

ANNUAL REPORT

2021-22



NATIONAL ACADEMY OF AGRICULTURAL SCIENCES
NEW DELHI

ANNUAL REPORT

2021-22



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

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PREFACE

At the time I wrote the preface to last year's Annual Report, the pandemic had started and during the early days of the pandemic the outlook looked bleak. Little did we realise that the second wave would have such terrible impact on the lives of all of us. It was tragic that we lost ten of our esteemed fellows and one colleague from the Secretariat during this period. Despite the constraints of the pandemic and lockdown, it is really satisfying to note that, the Academy never lost its spirit and I take the privilege to put forth before the esteemed Fellowship a synopsis of the initiatives undertaken and the objectives achieved in this Annual Report for the year 2021-22.



All the routine and committed activities of the Academy, including the mandatory Executive Council meetings and the AGM were accomplished through virtual or hybrid mode. The process of election of Fellows and Associates were completed well in time by the Sectional Committees. I am happy to report that during 2021, 34 new Fellows, including two Foreign Fellows and three Pravasi Fellows were elected and inducted to the Academy. In addition, 11 Associates have also been selected. I welcome all of them and look forward to their active participation in the Academy's activities.

The Academy organized 14 Brainstorming Sessions, as planned by the Programme Committee, on the issues of contemporary importance. The Academy published 10 Policy Papers and two Policy Briefs/Strategy Papers. In addition, the Academy organised special programmes, including a webinar on Transforming Agriculture, National Science Day and International Women's Day. Also as a mark of gratitude to our former President, late Prof V.L. Chopra, a virtual remembrance meeting was held on his death anniversary. A memoir carrying heartfelt messages from his family, friends, colleagues and students was released on August 09, 2021.

Dr Shakuntala Haraksingh Thilsted, the 2021 World Food Laureate and Global Leader for Nutrition and Public Health at the World Fish of the Consultative Group of International Agricultural Research, delivered the Foundation Day Lecture.

The Regional Chapters continued to be highly active and provided the required visibility to the objectives of the Academy across the country, by conducting various programmes throughout the year, particularly those sensitizing and inspiring the school children.

Successful organization of the XV Agricultural Science Congress on Energy and Agriculture: Challenges for 21st Century, at Banaras Hindu University, Varanasi, was a

major milestone. It was a privilege that the Congress was inaugurated by Shri Narendra Singh Tomar, Hon'ble Minister of Agriculture and Farmer's Welfare, Government of India. It was further enriched with the presence of eminent academicians who delivered plenary and special lectures on recent trends, innovations, challenges and opportunities in the energy sector. Comprehensive deliberations were held on nine scientific themes, covering all the aspects of energy and agriculture. The national level elocution contest among students selected from all over the country, Industry-Farmers-Scientists interaction and the Agri-expo were other highlights of the Congress. The programme committee and the organizing committee and their teams deserve appreciation of the Academy for the tireless efforts in making the Congress a grand success.

It is also to be appreciated that the Academy brought out the NAAS NEWS timely. The NAAS Yearbook 2022 and NAAS Yearly Planner were also published in time. Agricultural Research, the journal of the Academy, was published in time. Thanks to Prof Anupam Varma, Editor-in-Chief of the journal, for his untiring efforts.

The success achieved is attributed to the entire Fellowship. I express appreciation and thank all the Conveners of the Regional Chapters, Brainstorming Sessions and other events for their contribution. I place on record my gratitude to Dr Panjab Singh, Immediate Past-President; Dr Anil K. Singh and Dr K.M. Bujarbaruah (w.e.f. 1.1.2022), Vice-Presidents; Dr P.K. Joshi and Prof. K.C. Bansal, Secretaries; Prof Rajeev K. Varshney, Foreign Secretary (w.e.f. 1.1.2022); Dr P.S. BIRTHAL and Dr Malavika Dadlani, Editors; Dr Rajendra Parsad, Treasurer (w.e.f. 1.1.2022) and Shri Sanjay Garg, ICAR Nominee for their guidance and contributions. A special word of thanks to the outgoing office bearers and EC members (up to 31.12.2021), namely Dr J.C. Katyal, Vice President; Dr U.S. Singh, Foreign Secretary; Dr R.K. Jain, Treasurer, and Members of Executive Council Dr Madhoolika Agrawal, Dr Arvind Kumar, Dr Rajender Parsad, Dr Brahma Singh, Dr Rajeev K. Varshney and Dr Ch. Srinivasa Rao (ICAR Nominee).

These were indeed trying times for all of us. I appreciate the grit and dedication shown by the colleagues in the NAAS Secretariat Dr Sanjeev Saxena, Executive Director and the team comprising Shri Miraj Uddin, Ms Minu Tiwari, Shri P. Krishna, Shri Jai Singh, Mr Chitesh Kaushik, Shri Kamal Singh and Shri Banwari Lal for efficiently managing and supporting the activities of the Academy. 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 provide an interactive platform 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 rural development; agricultural research, education and extension; and facilitate the provision of evidence-based inputs to policymakers and other stakeholders at different 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 the role of agricultural research, education and extension in economic development.

The Academy has emerged as a think tank for agricultural science policy in India. The Fellows of the Academy, recognized for their contributions to science, include distinguished personalities in agriculture and allied sciences 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.
- 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 agricultural transformation to strengthen the 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 in Barapani, Bengaluru, Bhopal, Coimbatore, Cuttack, Hyderabad, Karnal, Kolkata, Lucknow, Ludhiana, Pune and Varanasi.

SCIENTIFIC ACTIVITIES

Brainstorming Sessions/Strategy Workshops/Consultation Meetings

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

Sl. No.	Title	Convener/ Co-Convener	Date
1.	Gender and Nutrition based Extension in Agriculture	Dr Ashok K. Singh Dr Randhir Singh	June 28, 2021
2.	Drudgery Free Agriculture: Challenges and Way Forward	Dr K.P. Singh Dr Naresh Chhuneja	September 15, 2021
3.	Certification of Quality Planting Material of Clonally Propagated Fruit Crops for Promoting Diversification	Dr V.K. Baranwal	September 20, 2021
4.	‘Strategies and Approaches for Promotion of Sustainable Bivoltine Sericulture in India	Dr Dandin S.B. Dr S. Hittalmani Dr S. Rajendra Prasad	September 22, 2021
5.	WTO and Indian Agriculture	Dr P.S. Birthal Dr Sachin Sharma Prof Abhijit Das	October 07, 2021
6.	Secondary Agriculture: Challenges, Opportunities and Way Forward	Dr S.N. Jha	October 21, 2021
7.	Agri-startups in India: Opportunities, Challenges, and Way Forward	Dr Ch. Srinivasa Rao Dr Ranjit Kumar	November 05, 2021

8.	Limitations of the Global Hunger Index	Dr Mahtab S. Bamji Dr P.K. Joshi Dr Rajender Parsad	November 08, 2021
9.	Waste to Wealth – Use of Food Industry Waste as Animal Feed and Beyond	Dr N.K.S. Gowda	December 03, 2021
10.	Road Map to Rehabilitate 26 Million ha Degraded Lands by 2030	Dr Ch. Srinivasa Rao Dr J.C. Katyal Dr Anil K. Singh	December 09, 2021
11.	Agriculture and Entrepreneurship Models for Quality Fodder Production	Dr Ajoy Kumar Roy Dr Amaresh Chandra Dr D.R. Malaviya	December 17, 2021
12.	Draft Regulation for GM Food and Feed Imports and Detection of Unauthorized GM Events	Dr K.C. Bansal Dr Gurinderjit Randhawa	January 10, 2022
13.	Food Fortification Issues and Way Forward	Dr K. Madhavan Nair	March 11, 2022
14.	Self-sufficiency in Edible Oil Production	Dr Sanjeev Gupta	March 28 2022

Gender and Nutrition based Extension in Agriculture (Convener: Dr. Ashok K. Singh, Co-convener: Dr. Randhir Singh)

Keeping in view the triple burden of malnutrition, that is, the coexistence of over-nutrition, under-nutrition and hidden hunger (micronutrient deficiency), a brainstorming session was organized on 28 June 2021 to explore the prospects of integration of nutrition-rich technological options with government schemes and extension systems to improve the nutritional security of the country. The discussion revolved around the following:



- Inclusive agricultural policy embedding the gender component with dimensions of equitability, opportunity and sustainability
- Bio-fortification, fortified foods and composite foods to address nutritional requirements.

- Traditional food system and indigenous recipes.
- Nutrition literacy among farm women and school children.
- Promotion of livestock products, especially milk and eggs in the food pyramid.
- Development of suitable extension models for enhancing livelihood.

Drudgery Free Agriculture: Challenges and Way Forward (Convener: Dr K.P. Singh, Co-Convener: Dr Naresh Chhuneja)

A strategy workshop on 'Drudgery Free Agriculture: Challenges and Way Forward' was organized on September 15, 2021. The workshop was convened by Dr K.P. Singh, Principal Scientist, ICAR-CIAE, Bhopal, under the chairmanship of Dr Trilochan Mohapatra, President NAAS. Dr Gajendra Singh, Ex-DDG (Engineering), ICAR, was the Co-Chair. Dr A.K. Singh, Vice-President, NAAS, presented the workshop's objectives, and Dr K.P. Singh delivered the outline of the programme.



In his opening remarks, Dr Mohapatra highlighted the role of machines and management practices using digital platforms for the intensification of Indian agriculture. He also emphasised developing entrepreneurship to establish farm machinery custom-hiring centres to utilise tractors and other agricultural machines optimally.

A lack of access to appropriate agricultural machines and decision support systems results in excessive physical stress and fatigue, amounting to high levels of drudgery. The working conditions and lack of essential facilities force farmers to adopt static machines, which drastically reduce the comfort index. The following key recommendations emerged from the discussion:

- Development of entrepreneurship models for custom-hiring for optimum use of tractors and other machines to reduce drudgery in agriculture. Modern mechanization strategies should be introduced using a digital platform equipped with sensors and machine and deep learning technologies.
- Development of Uber / Ola type model using digital platform for optimal utilization of tractors and machines.
- Gender-neutral machines need to be designed and developed given the increasing participation of women workers in agriculture.
- Multi-disciplinary national and international collaborations are needed in the field of digital and disruptive technologies in agriculture.

- Introduction of Mobile vans for on-farm repair and maintenance services of agricultural machines in remote areas.
- Development of linkages among researchers, entrepreneurs and farmers.
- The high initial investment for the adoption of digital and disruptive technologies needs to be addressed.

Certification of Quality Planting Material of Clonally Propagated Fruit Crops for Promoting Diversification (Convener: Dr V.K. Baranwal)

A strategy workshop on ‘Certification of Quality Planting Material of Clonally Propagated Fruit Crops for Promoting Diversification’ was organized on September 20, 2021. The workshop was chaired by Dr T. Mohapatra, President, NAAS, and co-chaired by Prof Anupam Varma, Ex ICAR National Professor, IARI. The need to establish a robust system for certification of planting material of fruit crops and the development of a national database of the centres producing the planting material was highlighted by Dr Mohapatra. He also emphasized testing soil-borne pathogens and bacteria, besides testing plant viruses and developing easy-to-use diagnostics.

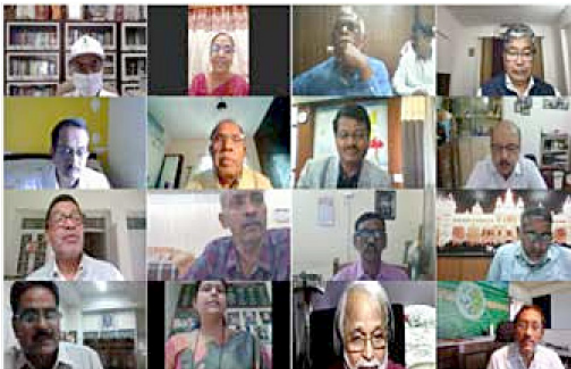
Non-availability of genuine and quality planting material of improved/ superior fruit varieties is a significant bottleneck in increasing the productivity of fruit crops. Diseases of clonally-propagated fruit crops caused by viruses and virus-like agents and bacterial pathogens can severely affect the longevity, yield, appearance, and taste of fruits. Such pathogens are often challenging to detect and quickly spread to newer areas. Therefore, there is an urgent need to prepare detailed guidelines to ensure the production and supply of certified quality planting material (QPM) of fruit crops. Following recommendations emerged from the discussion.

