. EC was also apprised of about the appointment of Executive Director, NAAS scoring of journals 2021, CAG report- follow-up action, and status of Policy papers / Policy Briefs etc.

115th Meeting

This was held on December 26, 2020 chaired by Dr T. Mohapatra. Some of the important decisions include ratification of the election of office bearers/EC members/fellowship/associates from January 2021, and approval of the recommendations of the Programme Committee and various judging committees for Academy awards. It was also decided that the recommendations of Journal Score Committee may be submitted to EC at the earliest for approval.

116th Meeting

The meeting was held on February 19, 2021 in a hybrid mode—in-person as well as online—under the Chairmanship of Dr T. Mohapatra. The Chairman welcomed all EC Members, and specially to the newly elected Office Bearers and Members of the Executive Council, who joined on January 1, 2021 — Dr Anil K Singh, Vice President; Dr K.C. Bansal, Secretary; Dr (Ms) Malavika Dadlani, Editor; and Dr M.S. Chauhan, Dr S.K. Datta, Prof. A.R. Podile and Dr (Ms) Taru Sharma, Members. The EC observed one-minute silence to pay homage and respect to Dr Sanjaya Rajaram. The President reiterated that Academy should also take up focused discussions on the current topical issues. And the deliberations should provide evidence-based solution to policy makers and Central/State Governments.

Prof. Ramesh Chand, Director, Institute of Agricultural Sciences, BHU, special invitee, briefed on the preparation of XV Agricultural Science Congress (ASC). The EC approved registration fee structure for foreign and national delegates. Dr Anil K Singh, Member-Secretary of the Technical Program Committee, XV ASC and Vice President, NAAS, briefly introduced about the Technical Program. The President requested members to suggest some contemporary topics as well as name some global researchers and experts, who may be invited.

The EC was informed that as per the revised guidelines approved in 115th EC meeting, the Nomination Forms and Guidelines for election of Fellows, selection of Associates and Young Scientist Awards have been modified and up-loaded on the website. EC was

also informed about the documents submitted to various ministries and departments such as the Recommendations to Science, Technology and Innovation Policy 2020 (STIP 2020) to the Principal Scientific Advisor, Government of India.

The EC approved (i) extension for submission of applications for election of Fellows, selection of Associates and Young Scientist Awards to April 15, 2021; and (ii) selection of Dr Sanjeev Saxena, ADG (IPR) after superannuation on March 31, 2021 for the post of Executive Director of the Academy.

117th Meeting

An emergency meeting was held on March 11, 2021 in a hybrid mode. The Agenda of the meeting was to discuss involvement of NAAS in the Supreme Court in 'GM Food Crops' Case. The matter was listed for hearing in the Supreme Court on April 13, 2021.

The members appreciated the pro-active role of the Academy in supporting evidence-based information submitted earlier to the Hon'ble Supreme Court. It was decided that scientific evidence should be collated to present a strong case in the Supreme Court for conducting field trials of GM food crops; and other Departments such as DST and DBT also need to be invited for discussion. A Committee under the Chairmanship of Prof Swapan K Datta was constituted to chalk out response after collecting the needed information.

Journal Score Committee

The Academy carries out voluntary evaluation every three years of scientific journals of standing and of relevance to agricultural and allied sciences. 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 the annual basis. Based on the recommendations, the list of NAAS Scored Journals effective from January 1, 2021 has been updated and uploaded on Academy's website.

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

Consultancy Services by NAAS

Expert Group for Identifying Global Technology Available for Village- Level Crop Yield Estimation

On the request of the Mahalanobis National Crop Forecast Change Centre (MNCFC), Ministry of Agriculture and Farmer's Welfare, Govt of India, New Delhi, the Academy constituted an Expert Group to explore technologies available globally for crop yield estimation at the village/farm level. The focus of the study is to identify technologies that would enable obtaining timely estimates for meeting the objective of the Agricultural Ministry. The emphasis is on using modern tools and technologies like remote sensing

and Unmanned Aerial Vehicle (UAV) in combination with crop growth models. The output of the project would be to identify the most effective technology suitable for Indian conditions for adoption by the Ministry and using it for implementation of Government Programmes like Pradhan Mantri Fasal Bima Yojna (PMFBY).