- A national-level apex body is required to oversee the planning and execution of the overall certification programme of all the clonally-propagated plants.
- Guidelines need to be framed for pre-basic and basic material certification, including indexing and eradication of pathogens and maintenance of passport data.
- Establishing a strong network of universities and research institutions mandated with the supply of certified primary materials of specific crops and accredited nurseries producing the certified planting materials is the need of the hour.
- Facilities for virus indexing and genetic homogeneity should be established in institutions mandated to produce certified basic materials of fruit crops.
- All the imported planting materials should be adequately tested for pests and diseases through PEQ
- Bar-coding/QR-coding is needed for all the certified and clean planting materials.

Strategies and Approaches for Promotion of Sustainable Bivoltine Sericulture in India (Conveners: Dr Dandin S.B. and Dr Shailaja Hittalmani, Co-conveners: Dr S. Rajendra Prasad)

A brainstorming session on 'Strategies and Approaches for Promotion of Sustainable Bivoltine Sericulture in India' was organized on 22 September 2021 to address the issues confronting the sericulture industry with special reference to the production of quality bivoltine silk as a substitute of imported silk. Dr T. Mohapatra, President, NAAS, stated that the mulberry based bivoltine sericulture system needs improvement to meet the domestic demand for quality silk.

Diverse germplasm lines of mulberry and silkworms are required to develop varieties for higher productivity and quality.



The following recommendations emerged from the deliberations:

- Conduct a study to assess the demand for silk in the domestic market.
- Evolve sericulture-based farming systems to exploit the fallow and uncultivated forest lands for silk production.
- Assess the grades of cocoons produced locally for their suitability to different quality grades of silk.
- Emphasise on the development of double silkworm hybrids.
- Involve private egg producers by providing them financial assistance.
- Extension system should cover all aspects of sericulture, including reeling, twisting, weaving etc. in the supply chain. Sericulture extension must be participatory and involve all community-based organizations such as FPOs and SHGs
- To improve the quality of silk, quality-based pricing can be adopted for all products.

WTO and Indian Agriculture (Conveners: Dr P.S. Birthal, Dr Sachin Sharma and Prof Abhijit Das)

India has been facing several issues related to domestic support, market access, export subsidies and food security at the WTO. The developing countries, in general, are affected by the asymmetries in the Agreement on Agriculture (AoA), favouring the developed countries to continue with the massive agricultural subsidies without breaching their commitments to the AoA. Their Aggregate Measurement of Support (AMS) entitlement

has allowed them to provide high levels of trade-distorting support along with product-specific concentration, leading to overproduction of agricultural commodities and consequently depression in their international prices, that in a way is causing losses in farm incomes in developing countries. It also leads to related issues of the surge in cheap imports in the domestic markets of developing

countries. Farmers in the developing countries are small and subsistence-oriented, and hence, they remain highly vulnerable to the volatility in international prices and import surges of agricultural commodities. India also finds itself restricted in implementing welfare-oriented agricultural policies owing to strict disciplines laid under the AoA. In recent times, even the existing flexibilities available to the developing countries are being proposed to be subjected to disciplines in agricultural negotiations. India's support programmes have consistently been attacked at the WTO in terms of counter-notifications (for example, for cotton, sugar, wheat and rice) and questioning in various meetings of the Committees on Agriculture (CoA). The recent dispute on India's sugar policy is an example. The price support-based procurement and public stockholding of foodgrains, the backbone of India's food security, also face criticism at the WTO.



Given such an environment at the international level, India needs to develop a roadmap for negotiations that seek redressal of the existing asymmetries and imbalances in the AoA. The NAAS organized a brainstorming session on October 7, 2021, to generate feedback for the policymakers to effectively manage challenges at the WTO. The discussion led to the following recommendations that would help India and other developing countries have a level playing field in the liberalized global economic order.

- Along with other developing countries, India must continue to demand removing asymmetries in the AoA, especially the AMS entitlements, which allow developed countries to provide high levels of trade-distorting support under the Amber box provisions.
- Developing countries should continue to oppose any attempt to dilute the existing special and differential (S&DT) provisions, especially capping the support under the Development box (Article 6.2) and reducing the *de minimis* limit.
- Since many developing countries have been implementing the price support backed procurement policy, there is a need to address the issue of external reference prices (ERP) based on 1986-88 prices. The ERP need to be based on the recent import or export prices of agricultural commodities. Alternatively, the developing countries should be aggressive in demanding flexibility to consider inflation in the calculation

of market prices.

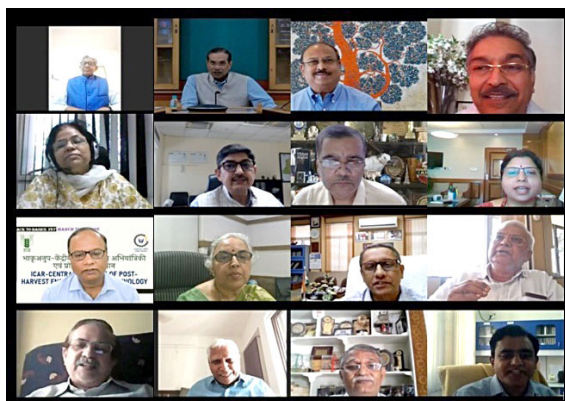
- Members of WTO are now engaged in finding a permanent solution to the issue of public stockholding of food grains for food security purposes. Any permanent solution should be better than the interim solution, i.e. the Bali Peace Clause, in terms of commodities coverage, new programmes and less onerous conditions.
- Given the import surges of agricultural goods and their adverse impacts on farm income, the developing countries should seek a simple, effective, operable and accessible SSM.
- Given that India can provide transport and marketing related export subsidies only (Article 9.4) till 2023, there is a need to focus on improving the infrastructure for agricultural exports.
- India and many other developing members have highlighted sustainable development goals (SDGs) related to hunger and poverty in various proposals submitted to the WTO. However, the negotiations need to highlight these more aggressively to achieve a level playing field for the poor farmers.
- There is a need for frequent inter-ministerial meetings and discussions with stakeholders, including farmers, civil society organizations and state governments, to sensitise them on the issues critical to agricultural trade and seek their feedback on addressing these through domestic and trade policies.
- There should be greater cooperation among different ministries or departments related to agriculture, environment, external affairs and commerce in policy formulations to ensure that the policies are WTO compliant but not detrimental to the domestic interests. India has considerable policy space under the Green box that can be realized by aligning or reforming several existing agricultural and food policies.
- India should have a market intelligence unit in its embassies to track the agricultural and trade policies of the concerned countries and provide feedback to the Government of India.

Secondary Agriculture: Challenges, Opportunities and Way Forward (Convener: Dr S.N. Jha)

A brainstorming session was organized on 'Secondary Agriculture: Challenges, Opportunities and Way Forward' on October 21, 2021. The following points emerged from the deliberations:

- The definition of secondary agriculture should focus on the development of high-value products encompassing crop residues and by-products and agro-based rural industries.

- Formulate national policy on post-harvest management of agricultural commodities, including primary, secondary and tertiary processing.
- Establish linkages between research organizations and nutraceutical and pharmaceutical industries to initiate demand-driven research on secondary agriculture.
- Create “own and operate” type enterprises to produce high-value crop-specific products and engage the private sector with technical backstopping.
- Form a dedicated network of scientists cutting across disciplinary boundaries for strengthening research on secondary agriculture.
- Create a database on the availability of secondary raw materials.



Agri-startups in India: Opportunities, Challenges, and Way Forward (Convenors: Dr Ch. Srinivasa Rao and Dr Ranjit Kumar)

Startups are considered to be the potential growth engine in making India a US\$ 5 trillion economy and realizing the dream of Atmanirbhar Bharat. Currently, there are 2500+ active agri-startups in India. To deliberate on different aspects of the agri-startup ecosystem and create an enabling environment, the National Academy of Agricultural Sciences (NAAS) organized a one-day brainstorming session on ‘Agri-startups in India: Opportunities, Challenges, and Way Forward’ on 5th November 2021. The following issues emerged from the deliberations:

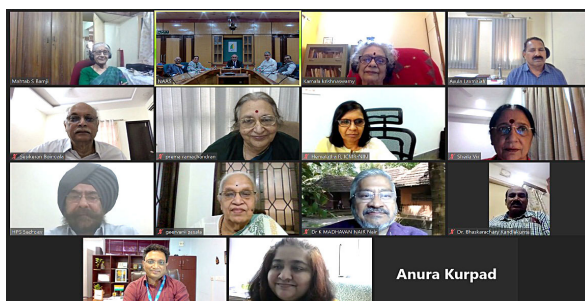


- Provisions should be made for agri-startups for testing and validation services to encourage early-stage entrepreneurs.
- Frequent academia-entrepreneur interactions should be organized to nudge the students and faculty towards startups and entrepreneurship.
- All agricultural universities should establish an Incubation Centre.

- Data related to geo-referenced land records, soil details, crop production, market transactions, etc., should be made available publicly.
- Evolve a national policy for facilitating the scaling of startups.
- Create a pool of mentors and investors with expertise to support Incubator Centres in mentoring the startups.

Roundtable Discussion on Limitations of the Global Hunger Index (Conveners: Dr Mahtab S. Bamji, Dr P.K. Joshi, Dr Rajender Parsad)

The Academy organized a roundtable discussion on the GHI with leaders and academicians in nutrition, medical science, statistics and economics on 8th November, 2021. The objective of the discussion was to (i) critically examine the GHI report and present views on whether it is an appropriate measure of hunger, and (ii) propose the way forward on the 'Hunger Index'. The key issues on limitations of the Global Hunger Index are listed below:



- The indicators used in computing the GHI do not represent 'hunger'. The FAO uses 'prevalence of undernourishment' to represent the extent of hunger. It states that "hunger" may also be referred to as undernourishment". Of the four indicators of the Global Hunger Index, only one of the indicators, 'undernourished population,' is included to represent hunger. The experts strongly discarded the nomenclature as Hunger Index to represent 'hunger'.
- The GHI has used four indicators to construct the index and ranking of the countries accordingly. The indicators used are (i) percent of the undernourished population, reflecting insufficient nutrition; (ii) the share of children <5 years, who have low weight for their height, reflecting acute undernourishment (wasting); (iii) the share of children below five years who have low height for their age (stunting), reflecting chronic undernourishment; and (iv) the mortality rate of children under five, partly reflecting the fatal mix of inadequate nutrition and unhealthy environments. The experts emphasized that while hunger leads to undernutrition, it is not the only reason for under five years of undernutrition or mortality.
- The three indicators used in GHI refer to children below five years, who constitute only one-sixth of India's population. The experts claimed that the index inadequately represents the country's entire population and the hunger. The group suggested that following the four indicators may be tried to begin with for constructing Hunger Index: (i) percent food insecure population; (ii) percent undernourished

population; (iii) dietary intake of major food commodities; and (iv) assessment of anxiety element.

There was a consensus that the GHI 2021 Report presents a highly biased estimate of hunger. The Government of India should not accept its ranking, and a new index should be developed following consensus on the definition of hunger and its indicators.

Strategy Workshop on ‘Waste to Wealth – Use of Food Industry Waste as Animal Feed and Beyond’ (Convener: Dr N.K.S. Gowda)

A strategy workshop on ‘Waste to Wealth – Use of Food Industry Waste as Animal Feed and Beyond’ was organized on 3rd December 2021 to explore opportunities to convert food waste into animal feed. The following recommendations emerged from the deliberations:



- Develop an authentic database on waste from various sectors.
- Provide incentives and tax benefits to the MSME units engaged in utilizing the waste to produce valuable products.
- Designate a single Ministry in the Government of India to plan and implement schemes to efficiently utilize the waste following a cluster approach.
- Efforts should be made to utilize the waste from the meat industry by promoting “composite feed” made from rendered meat, bone meal and agricultural waste.
- Promote silage technology to convert huge quantities of fruit residues.
- Establish hubs to ensure a regular supply of lactic acid bacterial culture to small units for profitable conversion of waste to wealth.
- Enhanced support of ICAR and CSIR Institutes to the startups engaged in utilizing the waste.
- Financial support to MSME for waste processing.

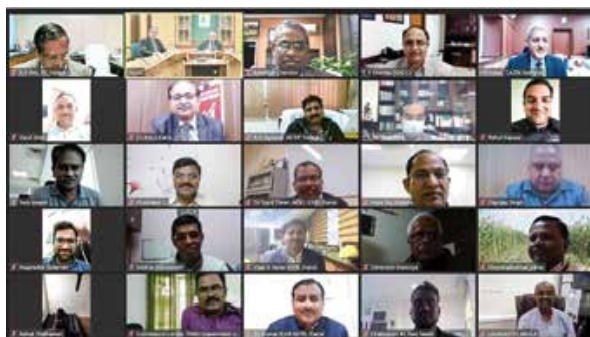
Brainstorming Session on ‘Road Map to Rehabilitate 26 Million ha Degraded Lands by 2030’ (Conveners: Dr Ch. Srinivasa Rao, Dr J.C. Katyal, Dr Anil K. Singh)

A brainstorming session for evolving a road map to rehabilitate degraded lands was organized on 9th December 2021. The following recommendations emerged from the deliberations:

- Develop a harmonized database on land degradation focusing on the magnitude of degradation, rate of degradation and restoration.
- Encourage inter-departmental collaborations and platforms with a group of secretaries for monitoring the degradation and implementation of various government schemes by the central and state governments.
- Identify critical zones for reducing water erosion, soil loss, carbon and nutrient loss, overgrazing, zooming and soil acidity.
- Encourage participation of communities and the private sector under corporate social responsibility in managing degraded lands.
- Evolve agri-food production systems and accompanying technologies suitable for degraded lands and their restoration.

Brainstorming Session on 'Agriculture and Entrepreneurship Models for Quality Fodder Production' (Convener: Dr Ajoy Kumar Roy, Co-conveners: Dr Amaresh Chandra, Dr D.R. Malaviya)

The Academy organized a brainstorming session on 'Entrepreneurship for Quality Fodder Production' on 17th December 2021 in the hybrid mode under the chairmanship of Dr T. Mohapatra, President, NAAS, to identify potential areas for developing enterprises for quality fodder production and marketing. The following issues emerged during the discussion:



- Non-availability of improved fodder seed and planting material (especially grasses) is a major constraint in meeting the demand for fodder.
- There is a need to implement government schemes for fodder/feed production effectively.
- A seed plan of feed and fodder may be developed for the next 5-10 years.
- The potential of hydroponics in fodder production should be assessed.
- The potential of organic fodder for the production of organic dairy milk needs to be explored for the domestic and export markets.
- Decomposing packaging material needs to be developed to avoid environmental degradation.

Stakeholders Consultation on 'Draft Regulation for Genetically Modified (GM) Food and Feed Imports and Detection of Unauthorized GM Food Events' (Convener: Prof K. C. Bansal, Co-convener: Dr Gurinderjit Randhawa)

A Stakeholders Consultation on 'Draft Regulation for Genetically Modified (GM) Food and Feed Imports and Detection of Unauthorized GM Food Events' was organized by the Academy on 10 January 2022 in the hybrid mode under the Chairmanship of Dr Trilochan Mohapatra with Dr Swapan K. Datta, former DDG (CS), ICAR as Co-chair. Key recommendations that emerged were submitted to the FSSAI and are summarized below:



- Food safety aspects of all Genetically Modified Organisms (GMO) or Genetically Engineered Organisms (GEO), whether produced locally or imported, are to be dealt with by FSSAI.
- The term 'Genetic Engineering' may be substituted by 'Modern Biotechnology' and defined as per the guidelines of the Codex Alimentarius Commission.
- The term 'Genome Editing' needs to be clarified in the definition of Genetic Engineering itself, and the genome-edited products may be exempted. Genome edited crop products of SDN1 and SDN2 categories cannot be detected, remain indistinguishable from a conventionally bred product, and contain no foreign DNA.
- Concerning the laboratory for Genetically Modified Foods testing, it was suggested that the existing accredited GMO laboratory infrastructure for detection, identification and quantification at ICAR/ICMR/CSIR/SAUs be upgraded by MOEF&CC under the Global Environment Facility (GEF) project.
- Genetically Modified Organisms or Genetically Engineered Organisms or Living Modified Organisms shall not be used as an ingredient in any infant food, needs to be either deleted or revised.
- All food products having individual Genetically Modified or Engineered (GE) ingredients 2% or more should be labelled as '*Contains GMO*'.
- Concerning the detection of unauthorized GM food events, it was suggested that Apex Central Reference laboratory, Satellite Referral Laboratories, and a knowledge bank to provide relevant information to the stakeholders might be established.

Strategic Consultation on ‘Preparedness for Prevention of Transboundary Infectious Diseases of Livestock and Poultry in South Asian Countries’ (Conveners: Dr U. S. Singh and Dr H. Rahman)

A Strategic Consultation on ‘Preparedness for Prevention of Transboundary Infectious Diseases of Livestock and Poultry in South Asian Countries’ was organized on 15 February 2022 by the NAAS jointly with the International Livestock Research Institute (ILRI), the South Asian Association for Regional Cooperation (SAARC) and the Bangladesh Academy of Agriculture (BAAG).

1. On “Challenges and priorities of Transboundary Animal Diseases (TAD) in South Asia countries”
 - Each country may list out major challenges (laboratory, diagnostic, vaccine, manpower) and pass on to ILRI who will arrange yet another brainstorming on linking the strength of one country to the weakness of the other within and outside the region through capacity building, training as well as possible resource exploration.
 - Each country may prioritize three TAD initially considering their disease severity, zoonotic threat and trading to other countries to develop a consensus among the member countries on addressing the priority diseases using both managerial and frontier science.
 - Impress upon SAARC to create a special cell/ unit on TAD.
 - Develop animal disease screening facilities at the major animal transportation route with appropriate diagnostic kits and trained manpower.
2. On “Strategies to strengthen regional collaboration and funding for preparedness of TAD in the region”
 - One TAD coordination Center for South Asian Countries, preferably with ILRI, may be established for better preparedness against TAD.
 - A regional programme on TAD, in the line of ‘One Health’, may be framed in consultation with WHO, OIE, FAO, UNEP and SAARC to complement and supplement the effort of each member country in controlling TAD.
 - The Chief of Animal Husbandry department/ research institution of each SA country may impress upon the respective government to earmark a dedicated fund for managing and controlling TAD. Philanthropic organizations like Bill & Melinda Gates may also be approached for the cause.
 - The effort to contain TAD in the region may be continued through half yearly meeting/ workshop/ brainstorming session using virtual, and at times offline mode, to take stock of the problem and means to counter them.

- SAARC/ ILRI may devise collaborative programme on TAD surveillance, early warning system, tracking animal movement and vaccine synchronization.
- Animal traders should be considered as partner in TADs control through advocacy and confidence building measures.

Brainstorming Session on 'Food Fortification Issues and Way Forward' (Convener: Dr K. Madhavan Nair)

A brainstorming session on 'Food Fortification Issues and Way Forward' was organized on 11 March 2022 under the Chairmanship of Dr Ramesh Chand, Member, NITI Aayog, to deliberate upon the issues emerging from the new recommendations on nutrient requirements and dietary allowances by the ICMR-NIN, 2020; a nationwide study on the status of micronutrients (anemia, iron, vitamin A and D, folic acid and vitamin B12, and iodine) among children aged between 1-19 and adolescents (CNNS 2019); and urban diet and nutrient survey (NNMB 2017).

The following recommendations emerged:

- Dietary diversification is a sustainable strategy to address the problem of malnutrition, including micronutrient deficiencies, holistically.
- Deal with the fortification of each micronutrient separately and contextually (vitamin A for poor children, vitamin D for School Lunch Initiative (SLI)).
- Fortification needs to be discouraged if there is an ongoing universal supplementation programme of specific nutrients (i.e., iron and anemia mukt Bharat).
- Restrict the fortification of one vehicle rather than a layering of multiple vehicles as this may pose a safety issue, particularly concerning iron and vitamin A.
- Close monitoring for addressing risk and benefit in the context of evidence for a rise in biomarkers of iron and NCD is needed.
- Short and long term monitoring mechanisms of food fortification on health and toxicity need to be established.
- There is a need for contemporary and representative data on dietary intakes and functional/biochemical deficiency prevalence across all age groups.

Experts' Meet on 'Self-sufficiency in Edible Oil Production' (Convener: Dr Sanjeev Gupta)

India faces a substantial supply deficit in edible oils. Over 55% of the country's edible oil demand is met through imports. A rationalised and comprehensive approach is needed

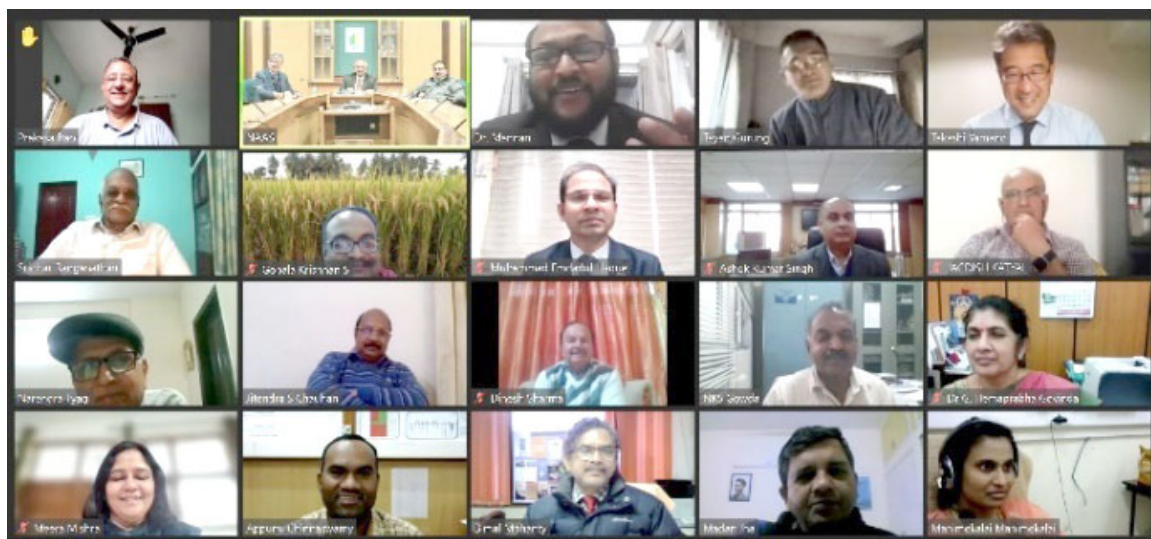
to reduce import dependence and increase domestic production. The NAAS, therefore, organized an Experts' Meet on 28 March 2022 under the Chairmanship of Dr Trilochan Mohapatra, President, NAAS. Dr Mangala Rai, former President, NAAS was the Co-chair. The following recommendations emerged from the consultation:

- Considering India's high per capita consumption of edible oils, an aggressive campaign needs to be launched on media platforms to reduce their consumption. Efforts are also required to restrict their use for industrial purposes.
- Use advanced breeding tools (fast track breeding, genomic selections, gene silencing, genome editing, etc.) to increase productivity and quality parameters in oilseeds.
- The decision to release indigenously developed GM oilseed crops may be hastened.
- Secondary sources of edible oil (i.e., cottonseed, rice bran and TBOs) need mainstreaming in the edible oil sector. Innovations in refining, bleaching and deodorisation will contribute to achieving self-sufficiency in edible oils.
- Create an 'Oilseed Development Fund', imposing a 0.5% cess on imports, and the funds can be utilized for R&D projects and incentivizing farmers.
- Raise import duty on edible oils to encourage domestic production.
- There is a huge yield gap in oilseed crops, about 60%, which needs to be bridged through micro-nutrient applications, life-saving irrigations, and customized fertilizers.
- Ensure the availability of quality seeds to farmers by establishing more seed hubs, seed villages, and seed banks.
- Identify potential areas for each oil crop to utilise the resources efficiently.
- Extend subsidies and incentives to all machines and equipment.
- Explore export avenues for sesame, groundnut and castor oils.
- Promote value chains under 'Make in India', inviting cooperatives and corporates to create production and processing hubs.
- Government agencies procure only 5% of the oilseed production. A separate procurement agency needs to be established for the effective implementation of MSP and to encourage farmers to take up more oilseed crops.