Impact of National Agricultural Research System on Indian Economy

The national agricultural research system has played a vital role in achieving country's food and nutritional security. Earlier studies have indicated very high rates of returns from investment in agricultural research. Agricultural research contributes immensely in improving efficiency (agricultural growth), raising farmers' incomes, generating employment opportunities and reducing poverty. Technology-led growth in agriculture sector is essential to accelerate competitiveness and increase foreign exchange earnings. During the last five decades, numerous technologies have been released and adopted by the farmers to increase their income and raise agricultural production. It is important to document impact of the promising technologies that made India proud of her agriculture sector.

The Indian Council of Agricultural Research/Department of Agriculture Research and Education has entrusted a Consultancy to the NAAS. The objective is to develop a compendium that documents promising past technologies and their transfer efforts which made significant contribution in improving efficiency, ensuring food and nutritional security, increasing farmers' income, reducing poverty, generating foreign currency and improving Indian economy.

Programmes Planned for 2021

The Academy organizes Brainstorming Sessions (BSS), Strategy Workshops (SW) each year on thematic areas of national importance related to Indian agriculture. For 2021, the Executive Council has approved following programmes.

Sl. No.	Brainstorming sessions/strategy workshops	Convener/Co-Convener
1	Contract Farming for Transforming Agriculture: Challenges and Way Forward	Dr Anjani Kumar
2	Potential of Transgenic Poultry for Biopharming	Dr Tarun Kumar Bhattacharya
3	Policy Dialogue on Biofortification	Dr U.S. Singh
4	Gender and Nutrition Based Extension in Agriculture	Dr Ashok K. Singh
5	WTO and Indian Agriculture	Drs P.S. Birthal and Sachin K. Sharma

Sl. No.	Brainstorming sessions/strategy workshops	Convener/Co-Convener
6	Drudgery Free Agriculture	Drs N.S. Bains and K.P. Singh
7	Road Map to Rehabilitate 26 million ha Degraded Lands by 2030	Drs Ch. Srinivasa Rao, J.C. Katyal, A.K. Singh
8	Impact of COVID 19 on Animal Health and Dairy Industry	Drs R.K. Singh and A.K. Singh
9	Quality Planting Material for Promoting Agricultural Diversification	Dr V.K. Baranwal
10	Waste-to-Wealth: Use of Food Industry Waste as Animal Feed	Dr N.K.S. Gowda
11	Sericulture for Enhancing Farmers' Income	Dr M. Mahadevappa
12	Agriculture and Entrepreneurship Models for Quality Fodder Production	Dr Ajoy Kumar Roy

FINANCIAL STATEMENT

The Academy received from the Department of Agricultural Research and Education (DARE), New Delhi, Grant-in-Aid of Rs 140 lakh during the year 2020-21. The Accounts of the Academy are audited by Chartered Accountants appointed with the approval of the General Body. The Utilization Certificate for the year 2020-21 has been submitted to the DARE.

A brief Audited Statement of Accounts and Auditor's Report for 2020-21 is annexed as Annexure I and II.

ACKNOWLEDGMENT

The Academy gratefully acknowledges the Department of Agricultural Research and Education and the Indian Council of Agricultural Research, for their continued financial and logistics 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). The esteemed Fellows also lend their services for various activities of the Academy such as Annual General Body Meeting, Scoring of Research Journals, critically examining 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 Fellowship and other staff involved in the above activities during the year.

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: vk Gupta14@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, 2021 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

1. Accounts are continuously maintained on "cash basis" however TDS by the banks interest etc. have claimed on accrual basis.
2. GST paid on "accrual basis" while accounts are being maintained on "cash basis".

Subject to above we further report that:

1. 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.
2. 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.
3. 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, 2021.
- 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.

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


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

Place : New Delhi
Dated : 16-07-2021

UDIN: 21080585AAAABI9769



NATIONAL ACADEMY OF AGRICULTURAL SCIENCES
Year Ended 31st March 2021.

Accounting Policies and Notes to Accounts Forming Part of the Balance Sheet as on March 31, 2021

1. Method of Accounting

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

2. Investments

- (a) The Academy has made investments as required to be invested under section 11(5) of the Income Tax Act, 1961 and value of the investments are shown at cost.
- (b) Income from investments has been recognized on cash/receipt basis.

3. Fixed Assets and Depreciation

- (a) Fixed Assets are stated at written down value less Depreciation calculated as per the rates of Depreciation provided in the Income Tax Act 1961, read with Rules made there under.