Special Programmes

Webinar on Transforming Agriculture in Asia

The Academy organized a special webinar on “Transforming Agriculture in Asia” by Dr Takashi Yamano, Principal Economist, Asian Development Bank (ADB), Manila on December 20, 2021. The webinar was based on the report prepared by the ADB to show how agriculture has minimized the impact of Covid-19. He expressed that the growth trajectories of Asia’s developing economies are heading in different directions. Stronger growth rates are expected in economies coping well with the COVID-19 pandemic, as they can take advantage of the strengthening recovery in global demand. But those who are struggling with the pandemic cannot and are falling behind. India is performing very well compared to several economies in Asia. He elaborated on the challenges faced by



Asian agriculture, which include changing (i) food demand patterns, (ii) demography, (iii) climate risk, and (iv) fragile environment. Dr Yamano said that the Asian economies are becoming more affluent and more urbanized; therefore, the demand pattern is shifting toward more resource-intensive animal products. He proposed the following measures to strengthen the agriculture sector (i) shift from subsidies to a direct support system, (ii) promote resource-conservation technologies, (iii) modernize agriculture laws and regulations, (iv) invest in climate-resilient infrastructure, (5) support to market-oriented development, and (6) invest in agricultural R&D to meet the future challenges.

National Science Day

The Academy celebrated National Science Day on February 28, 2022, with an online lecture by Prof.R. Ramakumar from the Tata Institute of Social Sciences, Mumbai. The

lecture was chaired by Dr T. Mohapatra, President, NAAS, Secretary, DARE & DG, ICAR, and co-chaired by Dr A.K. Singh, Vice President, NAAS.

The application of modern science in agricultural production has been the major hallmark in transforming India from a ship-to-mouth existence to food self-sufficiency. This changed the position of India on the global map in terms of food security and sovereignty, as well as in terms of the capacity for creating new knowledge and technology and utilizing them for production. Prof Ramakumar emphasised the importance of modern science and technology in shaping the development of agriculture and stressed the need for increased investment in quality public research. He discussed in detail the strong linkage between public investment in agricultural research focused on productivity enhancement and the reduction in rural poverty. India spends less on agricultural research as a share of the agricultural gross domestic product than many developing countries. Prof Ramakumar warned of the implications of relying on private sector agricultural research, which develops technologies primarily suited to commercial and capital-intensive cultivation.

International Women's Day

The Academy celebrated International Women's Day on March 8, 2022, organizing an online panel discussion on 'R&D Innovations for Sustainable Agriculture in India'. The programme was chaired by Dr T Mohapatra, President, NAAS, Secretary, DARE & DG, ICAR, and co-chaired by Dr KM Bujarbaruah, Vice President, NAAS. In his opening remarks, Dr T Mohapatra highlighted the challenges women face in today's world and emphasized gender equality.

Dr Parveen Chhuneja, Director, School of Biotechnology, PAU, Ludhiana, highlighted the importance of molecular marker technology along with the role of disease resistance genes. Dr P.D. Kamala Jayanthi, ICAR National Fellow, Indian Institute of Horticultural Research, Bangalore, stated that the changing climatic conditions and extensive monocropping have adversely influenced the ecology and biology of insect pests leading to a considerable shift in their pest status across several crops. She highlighted the intensive global efforts to identify green chemicals that can support integrated pest management with minimal disturbance to agri-ecosystems. Dr Parameswari Balasubramaniam, ICAR-NBPGR, Hyderabad, emphasized biotechnology-based innovations to update the current disease management strategies. Dr Ch. Jyotiprava Dash, ICAR-IISWC, Koraput, Odisha, briefed about the issues in hydrology, scientific validation and refinement of indigenous technologies, solar-operated micro-irrigation and ecosystem-based land use planning for judicious management of natural resources. Dr Monika Saini, Scientist -I, AIIMS, New Delhi, spoke about women's crucial and unique contribution to the Indian livestock sector. Dr Reshma Gills, Scientist, ICAR-CMFRI, Kochi, focused on the constraints also the role of social scientists in the mass adoption of various technologies. She stressed the need for teaming up with social scientists to develop farmer-friendly technologies.

REGIONAL CHAPTERS

Regional Chapters organized following events addressing agriculture, food and nutritional issues of national and regional importance.

Event	Date
Barapani Chapter	
A lecture on 'Vision for Agricultural Education and Research in India in 21st Century with Special Reference to NEP 2020 and Agricultural Education' in collaboration with the International Union of Organic Agriculture and College of Agriculture (CAU-I), Kyrdemkulai, Meghalaya	September 20, 2021
A lecture on 'Aatma Nirbhar Bharat with Integrated Natural Resources Management and Education Perspective' by Dr P.K. Ghosh, Director and Vice-Chancellor, ICAR-National Institute of Biotic Stress Management, Raipur	October 28, 2021
An International conference jointly with the International Union of Organic Agriculture, Shillong and College of Agriculture (CAU-I), Kyrdemkulai on 'Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario' at College of Agriculture (CAU-I), Kyrdemkulai, Meghalaya.	December 7-9, 2021
Bengaluru Chapter	
A lecture on 'Potential of Stem Cell Technologies for AgTech Outcomes' by Professor Paul J. Verma, Professor at the SARDI, an Affiliate Professor at the University of Adelaide, and an Adjunct Professor at the Monash University, Australia	September 03, 2021
A lecture on 'Can Genome Editing Contribute to Livestock Agriculture?'	October 07, 2021
A lecture on 'Career Opportunities in Agriculture and Allied Sciences' at St Francis School	December 20, 2021
Bhopal Chapter	
Webinar on 'Nanotechnology in Agriculture: Opportunities and Challenges' in collaboration with the ICAR-Indian Institute of Soil Science, Bhopal.	June 21, 2021
Celebrated the Soil Health Awareness Week in collaboration with the Indian Institute of Soil Science (IISS), Bhopal.	December 01-07, 2021
Celebrated Agricultural Education Day.	December 03, 2021

Coimbatore Chapter	
A scientific session on 'Advances in the Management of Sugarcane Pests and Diseases' during the International Conference on Sugarcane Research (CaneCon 2021) was jointly organized by ICAR-SBI Coimbatore and the Society for Sugarcane Research and Development, Coimbatore.	June 19-22, 2021
A lecture on 'Entrepreneurship Opportunities in Nutricereals' by Dr S. Balasubramanian, Head, ICAR-Central Institute for Agricultural Engineering Regional Centre, Coimbatore.	August 26, 2021
A webinar on 'Economizing Water Signature in Agriculture' in a hybrid mode'.	August 31, 2021
A webinar on 'Sugarcane-based Entrepreneurship Development' in collaboration with ICAR-SBI, Coimbatore.	September 09, 2021
On the occasion of World Food Day, a lecture was organized on 'Safe Food Now for a Healthy Tomorrow.'	October 16, 2021
A webinar was organized on 'Enzymes for 2nd Generation Ethanol: Addressing the Challenges'	
An awareness campaign for the school children on the 'Agriculture and Environment: the Citizen Face' at Premier Vidya Vikaash Higher Secondary School, Coimbatore.	November 25, 2021
On the occasion of World Soil Day, a lecture was organized on 'Yogic Kheti for Soil Health Improvement'.	December 05, 2021
A lecture on 'Recent Developments in Nanotechnological Applications in Agriculture' was organized.	
On the occasion of "World Pulses Day" a lecture on 'Pulses to empower youth in achieving sustainable agricultural food system' was organized.	February 10, 2022
On the occasion of "National Science Day" a lecture on 'How to deliver technologies' was organized.	February 28, 2022
Cuttack Chapter	
A field visit-cum-awareness programme on 'Climate Smart Rice Farming' in collaboration with ICAR-National Rice Research Institute was organized at Badakusunpur, Tangi-Choudwar block, Cuttack.	February 17, 2022
Hyderabad Chapter	
Organized two sensitization programmes for the students at Vignan University, Guntur, A. P. and Horticulture University, Telangana	June 05 2021 and June 14, 2021

A National Summit on 'Building Organized Sheep and Goat Meat Sector in India towards Ensuring Atmanirbhar Bharat' in association with ICAR-NRC on Meat, ICAR-NAARM and Indian Meat Science Association at ICAR-NAARM, Hyderabad.	September 03, 2021
A training programme on 'Entrepreneurial Skill Development for Agricultural Graduates' jointly with ICAR-NAARM.	September 20-22, 2021
Organized a two-day national entrepreneurship ideation competition, 'Aggnite'.	September 24-25, 2021
a training programme on 'Entrepreneurial Skill Development for Agricultural Graduates' for the students of Agricultural College, Naira (ANGRAU).	September 29 - October 01, 2021
A six-day training programme on 'Doubling Farmers Income with Integrated Farming Systems (IFS)' in association with ICAR-NAARM was organized at Krishi Vigyan Kendra, Palem, Nagarkurnool.	4-6th and 10-12th January 2022.
A ten-day Skill Development Training Programme on 'Eco-Friendly Bag making' under SCSP for SC women in association with ICAR-NAARM and Krishi Vigyan Kendra (KVK), Yagantipalle was organized at KVK, Yagantipalle.	February 07-18, 2022
'National Science Day' on the theme 'Integrated Approach in Science and Technology for a Sustainable Future' was organized in association with ICAR-NAARM and Samskuthi Foundation, Hyderabad	February 28, 2022
A five-day training programme on 'Enhancing Livelihood of Women Farmers through Jute Bag Making' was organized in association with ICAR-NAARM and Krishi Vigyan Kendra (KVK), Ghantasala, Krishna District, Andhra Pradesh.	March 01, 2022
An interactive programme for students of 9th and 10th classes from the Zilla Parishad High School and Kodakandla Model School from Jangaon district of Telangana was organized in association with Madhumitha Foundation, Suryapet, Telangana, at ICAR-NAARM, Hyderabad.	March 10, 2022
Karnal Chapter	
A webinar on 'Response to COVID-19 Crisis for Improving Animal and Human Health among Rural Households'	April 24, 2021
A webinar on 'Revisiting the MSP - Remunerative Pricing for Crops and Livestock Products in Haryana and Rajasthan'	May 22, 2021