4. Income tax Provision and contingent Liabilities:

- (a) The Income Tax Department has disallowed the claim of benefits of Rs. 3,91,85,233/- u/s 11(2) towards accumulation of Income for specified purposes for the assessment year 2016-17 and raised a demand of Rs. 1,33,91,970/- after adjusting the refund claim of Rs. 32,90,177/-. An appeal has been filed before the Commissioner of Income Tax against the addition made. Management is of the view that No Addition should sustain hence, No provisions is made.
- (b) 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. Management is of the view that No Addition should sustain hence, No provisions is made.

- 5. During the year under consideration a sum of Rs 3,11,76,115/- is proposed to be accumulated u/s 11(2) of the Income Tax Act, 1961.

6. Payments of Auditors

	31/03/2021	31/03/2020
Audit Fee/GST Fee and expenses	53,895/-	73,000/-

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.

For Virender K Gupta & Co.
Chartered Accountants

(V.K.Gupta)

Partner
M.No.080585
Place: New Delhi
Dated 16 JUL 2021



National Academy of Agriculture Sciences



+ Secretary

+ Treasurer

[Handwritten signatures of Secretary and Treasurer]

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES

BALANCE SHEET AS ON 31.03.2021

LIABILITIES	AMOUNT (Rs.)	ASSETS	AMOUNT (Rs.)
CAPITAL FUND		FIXED ASSETS (Ann. B.S. 1)	
Opening Balance	15,60,82,451	Opening Balance	1,86,74,576
Add: Transferred from Accumulated Fund	1,59,59,181	Additions during the year	47,182
Add: Excess of Income over Expenditure during the year	1,86,85,761	Write off during the year	-
Less: Funds transferred to Specific Reserve Fund	3,11,76,115	Depreciation for the year written off	(20,80,022)
		Deposits in Approved Securities (Ann. B.S. 2)	1,66,41,736
SPECIFIC RESERVE FUND			30,31,73,915
Opening Balance	15,84,15,684	CURRENT ASSETS	
Add: Addition during the year	3,11,76,115	Bank Balances (Ann. B.S. 3)	13,60,710
Less: Utilized during the year	1,59,59,181	Cash Balances (Imprest A/c)	2
ENDOWMENT FUND			
Opening Balance	20,00,000		
Received during the year	-		
CURRENT LIABILITIES		ADVANCES	
National Soil & Land Use Policy	20,00,000	Advances with NAAS Regional Chapters (Ann. B.S. 4)	4,69,705
Developing Proforma to Rank ICAR Institutions		Tax Deducted at Source	1,08,93,084
Compendium on Impact of NARS.....		Payment to Income Tax Department (AY 2016-17 & 2017-	49,12,779
Earnest Money (MM ACTIV)		XV ASC	10,00,000
PFIMBY Project		GST Receivable	76,064
GST Payable (CGST+SGST)			
TOTAL	33,85,27,995	TOTAL	33,85,27,995

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

For Virender K Gupta & Co
Chartered Accountants



(V.K. Gupta)

Partner

M NO -080585

Place: New Delhi

Date 16 JUL 2021

UPIN: 21050555AAAAB19789

National Academy of Agricultural Sciences



Secretary

Treasurer

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31ST MARCH, 2021

EXPENDITURE	AMOUNT (Rs.)	INCOME	AMOUNT (Rs.)
To Expenditure towards NAAS activities (<i>Ann. I.E. II</i>)	1,59,11,999	By Grant-in-Aid from D.A.R.E.	1,40,00,000
To Depreciation (<i>Ann. B.S. I</i>)	20,80,022	By Interest on Investment	2,07,56,250
To Excess of Income over Expenditure transferred	1,86,85,761	By Interest, Contribution from Subscriptions, Publications and Other receipts towards NAAS activities (<i>Ann. I.E. III</i>)	19,21,532
Total:	3,66,77,782	Total:	3,66,77,782

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

For Virender K Gupta & Co
Chartered Accountants



(V.K Gupta)

Partner

M.NO.-080585

Place: New Delhi

Date:

16 JUL 2021

V.IN: 21080585 AAAABI9769



National Academy of Agricultural Sciences

Secretary
[Signature]

Treasurer
[Signature]

EXECUTIVE COUNCIL

Position	2020	2021
President	Dr T. Mohapatra	Dr T. Mohapatra
Immediate Past President	Prof Panjab Singh	Prof Panjab Singh
Vice-President	Prof A.K. Srivastava	Dr J.C. Katyal
Vice-President	Dr J.C. Katyal	Dr Anil K. Singh
Secretary	Dr Anil K Singh	Dr P.K. Joshi
Secretary	Dr P.K. Joshi	Dr K.C. Bansal
Foreign Secretary	Dr U.S. Singh	Dr U.S. Singh
Editor	Dr Kusumakar Sharma	Dr P.S. Birthal
Editor	Dr P.S. Birthal	Dr Malavika Dadlani
Treasurer	Dr R.K. Jain	Dr R.K. Jain
Member	Dr Madhoolika Agrawal	Dr Madhoolika Agrawal
Member	Dr J.S. Chauhan	Dr J.S. Chauhan
Member	Dr B.S. Dwivedi	Dr M.S. Chauhan
Member	Dr Arvind Kumar	Dr S.K. Datta
Member	Dr. Ashwani Kumar	Dr Arvind Kumar
Member	Dr W.S. Lakra	Dr W.S. Lakra
Member	Dr V. Prakash	Dr Rajender Parsad
Member	Dr Rajender Parsad	Prof A.R. Podile
Member	Dr D.D. Patra	Dr (Ms) Taru Sharma
Member	Dr Brahma Singh	Dr Brahma Singh
Member	Dr Rajeev K. Varshney	Dr Rajeev K. Varshney
Member	Dr R. Visvanathan	Dr R. Visvanathan
ICAR Nominee	Dr Ch. Srinivasa Rao	Dr Ch. Srinivasa Rao

SECRETARIAT

Executive Director

Shri Umesh Rai, Programme Executive

Shri Miraj Uddin, Budget & Accounts Executive

Shri Jai Singh, Office Management Jr. Executive

Ms Minu Tiwari, Programme Executive

Shri B.L. Yadav, Driver cum Office Assistant

Shri P. Krishna, Programme Executive

Shri Kamal Singh, General Office Assistant

LIST OF ACRONYMS

AGM	Annual General Meeting
AMR	Anti-Microbial Resistance
ARC	Apical Rooted Cuttings
ASC:	Agricultural Science Congress
BDA	Biological Diversity Act
BHU	Banaras Hindu University
BSS	Brainstorming Session
CAG:	Comptroller and Auditor General (of India)
CFM	Concentrated Fruit Maturity
CGIAR	Consultative Group on International Agricultural Research
CIP:	International Potato Center
CNRS	National Centre for Scientific Research
CSIR	Council of Scientific and Industrial Research
EC	Executive Council
GEAC	Genetic Engineering Appraisal Committee
HPKV	Himachal Pradesh Krishi Vishvavidyalaya
ICAR	Indian Council of Agricultural Research
ICAR- NIASM	ICAR-National Institute of Abiotic Stress Management
ICAR- SBI	ICAR-Sugarcane Breeding Institute
ICAR-CSSRI	ICAR-Central Soil Salinity Research Institute
ICAR-NAARM	ICAR-National Academy of Agricultural Research Management
ICAR-NDRI	ICAR-National Dairy Research Institute
ICAR-NIAP:	ICAR-National Institute of Agricultural Economics and Policy Research
ICAR-VPKAS	ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan
ICMR	Indian Council of Medical Research
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information and Communication Technology
IMSA	Indian Meat Science Association
INSA	Indian National Science Academy
KIIT	Kalinga Institute of Industrial Technology
MH	Machine Harvesting
NAAS	National Academy of Agricultural Sciences

NABARD	National Bank for Agriculture and Rural Development
NARS	National Agricultural Research System
NASC:	National Agricultural Science Centre
NASI	National Academy of Sciences, India
NEH	North Eastern Hill
NEP	National Education Policy
NGO	Non-Governmental Organisation
PAU	Punjab Agricultural University
PMFBY	Pradhan Mantri Fasal BimaYojana
PPVFRA	Protection of Plant Varieties and Farmers' Rights Act
RCGM	Review Committee on Genetic Manipulations
SAARC	South Asian Association for Regional Cooperation
SARAS	Society for Abiotic Stress Research in Agricultural Sciences
SDGs	Sustainable Developmental Goals
SOC	Soil Organic Carbon
SOPs	Standard Operative Procedures
STIP	Science, Technology and Innovation Programme
TADs	Transboundary Animal Diseases
UAV	Unmanned Aerial Vehicle