Kolkata Chapter	
A webinar on 'Feeding Smart, Right from Start' for the students of Kalyani Experimental High School, Kalyani.	September 07, 2021
Lucknow Chapter	
A directory of Fellows and Associates of the Lucknow Chapter was printed.	
Ludhiana Chapter	
Seven awareness programmes for school students through the Krishi Vigyan Kendras (KVKs).	April to June 2021
A one-day awareness programme for the students of Government Senior Secondary School at Kalyan, on 'Judicious Use of Water'.	August 25, 2021
<p>Awareness programmes during National Nutrition Week at Krishi Vigyan Kendras at seven locations, in collaboration with Punjab Agricultural University.</p> <ul style="list-style-type: none"> • September 06 2021, Ropar • September 07, 2021, Bathinda • September 09 & 16, 2021, Faridkot • September 01, 2021, Patiala • September 07, 2021, Bahawal (Hoshiarpur) • 13 July, 7 September and 15 September 2021, Mansa • September 30, 2021, Bathinda 	September 06-30, 2021
An online lecture on 'Nutrition: The way to Go?' in collaboration with the Punjab Agricultural University (PAU), Ludhiana.	September 24, 2021
The Punjab Agricultural University's Krishi Vigyan Kendras, Gurdaspur, Moga, Bathinda and Rauni (Patiala) organized one-day awareness programmes on "Crop Residue Management" in collaboration with Ludhiana Chapter.	From October to November 2021
Pune Chapter	
A panel discussion on 'Organic Farming in Maharashtra: Challenges and Opportunities' in collaboration with ICAR-NRC for Grapes, Pune.	September 08, 2021
A panel discussion on 'Climate Resilient Fisheries and Aquaculture' in collaboration with ICAR-Central Institute of Fisheries Education, Mumbai was organized.	March 07, 2022

Varanasi Chapter	
ICAR Research Complex for Eastern Region, Patna, in association with NAAS Varanasi Chapter, organized a national e-workshop & stakeholders' meeting on 'Medicinal Plants in Eastern India: Prospects and Constraints'.	August 06, 2021
An awareness programme on 'Importance of Nutrition and Healthy Eating' for the girl students of the Government Girls Intermediate College (GGIC), Jakhini, Varanasi.	September 17, 2021
An awareness campaign on 'Career Opportunities in Higher Agriculture Education' for the graduate students of agriculture sciences of Ram Suresh Singh Degree College (Kashi Vidhyapeeth), Chunar, Varanasi.	December 21, 2021

Highlights of the Activities of the Regional Chapters

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

Barapani Chapter

The Chapter organised a lecture by Dr S. Ayyappan, Chancellor, CAU, Imphal, on 'Vision for Agricultural Education and Research in India in 21st Century with Special Reference to NEP 2020 and Agricultural Education' on September 20, 2021, focusing on new aspects of agricultural education, research and innovation.

It also organised a lecture as a part of the nation's "Azadi Ka Amrit Mohatsav", on Aatma Nirbhar Bharat with Integrated Natural Resources Management and Education Perspective was delivered by Dr P.K. Ghosh, Director and Vice-Chancellor, ICAR-National Institute of Biotic Stress Management, Raipur on 28th October 2021, who emphasized the sustainable management of natural resources for agricultural growth and improved food security.

The Chapter jointly organized with the International Union of Organic Agriculture, Shillong and College of Agriculture (CAU-I), Kyrdemkulai an International conference on 'Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario' from 7-9 December 2021 in hybrid. The conference was attended by 90 participants, while more than 100 joined virtually from India and abroad. Dr Trilochan Mohapatra, President, NAAS, delivered the Inaugural address emphasizing the need for climate-resilient agro-techniques for the sustainable

development of farming communities during the 21st century. Several guests of honour graced the occasion and addressed the participants.

There were ten technical sessions during the conference, which began with a plenary lecture by Dr Ermias Kebreab, Associate Dean and Director, World Food Center, University of California, Davis, USA, on 'Livestock Methane Emissions - An Opportunity to Slow Global Warming', which was chaired by Dr M. Premjit Singh, former Vice-Chancellor of CAU. The conference concluded with a valedictory programme on 9 December 2021, which was graced by Sh Banteidor Lyngdoh, Minister for Agriculture and Horticulture, Meghalaya, as the Chief Guest and Mrs N. Guite, General Manager, NABARD, Meghalaya as the Guest of Honor.

Bengaluru Chapter

The Chapter organized a lecture on 'Potential of Stem Cell Technologies for AgTech Outcomes' on September 3, 2021, by Professor Paul J. Verma, Professor at SARDI, an Affiliate Professor at the University of Adelaide, and an Adjunct Professor at Monash University Australia. He focused on the generation of embryonic stem cells and induced pluripotent stem cells in cattle, sheep, horses and feline. He discussed different strategies and success rates and the application of these cell types in animal and agricultural technologies. He emphasized the need for future research on stem cell biology in large animals and other animal reproductive technologies, including JIVET, SCNT, and genome editing.

It also organised a lecture on October 7, 2021, on 'Can Genome Editing Contribute to Livestock Agriculture?' by Prof. Bruce Whitelaw, Interim Director, The Roslin Institute, and Professor of Animal Biotechnology, Royal (Dick) School of Veterinary Studies, University of Edinburgh. Dr Raghavendra Bhatta, Director, ICAR-NIANP and Convener, Bengaluru Chapter, delivered a lecture on 'Career Opportunities in Agriculture and Allied Sciences' at St Francis School, December 20, 2021.

Bhopal Chapter

The Chapter organized a National Webinar on 'Nanotechnology in Agriculture: Opportunities and Challenges' on 21 June 2021 in collaboration with the ICAR-Indian Institute of Soil Science. Dr Anil Kumar Singh, Vice-President of the NAAS, chaired the technical session. Dr J.C. Tarafdar, former Principal Scientist, ICAR-CAZRI, delivered a lecture on 'Promise of Nano-fertilizers in Agriculture' and highlighted the use of nano-products like biosynthesized nano-nutrients and nano induced polysaccharide powder in agriculture, and advocated integrated use of conventional and nano-fertilizers to minimize soil nutrient mining. Dr Satyakam Patnaik, Senior Scientist, CSIR-Indian Institute of Toxicology Research, Lucknow, presented studies on 'Toxicity of Nanomaterials on Soil and Plant Systems', and Dr Onkar Tiwari, Programme Officer, DBT, elaborated on 'Biosafety and Policy Framework for Nanomaterials in Agriculture'.

It also collaborated with the Indian Institute of Soil Science (IISS), Bhopal and celebrated the Soil Health Awareness Week during December 01-07, 2021 at the Institute as well as in several villages of Bhopal district. Dr A.K. Patra, Director, IISS and Convener emphasized the role of soil for the survival of the human being and requested to create awareness amongst villagers to protect this precious natural resource for the next generation. On this occasion, a farmer-scientist interaction meet was organised at village Khamkheda, Bhopal district, in which Soil Health Cards were distributed to farmers.

An Agricultural Education Day was celebrated on December 03, 2021, where more than 100 college students were taught about various aspects of soils, including soil salinization. A quiz competition on soil awareness was also organized. Farmer-Scientist Interaction meet and Field Days were organized on December 01 and 02 where more than 200 farmers under the scheme SCSP.

Coimbatore Chapter

The Chapter organized a scientific session on 'Advances in the Management of Sugarcane Pests and Diseases' during the International Conference on Sugarcane Research: (CaneCon 2021) on June 19-22, 2021 organized by ICAR-SBI and the Society for Sugarcane Research and Development, Coimbatore. Six lead papers, including four from foreign experts, were presented in which the global scenario of devastating diseases, continental shifts in diseases, and fungal disease spread, and the emergence of new disease epidemics due to host shifts were deliberated upon. Alternatives to synthetic insecticides, the use of biological agents and mass production technologies for beneficial insects for the management of sugarcane pests were also discussed.

The Chapter also organized the following events: (i) a lecture on 'Entrepreneurship Opportunities in Nutricereals' by Dr S. Balasubramanian, Head, ICAR-Central Institute for Agricultural Engineering Regional Centre, Coimbatore. Dr Balasubramanian highlighted the development of small machinery for the entrepreneurs to process millets and millet-based products for value addition to support tribal farmers; (ii) a webinar on 'Economizing Water Signature in Agriculture' on August 31, 2021, in hybrid mode. In his address, Dr G. Hemaprabha, highlighted the need for judicious use of water in view of increasing population and climate change, especially in Asia. The System of Rice Intensification (SRI) and Sustainable Sugarcane Initiative (SSI) have the potential to address the water scarcity; (iii) a webinar on 'Sugarcane-based Entrepreneurship Development' in collaboration with ICAR-SBI, Coimbatore, on September 9, 2021. Vipin Sarin, an entrepreneur and an incubatee of ABI, ICAR-SBI, elaborated that 1000 products can be prepared from sugarcane which have high potential as raw material for new and healthy products.

On the World Food Day occasion on October 16, a lecture on 'Safe Food Now for a Healthy Tomorrow' by Prof G. Hemalatha, Head, Food Science and Nutrition, Community Science

College and Research Institute, TNAU Madurai. Dr Hemalatha stressed the immediate need to prevent and manage foodborne risks for food security, human health and sustainable development.

A webinar on 'Enzymes for 2nd Generation Ethanol: Addressing the Challenges' was organized. Dr Rajeev K. Sukumaran, Senior Principal Scientist & Head, Microbial Processes and Technology Division, CSIR-National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram delivered the lecture highlighting Integrated Biorefinery processes of biomass conversion to ethanol and chemicals through the fermentative process using different agricultural feedstocks like rice and wheat straw and bagasse; applications of cellulases, beta glucosidases and other biomass hydrolyzing enzymes. He also deliberated on the production of biomass-degrading enzymes, development of bioprocesses for enzyme production and other microbial products, including process optimizations; regulation of cellulase gene expression in filamentous fungi; and challenges in the production of cellulases for biomass hydrolysis through targeted interventions.

An awareness campaign for the school children was organized on the theme, 'Agriculture and Environment: the Citizen Face' at Premier Vidyaa Vikaash Higher Secondary School on 25 November 2021. Dr G. Hemaprabha, in her address, highlighted the rising opportunities in the agricultural sector in India and abroad. Dr R. Viswanathan spoke on the academic avenues and opportunities in the agriculture sector.

On the World Soil Day occasion, a lecture was delivered by Kumari Rajeswari, Brahma Kumaris, Coimbatore on 'Yogic Kheti for Soil Health Improvement'.

The Chapter organized a lecture on 'Recent Developments in Nanotechnological Applications in Agriculture' by Dr K.S. Subramanian, Director of Research and NABARD Chair, Tamil Nadu Agricultural University, Coimbatore.

It also organized World Pulses Day on 10 February 2022. On the occasion, Dr Subbalakshmi Lokanadhan delivered a lecture on 'Pulses to empower youth in achieving sustainable agricultural food system'.

The Chapter celebrated National Science Day on February 28 2022 with a lecture on 'How to deliver technologies' by Dr K.A. Mohan, Biotechnologist and Chief Advisor, Rasi Seeds, Attur, Salem.

Cuttack Chapter

Cuttack Chapter organized a field visit-cum- awareness programme on 'Climate Smart Rice Farming' at Badakusunpur, Tangi-Choudwar block, Cuttack, in collaboration with ICAR-National Rice Research Institute on February 17, 2022.

Hyderabad Chapter

The Chapter organized the following events:

Two sensitization programmes for the students of Vignan University, Guntur, Andhra Pradesh, on June 5, 2021, and Horticulture University in Telangana on June 14, 2021. About 200 students participated in these programmes, which focused on opportunities in agriculture, value addition to agricultural commodities, water management, soil health innovations, micro-irrigation, water use efficiency, fertigation, crop residue conversion into green energy, farmer producer organization (FPOs), women self-help groups (SHGs), market linkages, artificial intelligence (AI) and machine learning.