61. Mastitis Management in Dairy Animals	-2013
62. Biopesticides – Quality Assurance	-2014
63. Nanotechnology in Agriculture: Scope and Current Relevance	-2014
64. Improving Productivity of Rice Fallows	-2014
65. Climate Resilient Agriculture in India	-2014
66. Role of Millets in Nutritional Security of India	-2014
67. Urban and Peri-urban Agriculture	-2014
68. Efficient Utilization of Phosphorus	-2014
69. Carbon Economy in Indian Agriculture	-2014
70. MOOC for Capacity Building in Indian Agriculture: Opportunities and Challenges	-2014
71. Role of Root Endophytes in Agricultural Productivity	-2014
72. Bioinformatics in Agriculture: Way Forward	-2014
73. Monitoring and Evaluation of Agricultural Research, Education and Extension for Development [AREE4D]	-2015
74. Biodrainage: An Eco-friendly Tool for Combating Waterlogging	-2015
75. Linking Farmers with Markets for Inclusive Growth in Indian Agriculture	-2015
76. Bio-fuels to Power Indian Agriculture	-2015
77. Aquaculture Certification in India: Criteria and Implementation Plan	-2015
78. Reservoir Fisheries Development in India: Management and Policy Options	-2016
79. Integration of Medicinal and Aromatic Crop Cultivation and Value Chain Management for Small Farmers	-2016
80. Augmenting Forage Resources in Rural India: Policy Issues and Strategies	-2016
81. Climate Resilient Livestock Production	-2016
82. Breeding Policy for Cattle and Buffalo in India	-2016
83. Issues and Challenges in Shifting Cultivation and its Relevance in the Present Context	-2016
84. Practical and Affordable Approaches for Precision in Farm Equipment and Machinery	-2016
85. Hydroponic Fodder Production in India	-2017
86. Mismatch between Policies and Development Priorities in Agriculture	-2017
87. Abiotic Stress Management with Focus on Drought, Flood and Hailstorm	-2017
88. Mitigation Land Degradation due to Water Erosion	-2017
89. Vertical Farming	-2019
90. Zero Budget Natural Farming - A Myth or Reality?	-2019
91. Loan Waiving versus Income Support Schemes: Challenges and Way Forward	-2019
92. Tropical Wilt Race-4 Affecting Banana Cultivation	-2019
93. Enhancing Science Culture in Agricultural Research Institutions	-2020
94. Payment for Ecosystem Services in Agriculture	-2020
95. Food-borne Zoonotic Diseases	-2020
96. Livestock Improvement through Artificial Insemination	-2020
97. Potential of Non-Bovine Milk	-2021
98. Agriculture and Food Policy for the Five Trillion Dollar Economy	-2021

Status / Strategy Papers

1. Role of Social Scientists in National Agricultural Research System (NARS)	-2015
2. Towards Pulses Self-sufficiency in India	-2016
3. Strategy for Transformation of Indian Agriculture and Improving Farmers Welfare	-2016
4. Sustaining Soybean Productivity and Production in India	-2017
5. Strengthening Agricultural Extension Research and Education	-2017
6. Strategy on Utilization of Glauconite Mineral as Source of Potassium	-2017
7. Vegetable Oil Economy and Production Problems in India	-2017
8. Conservation Policies for Hilsa and Mahseer	-2018
9. Accelerating Seed Delivery Systems for Priming Indian Farm Productivity Enhancement: A Strategic Viewpoint	-2018
10. Renewable Energy: A New Paradigm for Growth in Agriculture	-2018
11. Rumen Microbiome and Amelioration of Methane Production	-2019
12. Harnessing Full Potential of A1 and A2 Milk in India: An Update	-2019
13. Development and Adoption of Novel Fertilizer Materials	-2019

Policy Briefs

1. To Accelerate Utilization of GE Technology for Food & Nutrition Security and Improving Farmers' Income	-2016
2. Innovative Viable Solution to Rice Residue Burning in Rice-Wheat Cropping System through Concurrent Use of Super Straw Management System-fitted Combines and Turbo Happy Seeder	-2017
3. Soil Health: New Policy Initiatives for Farmers Welfare	-2018
4. Uniform Policy for Fish Disease Diagnosis and Quarantine	-2019
5. Saving the Harvest: Reducing the Food Loss and Waste	-2019
6. Better Management of Pesticides in India: Policy Perspectives	-2019
7. Regulatory Framework for Genome Edited Plants: Accelerating the Pace and Precision of Plant Breeding	-2020
8. Covid-19 Pandemic: Impact and New Normal in Agriculture	-2020
9. Direct Benefit Transfer of Fertilizer Subsidy: Policy Perspectives	-2020
10. Harmonization of Seed Regulations for Sustainable Food Security in India	-2020