A National Summit on 'Building Organized Sheep and Goat Meat Sector in India towards Ensuring Atmanirbhar Bharat' was organized in association with ICAR-NRC on Meat, ICAR-National Academy of Agricultural Research Management (NAARM) and Indian Meat Science Association at ICAR-NAARM, Hyderabad on September 3, 2021. Experts from across the country discussed various aspects of the sheep and goat meat sector, including breeding and reproduction policies to augment production, strategies for linking sheep and goat farmers to market and the role of the private sector and e-commerce in organizing the small ruminant sector. This was followed by a round-table discussion on selected themes.

A training programme on 'Entrepreneurial Skill Development for Agricultural Graduates' was organized jointly with ICAR-NAARM during 20-22 September 2021 for the students of Agricultural College, Bapatla (ANGRAU), Andhra Pradesh, and Agricultural College, Naira (ANGRAU) from September 29 to October 1, 2021.

A two-day national entrepreneurship ideation competition 'Aggnite' was organised jointly with Idea, a Technology Business Incubator (TBI) of ICAR-NAARM, during 24- 25 September 2021 to stimulate entrepreneurship among students. Sh Y. Krishna Rao, Chief General Manager, NABARD, Telangana, indicated that investment in Agri-Startups has a huge multiplier effect and can bring disruptive changes in the livelihood of farmers and rural communities.

The Chapter, organized a six-day training program in hybrid mode (in two phases) on 'Doubling Farmers Income with Integrated Farming Systems (IFS)' in association with ICAR-NAARM, at Krishi Vigyan Kendra, Palem, Nagarkurnool, involving 90 farmers of three villages viz., Vanguronipally, Kulmulonipally and Agraharam Potlapally from two districts of Mahbubnagar and Nagarkurnool of Telangana during 4-6th and 10-12th January 2022.

The Chapter organized a ten-day Skill Development Training Programme on 'Eco-Friendly Bag making' under SCSP for SC women in association with ICAR-NAARM and Krishi Vigyan Kendra (KVK), Yagantipalle from 7 to 18 February 2022 at KVK, Yagantipalle.

The Chapter organized 'National Science Day' on 28 February 2022 on this year's theme 'Integrated Approach in Science and Technology for a Sustainable Future' in association with ICAR-NARM and Samskuthi Foundation, Hyderabad.

The Chapter, in association with ICAR-NAARM and Krishi Vigyan Kendra (KVK), Ghantasala, Krishna District, Andhra Pradesh, organized a five-day training program on 'Enhancing Livelihood of Women Farmers through Jute Bag Making' under the SCSP program for farmers of four villages, viz., Kuchhikayalapudi, Ramanapudi, Ghantasala and Thadepalli on March 01, 2022.

As part of activities involving students, the Chapter, in association with Madhumitha Foundation, Suryapet, Telangana, organized an interactive program for students of 9th and 10th classes from the Zilla Parishad High School and Kodakandla Model School from Jangaon district of Telangana on 10 March 2022 at ICAR-NAARM, Hyderabad.

Karnal Chapter

The Chapter conducted a webinar on 'Response to COVID-19 Crisis for Improving Animal and Human Health among Rural Households' on April 24, 2021. Dr M. L. Madan, Convenor, NAAS Haryana Chapter & former DDG (Animal Science), ICAR, explained the genesis for organizing this webinar and elaborated on the theme. In his inaugural remarks, Dr T. Mohapatra, President, NAAS, discussed the impacts of COVID-19 on the farming community and the role of veterinarians and scientists in protecting the lives of rural people. He suggested that with emerging pandemics and 70% of the diseases being zoonotic, there is a need for genome sequencing of viruses and developing big data analytics and predictive modelling to face future challenges.

A webinar on 'Revisiting the MSP - Remunerative Pricing for Crops and Livestock Products in Haryana and Rajasthan' was organized on May 22, 2021, in a virtual mode. Dr J. S. Sandhu, Vice-Chancellor, SKN Agriculture University, Jobner (Jaipur), coordinated the proceedings. The webinar was attended by over 110 participants from the crop, animal and social science streams. Dr M.L. Madan, Convener explained the genesis of this webinar and highlighted major concerns in determining the remunerative prices of agricultural produce. Dr M.S. Chauhan, Director, ICAR-National Dairy Research Institute, Karnal, said that the MSP regime needs to be expanded to livestock products. Dr P.K. Joshi, Secretary, NAAS, delivered the inaugural address and detailed the measures to make agriculture profitable, particularly for smallholder farmers. He informed that a majority of the farmers remain deprived of the benefits of MSP; hence the need to revisit the MSP regime cannot be ignored. He said that MSP was introduced during the era of food- deficit to motivate the farmers to adopt high yielding varieties and protect farmers from price volatility. However, high-value agriculture, including horticulture, livestock and fisheries, together contribute 60% to the gross value of agricultural output and remains excluded from the MSP regime. The other lead presentations were made by Dr J.S. Sandhu, Vice-

Chancellor, SKN Agricultural University, Jobner; Dr O.P. Yadav, Director, ICAR-CAZRI, Jhodpur; Dr Sukhpal Singh, Professor, Department of Agricultural Economics, PAU, Ludhiana; Dr Suresh Pal, Director, ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi; Dr P.S. Birthal, ICAR-National Professor, ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi; Dr Anjani Kumar, Senior Research Fellow, International Food Policy Research Institute, New Delhi; Dr N. Kondaiah, Former Director, ICAR-National Research Center on Meat, Hyderabad; Dr Ranjay K. Singh, Principal Scientist, ICAR-CSSRI, Karnal; Dr B.S. Chandel, Principal Scientist, ICAR-National Dairy Research Institute, Karnal. Suggestions on the pricing of livestock produce were also given by Dr Suresh S. Honnappagol, former Animal Husbandry Commissioner, Government of India and Dr Ajay Kumar Gehlot, former Vice-Chancellor, Rajasthan University of Veterinary & Animal Sciences, Bikaner. Dr R.B Singh, Former President, NAAS, in his concluding remarks gave an exhaustive summation of the evolution of MSP as a support price and the need for new initiatives and policy structures for efficient and remunerative farming.

Kolkata Chapter

The Chapter organized a webinar to celebrate the National Nutrition Week on the theme 'Feeding Smart, Right from Start' on September 7, 2021, for the students of Kalyani Experimental High School, Kalayni. Prof Biswapati Mandal, Convener, Kolkata Chapter, introduced the theme. Prof Rintu Banerjee, Head, Department of Agricultural & Food Engineering, IIT, Kharagpur, was the Chief Guest. Prof Minati Sen, former Head, Department of Home Science, University of Calcutta, and Dr Minakshi Chakraborty, ICAR-KVK, Ramkrishna Mission Ashram, Nimpith highlighted different aspects of child nutrition and health.

Lucknow Chapter

The Chapter printed the directory of fellows and associates of NAAS and translated two policy papers viz, Policy Paper No. 92 - Tropical Wilt Race-4 Affecting Banana Cultivation, and (ii) Policy Paper No. 93 - Enhancing Science Culture in Agricultural Research Institutions.

Ludhiana Chapter

The Chapter conducted awareness programmes for school students through the Krishi Vigyan Kendras (KVKs) in seven districts from April to June 2021. The awareness programmes focused on smart practices and technologies for climate-resilient agriculture, judicious use of water, conservation of natural resources, nutritious summer beverages, and preservation of fruits and vegetables. It also organized a number of programmes for school children in association with PAU, Ludhiana: (i) One-day awareness programme on 'Judicious Use of Water' for the students of Government Senior Secondary School at Kalyan, on August 25, 2021; (ii) National Nutrition Week at seven locations during

September 6-16, 2021; (iii) A lecture on ‘Water Saving Techniques in Agriculture and at Domestic Level’ on September 30, 2021 for the school and college students and farm women; (iv) An online lecture on ‘Nutrition: The way to Go?’ on September 24, 2021, in association with the Punjab Agricultural University (PAU), Ludhiana. The lecture was delivered by Ms Ritu Sudhakar, Chief Dietitian, Dayanand Medical College & Hospital (DMC&H), Ludhiana.

The Chapter also organized a series of programmes on ‘Crop Residue Management’ to create awareness among school children about the adverse effects of residue burning and apprised them of the technological and agronomic practices for efficient management of crop residues. These programmes were jointly organized by the KVKs of the PAU.

Pune Chapter

The Chapter organized a panel discussion on ‘Organic Farming in Maharashtra: Challenges and Opportunities’ on September 8, 2021, collaborating with ICAR- NRC for Grapes, Pune. This programme was convened by Dr Himanshu Pathak, Convener, Pune Chapter and Director, ICAR-NIASM, Baramati, and Dr R.G. Somkuwar, Director, ICAR-NRCG. Dr S.N. Puri, former Vice-Chancellor of CAU, Manipur, chaired this event. Dr P.K. Joshi, Secretary, NAAS, offered introductory remarks highlighting several issues with organic farming and providing valuable suggestions. The panellists deliberated on the feasibility of organic farming in Maharashtra, focusing on organic farming and its practical aspects in crop science, horticulture, livestock, fisheries and commercial agriculture. The discussions also included the policy recommendation for organic farming.

The Chapter organized a panel discussion on ‘Climate Resilient Fisheries and Aquaculture’ on 7 March 2022 in collaboration with ICAR-Central Institute of Fisheries Education, Mumbai. The panellists deliberated on the impacts of climate change on fisheries and aquaculture and the management strategies for adaptation and mitigation. The discussion also included the policy recommendation for the resilient climate fisheries in Maharashtra.

Varanasi Chapter

The Chapter in association with ICAR Research Complex for Eastern Region, Patna, organized a national e-workshop & stakeholders’ meet on ‘Medicinal Plants in Eastern India: Prospects and Constraints’ on August 6, 2021. Dr Vikramaditya Pandey, ADG (HS), ICAR, in his address, highlighted issues like creating databases on indigenous medicinal plants, and herbal products. Dr Ujjwal Kumar, Director, ICAR-RCER, Patna highlighted the huge demand for medicinal plants during the Covid-19 pandemic and presented the present production status and domestic demand, market linkages, extraction, and processing. Dr Asis Majumdar, Professor, Jadavpur University, Dr Yamini Bhushan Tripathi, Professor, BHU, Dr P. L. Saran, Principal Scientist, DMAPR, Dr B.B. Basak, Scientist, DMAPR, Dr Sumit Chakraborty, Professor, UBKV, Dr Kaushal Kumar, BAU, Ranchi and Dr S Swain, OUAT, Bhubaneswar made insightful presentations on medicinal plants.

An awareness programme on the importance of nutrition and healthy eating was organized on September 17, 2021, at ICAR-IIVR, Varanasi for the students of the Government Girls Intermediate College (GGIC), Jakhini, Varanasi. On the occasion of National Nutrition week, 15 students of GGIC visited the ICAR-IIVR nutri-garden and technology park. Dr Sudhakar Pandey, Convener, NAAS-Varanasi Chapter, briefed about the National Nutrition Week and the theme of 2021 is 'Feeding Smart Right from Start'.

Jointly with ICAR-IIVR, it also organized an awareness campaign on 'Career Opportunities in Higher Agriculture Education' for the graduate students of agriculture sciences of Ram Suresh Singh Degree College (Kashi Vidhyapeeth), Chunar, Varanasi on 21st December 2021. They were apprised of the importance of vegetables for nutritional security, organic farming, waste management and protected cultivation and informed about the career opportunities in agriculture and allied sciences.

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 the agricultural education system for meeting the current and future challenges, and (iii) administrative and governance reforms.

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 of different activities. As on March 31, 2022, 35 Institutional Members have been inducted.

RECOGNISING EXCELLENCE (2022)

New Fellowship

Section I: Crop Sciences

Dr Naveen Chandra Bisht

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

Dr (Ms.) Parveen Chhuneja

Director, School of Agricultural Biotechnology, PAU, Ludhiana

Dr Jitendra Kumar

Principal Scientist, ICAR-Indian Institute of Pulses Research, Kanpur

Dr Sujay Rakshit

Director, ICAR-Indian Institute of Maize Research, Ludhiana

Dr Natesan Senthil

Professor, Deptt. of Plant Molecular Biology & Bioinformatics, CPMB&B, TNAU, Coimbatore

Dr Rajbir Yadav

Principal Scientist and Head (Acting), Division of Genetics, ICAR-Indian Agricultural Research Institute, New Delhi

Section II: Horticultural Sciences

Dr Anil Kumar Dubey

Principal Scientist, Division of Fruits and Horticultural Technology, ICAR-Indian Agricultural Research Institute, New Delhi

Dr (Ms) Charanjit Kaur

Principal Scientist, Division of Food Science and Post-Harvest Technology, ICAR-Indian Agricultural Research Institute, New Delhi

Dr Jagdish Singh

Principal Scientist & Head, Division of Vegetable Production, ICAR-Indian Institute of Vegetable Research, Varanasi

Section III: Animal Sciences

Dr Triveni Dutt

Director, ICAR-Indian Veterinary Research Institute, Izatnagar

Dr Mukesh Kumar Gupta

Professor, Department of Biotechnology and Medical Engineering, National Institute of Technology Rourkela, Rourkela

Dr Arumugam Kumaresan

Principal Scientist, Southern Regional Station of ICAR-NDRI, Adugodi, Bengaluru

Dr (Ms) Pragya Dhruv Yadav

Scientist 'F' and Group Leader, Maximum Containment Laboratory, Indian Council of Medical Research-National Institute of Virology, Pune

Section IV: Fisheries Sciences

Prof Geevaretnam Jeyasekaran

Former Director of Research, TNJFU, Thoothukudi

Dr Balasubramanian Senthilkumaran

Professor, Department of Animal Biology, School of Life Sciences, University of Hyderabad, Hyderabad

Section V: Natural Resource Management Sciences

Dr Om Parkash Choudhary

Principal Soil Chemist & Head, Department of Soil Sciences, Punjab Agricultural University, Ludhiana

Dr Dendi Damodar Reddy

Director, ICAR-Central Tobacco Research Institute, Rajahmundry

Dr Janki Sharan Mishra

Director, ICAR-Directorate of Weed Research, Jabalpur

Dr Santhosh Ranjan Mohanty

Principal Scientist & I/C Network Coordinator, ICAR AINP on Soil Biodiversity Biofertilizers, ICAR-Indian Institute of Soil Science (IISS), Bhopal

Dr Rajbir Singh

Director, ICAR-Agricultural Technology Application Research Institute (ICAR-ATARI), Ludhiana

Section VI: Plant Protection Sciences**Dr Sunil Chandra Dubey**

ADG (PP&B), Indian Council of Agricultural Research, New Delhi

Dr Bikash Mandal

Principal Scientist, Advanced Center for Plant Virology, Division of Plant Pathology, ICAR-Indian Agricultural Research Institute, New Delhi

Prof Ram Singh

Former Professor, CCS HAU, Hisar

Dr Thiruvengadam Venkatesan

Principal Scientist & Head, Division of Genomic Resources, ICAR-National Bureau of Agricultural Insect Resources, Bengaluru

Section VII: Agricultural Engineering & Technology**Dr Pitam Chandra**

Former Director, ICAR-CIAE, Bhopal

Dr Vemuri Muthayya Chowdary

Director, MNCFC, DA&FW, Ministry of Agriculture & Farmers Welfare, New Delhi

Section VIII: Social Sciences**Dr Jagdish Prasad Sharma**

Vice-Chancellor, SKUAST-Jammu

Dr (Ms) Smita Sirohi

Counsellor (RG)/Adviser (Agriculture & Marine Products), Embassy of India to Belgium, Luxembourg and the EU, Brussels, Belgium

Dr Bhupendra Veer Singh Sisodia

Ex-Professor & Head, NDUAT, Faizabad

Foreign Fellows**Dr Beat Keller**

Professor, Department of Plant and Microbial Biology, University of Zurich, Zollikerstrasse 107, 8008 Zurich, Switzerland

Dr Rod A. Wing

Director, Center for Desert Agriculture, KAUST, Thuwal, Kingdom of Saudi Arabia

Pravasi Fellows**Prof Neena Mitter**

Director, Centre for Horticultural Science & Director, Australian Research Council Hub on Sustainable Crop Protection, Queensland Alliance for Agriculture and Food Innovation, Queensland BioScience Precinct, The University of Queensland, Australia

Dr Prasanta Kumar Kalita

Professor & Presidential Fellow, University of Illinois, Urbana, Illinois, USA

Dr Ashok Kumar Mishra

Kemper and Ethel Marley Foundation
Chair –Morrison School of Agribusiness,
W.P. Carey School of Business, Arizona
State University, Mesa, USA

Associateship**Section I: Crop Sciences****Dr Prolay Kumar Bhowmick**

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

Dr Vignesh Muthusamy

Scientist (Senior Scale), Lab No. 102, Maize
Genetics Unit, Division of Genetics,
ICAR-Indian Agricultural Research
Institute, New Delhi

Section II: Horticultural Sciences**Dr Sudip Kumar Dutta**

Scientist (SS), Sikkim Centre, Tadong,
Gangtok, Sikkim

Section III: Animal Sciences**Dr Arun Kumar De**

Scientist (SS), Animal Science Division,
ICAR-Central Island Agricultural Research
Institute, Andaman and Nicobar Islands

Section IV: Fisheries Sciences**Dr Kundan Kumar**

Senior Scientist, ICAR-Central Institute of
Fisheries Education, Mumbai, Maharashtra

Section V: Natural Resource Management Sciences**Dr Rahul Tripathi**

Senior Scientist, Crop Production Division,
ICAR-National Rice Research Institute,
Cuttack, Odisha

Dr Rakesh Kumar

Scientist (Senior Scale), ICAR Parisar, PO
Bihar Veterinary College Campus, Patna,
Bihar

Section VI: Plant Protection Sciences**Dr Tushar Kanti Dutta**

Scientist (Senior Scale), 323, Division of
Nematology, ICAR-Indian Agricultural
Research Institute, New Delhi

Dr Babasaheb B. Fand

Scientist, Division of Crop Protection,
ICAR-Central Institute for Cotton Research,
Nagpur, Maharashtra

Section VII: Agricultural Engineering & Technology**Dr Ravi Pandiselvam**

Scientist, Physiology, Biochemistry and
Post Harvest Technology Division, ICAR-
CPCRI, Kasaragod, Kerala

Section VIII: Social Sciences**Dr Prabina Kumar Meher**

Scientist (Senior Scale), Division of Statistical
Genetics, ICAR-Indian Agricultural
Statistics Research Institute, New Delhi

Young Scientists Awards for 2021

Name of the Award	Name of the Awardee
Plant Improvement	Dr Vignesh Muthusamy
Plant Protection	Dr Pramod Kumar Sahu
Soil, Water and Environmental Sciences	Dr Shaon Kumar Das
Animal Sciences	Dr Jess Vergis
Agricultural Engineering and Technology	Dr Kothakota Anjineyulu
Social Sciences	Dr Reshma Gills

Academy Awards for the Biennium 2019-2020

Following awards were given during XV ASC at BHU, Varanasi on November 13, 2021, by the 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 for 2020	
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

FOUNDATION DAY AND ANNUAL GENERAL MEETING

Foundation Day Celebration

The Foundation Day Lecture was delivered by Dr Shakuntala Haraksingh Thilsted, the 2021 World Food Laureate and Global Lead for Nutrition and Public Health at the WorldFish of the Consultative Group of International Agricultural Research. She received the prestigious award for her groundbreaking research, critical insights, and landmark innovations in developing holistic, nutrition-sensitive approaches to aquatic food systems, including fisheries and aquaculture. She is the first woman of Asian origin to be awarded the World Food Prize. The Prize is the most prominent global award recognizing an individual who has



contributed to a reduction in global hunger through improving the quality, quantity, and availability of food for all.

Dr Thilsted dwelt on the role of aquatic foods in nourishing nations. Globally, 690 million people are undernourished; 2 billion do not have access to safe, nutritious and sufficient food; 3 billion are unable to afford a healthy diet—57% of whom live in sub-Saharan Africa and South Asia, and 1.9 billion adults are overweight/ obese. Children below the age of 5 years are facing severe nutrient deficiencies in Africa and Asia. Unfortunately, despite concerted efforts, global trends of malnutrition (undernutrition, over-nutrition, and micronutrient deficiencies) are on the rise. Covid 19 has further aggravated the problem.

Dr Thilsted emphasized that aquatic food consisting of fish (finfish, crustaceans, molluscs and other aquatic animals, excluding reptiles, seaweeds, etc.), and seafood (edible marine fish and shellfish) could play an important role in overcoming the problem of undernutrition and related issues. Aquatic foods have multiple benefits; these are rich in micronutrients and essential fatty acids. All nutrients in aquatic foods are highly bioavailable and enhance micronutrient bioavailability from plant-source foods when consumed together. These also bring greater dietary diversity through meal preparation and consumption. From a nutritional perspective, aquatic foods contain multiple micronutrients and essential fatty acids. These include minerals (iron, iodine, zinc and calcium) and vitamins (B12, D, and A). These help in brain development and strong bones, reduce stunting, prevent preeclampsia, preterm delivery, low birth weight and support cognitive development in children. Aquatic foods have considerable potential to nourish people. One kg of dried fish (approx. 4 kg of fresh fish) can provide sufficient essential nutrients for one child for more than two months (15 g dried fish per child per day). Reference was made to Food-based Dietary Guidelines of India on Aquatic Foods, which recommend eating fish more frequently (at least 100–200 g per week). In India, people in Kerala eat more fish; 62% of the Keralites eat fish daily. Andaman & Nicobar Islands and West Bengal are other high fish-eating states. Its consumption is also growing in the non-traditional fish consuming states.

There are several benefits of consuming fish regularly. Some of these are: (i) fish intake reduces mortality risk from heart disease; (ii) diets low in fish and seafood responsible for disease-related to disability-adjusted life years (DALYs); and (iii) daily consumption of fish reduces mortality. She referred that the diets low in seafood omega-3 fatty acids account for 1.4 million deaths in 2010.

Dr Thilsted described that aquatic foods have huge potential to be processed as nutritious, safe and accessible food products. These can be a ready-to-use supplement (RUFs) / ready-to-use therapeutic food (RUTF). The new products, which are developed by WorldFish and its partners in different parts of the world are accessible in smaller quantities, have a long shelf life, are easy to transport, and their consumption is extended during lean production periods. She suggested that aquatic superfoods can be included in the food-

based social safety net programmes and those adhering to the 'right-to-food' to nourish the poor and vulnerable, especially mothers, children, and school feeding. There is a need for national- and state level comprehensive policies and investments for aquatic foods to nourish India and incorporate diverse aquatic foods in national-, and state food-based dietary guidelines.

Presidential Address

Dr T. Mohapatra, President of the Academy, delivered the presidential address. In his address on 'Startup Culture in Agriculture', Dr Mohapatra mentioned the Hon'ble Prime Minister's vision of encouraging technology and innovation as effective instruments for economic transformation and emphasized the need for an effective public R&D system to develop new technologies with innovative approaches to create entrepreneurs/startups in the agricultural value chain. The Government of India has undertaken reforms to uplift the start-up ecosystem. He also mentioned that out of more than 41,000 recognized startups in India, there are over 6000 agri-startups, the majority of which deal with downstream of the supply chain.

He mentioned the opportunities to improve efficiency in agriculture by applying drones, satellite photography, sensors, IoT-based sensor networks, phase tracking, weather forecasts, and biotech solutions; and enumerated the business models that have emerged to harness the opportunities in agriculture.