NAAS Documents on Policy Issues*

1. Agricultural Scientist's Perceptions on National Water Policy	-1995
2. Fertilizer Policy Issues (2000-2025)	-1997
3. Harnessing and Management of Water Resources for Enhancing Agricultural Production in the Eastern Region	-1998
4. Conservation, Management and use of Agro-biodiversity	-1998
5. Sustainable Agricultural Export	-1999
6. Reorienting Land Grant System of Agricultural Education in India	-1999
7. Diversification of Agriculture for Human Nutrition	-2001
8. Sustainable Fisheries and Aquaculture for Nutritional Security	-2001
9. Strategies for Agricultural Research in the North-East	-2001
10. Globalization of Agriculture: R & D in India	-2001
11. Empowerment of Women in Agriculture	-2001
12. Sanitary and Phytosanitary Agreement of the World Trade Organization – Advantage India	-2001
13. Hi-Tech Horticulture in India	-2001
14. Conservation and Management of Genetic Resources of Livestock	-2001
15. Prioritization of Agricultural Research	-2001
16. Agriculture-Industry Interface: Value Added Farm Products	-2002
17. Scientists' Views on Good Governance of An Agricultural Research Organization	-2002
18. A gricultural Policy: Redesigning R & D to Achieve It's Objectives	-2002
19. Intellectual Property Rights in Agriculture	-2003
20. Dichotomy Between Grain Surplus and Widespread Endemic Hunger	-2003
21. Priorities of Research and Human Resource Development in Fisheries Biotechnology	-2003
22. Seaweed Cultivation and Utilization	-2003
23. Export Potential of Dairy Products	-2003
24. Biosafety of Transgenic Rice	-2003
25. Stakeholders' Perceptions On Employment Oriented Agricultural Education	-2004
26. Peri-Urban Vegetable Cultivation in the NCR Delhi	-2004
27. Disaster Management in Agriculture	-2004
28. Impact of Inter River Basin Linkages on Fisheries	-2004
29. Transgenic Crops and Biosafety Issues Related to Their Commercialization In India	-2004
30. Organic Farming: Approaches and Possibilities in the Context of Indian Agriculture	-2005
31. Redefining Agricultural Education and Extension System in Changed Scenario	-2005
32. Emerging Issues in Water Management – The Question of Ownership	-2005
33. Policy Options for Efcient Nitrogen Use	-2005
34. Guidelines for Improving the Quality of Indian Journals & Professional Societies in Agriculture and Allied Sciences	-2006
35. Low and Declining Crop Response to Fertilizers	-2006
36. Belowground Biodiversity in Relation to Cropping Systems	-2006
37. Employment Opportunities in Farm and Non-Farm Sectors Through Technological Interventions with Emphasis on Primary Value Addition	-2006
38. WTO and Indian Agriculture: Implications for Policy and R&D	-2006
39. Innovations in Rural Institutions: Driver for Agricultural Prosperity	-2007
40. High Value Agriculture in India: Prospects and Policies	-2008
41. Sustainable Energy for Rural India	-2008
42. Crop Response and Nutrient Ratio	-2009
43. Antibiotics in Manure and Soil – A Grave Threat to Human and Animal Health	-2010
44. Plant Quarantine including Internal Quarantine Strategies in View of Onslaught of Diseases and Insect Pests	-2010
45. Agrochemicals Management: Issues and Strategies	-2010
46. Veterinary Vaccines and Diagnostics	-2010
47. Protected Agriculture in North-West Himalayas	-2010
48. Exploring Untapped Potential of Acid Soils of India	-2010
49. Agricultural Waste Management	-2010
50. Drought Preparedness and Mitigation	-2011
51. Carrying Capacity of Indian Agriculture	-2011
52. Biosafety Assurance for GM food Crops in India	-2011
53. Ecolabelling and Certification in Capture Fisheries and Aquaculture	-2012
54. Integration of Millets in Fortified Foods	-2012
55. Fighting Child Malnutrition	-2012
56. Sustaining Agricultural Productivity through Integrated Soil Management	-2012
57. Value Added Fertilizers and Site Specific Nutrient Management (SSNM)	-2012
58. Management of Crop Residues in the Context of Conservation Agriculture	-2012
59. Livestock Infertility and its Management	-2013
60. Water Use Potential of Flood-affected and Drought-prone Areas of Eastern India	-2013