With appropriate policy support, the Farmer Producer Organisations (FPOs) are emerging as a practical approach towards empowering smallholder farmers. The strength of the FPOs needs to be harnessed to fill important gaps in the supply chain, focusing on the aggregation of farm produce and linking farmers to both inputs and output markets. The handholding between farmers and agri-tech entrepreneurs will create unique win-win collaborative business models.

He also discussed many challenges in agri-startups, such as lack of mentorship, inadequate knowledge of agriculture and allied fields, and problems with funding. These need professional mentoring at different stages, networking and communication, besides funding support. To overcome this, the active participation of academia, investors, industry and other stakeholders is a must. AgriBusiness Incubators (ABIs)/Accelerators are emerging as a crucial component of the startup ecosystem, providing support for developing and scaling growth-oriented early-stage enterprises. The Indian Council of Agricultural Research (ICAR) has established a network of 50 ABI Centers in its research institutes. He expressed satisfaction that a new generation of budding entrepreneurs and emerging startups are leading the way in disrupting the age-old agriculture system with innovative ideas and affordable solutions, which will be vital to fuel economic growth.

Presentation of the Newly Elected Fellows

The newly elected Fellows of the Academy made their presentations online during June 15-18, 2021, in five sessions. The presentations of Elected Fellows from Crop Sciences, Horticultural Sciences, Animal Sciences and Fisheries Sciences were chaired by Dr J.C. Katyal, Vice President and co-chaired by Dr K.C. Bansal, 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 A.K. Singh, Vice President and co-chairmanship of Dr P.K. Joshi, Secretary, NAAS. The newly elected Pravasi Fellows and Foreign Fellows also made their presentations online on June 18, 2021.

Excerpts from the Minutes of the 28th AGM

The 28th Annual General Body Meeting of the Academy was convened in hybrid mode on August 9, 2021, under the chairmanship of Dr Trilochan Mohapatra, President of the Academy. Before taking up the agenda for the meeting, the house observed a one-minute silence to pay homage to the Fellows of the Academy Dr Anand Swarup, Dr M Mahadevappa, Dr Sanjay Rajaram, Dr Hukum Chandra, Dr Ram Roshan Sharma, Dr Sushil Kumar, Dr Chakrapani Misra and Dr M. Udaya Kumar, and Mr Umesh Rai, Programme Executive at the NAAS Secretariat, who left for their heavenly abode since the last AGM.

Dr P.K. Joshi, Secretary, welcomed the President, past Presidents and esteemed Fellows and Associates who joined the AGM in-person or through virtual mode. Dr T. Mohapatra extended a hearty welcome to the entire fellowship, including the newly-elected Fellows and Associates. Dr P.K. Joshi conducted proceedings of the AGM as per the agenda. After that, the floor was opened to seek views of the fellowship on various issues for discussion at the Academy. Several topics were suggested for organizing policy/strategy workshops by the Fellowship. The topics will be considered by the Programme Committee while finalizing the programme for 2022.

Admission of the Fellows and Associates

It was informed that the presentations of the newly-elected NAAS Fellows of all the Sections were organized in a virtual mode from June 15-18, 2021. During the AGM, citations of the Fellows and Associates were read out, and by virtue of the authority vested in him, the President, NAAS, admitted 29 Fellows, 2 Foreign Fellows, 2 Pravasi Fellows and 11 Associates.

On this occasion, a publication, "Memoir –Prof Virender Lal Chopra," was released by the President in memory of Prof V.L. Chopra, past President of the Academy, and a brilliant scientist and teacher, who passed away on 18 April 2020.

XV Agricultural Science Congress

The National Academy of Agricultural Sciences (NAAS) organizes Agricultural Science Congress (ASC) every two years. The Academy organized XV ASC on the theme “Energy and Agriculture: Challenges in 21st Century” jointly with the Banaras Hindu University, Varanasi, from 13-16 November 2021. In view of the Covid-19 pandemic, the Congress was organized in a hybrid mode. It deliberated on the issues related to technologies, strategies and policies to make India energy-independent by 2047.

The Congress was attended by more than 1800 delegates (900 in-person, including 300 farmers). The participants included fellows of the Academy, researchers, academicians, policymakers, students, farmers, leaders from the industry and representatives of the civil society organizations. It was inaugurated by Shri Narendra Singh Tomar, Hon’ble Minister of Agriculture & Farmers’ Welfare, Government of India.



The Hon’ble Minister emphasized promoting new technologies for smallholder farmers for increasing their incomes and reduce energy costs. He mentioned the historic international initiative ‘Green Grids Initiative: One Sun – One World – One Grid’ launched by Prime Minister Shri Narendra Modi and UK Prime Minister at the Climate Change Conference (COP-26) held in Glasgow. The initiative has the support of 80 countries. He also stated that India’s commitment and ambitious plan to utilize clean and renewable energy for its developmental activities is globally applauded.



Dr Trilochan Mohapatra, President, NAAS & Secretary, DARE and DG, ICAR delivered the presidential address. Renowned academicians viz., Dr R.S. Paroda, former President, NAAS and Chairman, TAAS; Dr Mangala Rai, former Secretary, DARE & DG, ICAR; Dr Rattan Lal, Director, CMSC, USA; Dr Ajay Mathur, DG, International Solar Alliance; Dr Jimmy Smith, DG, ILRI; and Dr Shekhar C. Mande, DG, CSIR delivered plenary and special lectures on the challenges and opportunities for efficient energy use in agriculture.

Deliberations were held under nine scientific themes: (1) food, energy, water and climate nexus; (2) energy-smart resource use; (3) agricultural engineering and technologies; (4) post-harvest technologies; (5) policies and institutions for energy-smart management in agriculture; (6) harnessing energy efficiency in the fisheries sector; (7) energy in livestock and poultry production system; (8) innovations in crop improvement; and (9) emerging technologies in horticulture sciences.

Some important outcomes of these deliberations are listed below:

- The agriculture sector is the main user of water; its judicious and efficient utilization has direct implications for energy use. Climate change is also influenced by the availability and use of water and energy in the agriculture sector. Impacts of climate change are transmitted through water-related stresses (e.g., floods and droughts). Therefore, to effectively contribute to policy formulating processes at the national and state levels, NAAS may create a Water Advocacy Dialogue Forum to deliberate on 'water-energy-climate change' related issues.
- Agriculture is a labour-intensive activity, and a steady decline in the agricultural workforce calls for a formal network of Science, Innovation and Technology (SIT) institutions to find solutions through IT and electronics and develop suitable automation and robotics for agriculture and post-harvest sectors.
- Adoption of conservation agriculture can save up to 80% of the energy use along with a significant reduction in the emission of CO₂ and other GHGs, besides improving soil health. Hence, farmer-friendly and economically-feasible technologies are needed to reduce energy use and GHGs in agriculture.
- Energy audits and incentives for ensuring the efficient use of energy in agriculture production and processing enterprises would encourage the use of renewable energy, including solar, wind and biomass.
- Promote precision agricultural technologies such as sensor-based systems enabled with GPS, GNSS, RFID, VTRS and robot-controlled machines for the application of the right amounts of inputs (seed, fertilizer, water, chemicals, etc.) at the right time and the right place. Custom-hiring of the high-cost, high capacity, specialised machines and equipment should be promoted and popularised on large scale.
- The circular economy model is an emerging concept. It focuses on regeneration and aims at improving resource use efficiency by converting waste into valuable products with multiple uses. This requires generating more data to adopt such a model.

- Mechanised management of surplus residues of the crops and agro-processing activities is needed for converting these into animal feed and fodder, compost and manures, biogas and electricity to avoid their infield rotting and burning.
- Noticing a positive impact of the schemes like “Pani Bachao Paise Kamao”(Government of Punjab) and PM-KUSUM the forward-looking policies are needed to replicate and promote such schemes taking into consideration the sustainability and other environmental issues.
- The promotion of the ‘grid-connected-farmer-led’ solar generation system is an effective option for enhancing farmers’ incomes through the transfer of surplus power generated on farms to the national electricity grid. It is a win-win solution for all the stakeholders.
- As urbanization is unfolding, peri-urban agriculture and 3-D sea-farming will be crucial in meeting the future food demand. Public-private partnership in R&D and policy support will be vital for their success. There is scope to capitalize on the potential of soilless culture in urban horticulture.

A national-level elocution contest was organized on the theme of the Congress for the students selected from all over the country. During the Congress, special sessions on the ‘Role of Industry in Facing the Energy-related Challenges for the 21st Century’, and ‘Farmer-Scientist Interaction’ were also organized. The Agri-expo organized during the Congress provided a platform to more than 50 public and private organizations for showcasing their technologies, products and services.



PUBLICATIONS

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

Policy/Status/Strategy Papers

- Policy Paper 97 : Potential of Non-Bovine Milk
- Policy Paper 98 : Agriculture and Food Policy for the Five Trillion Dollar Economy
- Policy Paper 99 : New Agricultural Education Policy for Reshaping India
- Policy Paper 100 : Strategies for Enhancing Soil Organic Carbon for Food Security and Climate Action
- Policy Paper 101 : Big Data Analytics in Agriculture
- Policy Paper 102 : WTO and Indian Agriculture: Issues, Concerns and Possible Solutions
- Policy Paper 103 : Antimicrobial Resistance
- Policy Paper 104 : One World One Health
- Policy Paper 105 : Sugarcane-based Ethanol Production for Sustainable Fuel Ethanol Blending Programme
- Policy Paper 106 : Utilization of Wastewaters in Urban and Peri-urban Agriculture
- Strategy Paper 14 : Innovations in Potato Seed Production

Policy Briefs

Policy Brief No. 11: Towards Revision of Biological Diversity Act 2002

Newsletter

NAAS-News, Vol. 21, Nos 2 to 4 and Vol. 22, No. 1 (quarterly)

Journal (published by Springer India Pvt. Ltd)

NAAS Official Journal 'Agricultural Research' Vol. 10, Nos 2 to 4 and Vol. 11, No. 1 (quarterly)

Other Publications

The Academy has brought out a publication "Memoir – Prof Virender Lal Chopra" as a tribute to Prof. V.L. Chopra, Former President, NAAS on his birthday, August 9, 2021. The publication was released by the President in memory of Prof V.L. Chopra, past President of the Academy, and a brilliant scientist and teacher, who passed away on 18 April 2020.

EVENTS AND MEETINGS

New Year Get-together

The Academy organized 'New Year Get-together' on January 01, 2022. Dr P.K. Joshi, Secretary, NAAS, welcomed Dr Trilochan Mohapatra, President, NAAS, office bearers, members of the Executive Council, and the distinguished Fellowship and wished them a happy, healthy and prosperous 2022. In his address, Dr Mohapatra expressed his satisfaction with the performance of agriculture in 2021 amidst the challenges posed by the Covid-19 pandemic. He aspired the Academy to provide leadership in science and science policy. He expressed deep appreciation, on behalf of the Academy, to the outgoing members of the EC and welcomed new office bearers. Despite the Covid-19 pandemic, the Academy did exceedingly well during 2021 and timely performed all the academic and non-academic activities.

Meeting of the Conveners of Regional Chapters

Two meetings of the Conveners of the Regional Chapters were organized. It was decided that all the Chapters will adopt few schools in their region for nutrition literacy among school children. It was also decided that the Fellows may encourage school children to make their career in agriculture, organize lectures/workshops on issues of regional priority; and interact with the government officials to share with them the evidence-based policies.

Executive Council Meetings

During the year, seven meetings were held on April 16, 2021, August 6, 2021, October 23, 2021, November 13, 2021, December 14, 2021, January 18, 2022 and February 18, 2022 in either online or hybrid mode. Some important items considered and actions taken during the meetings are as follows.

118th Meeting

The 118th meeting of the NAAS Executive Council was held on April 16, 2021 (in virtual mode) under the chairmanship of Dr T. Mohapatra, President of the Academy. The progress of preparation of the XV Agricultural Science Congress to be held at Banaras Hindu University on November 13-17, 2021, was reviewed. The Technical Programme of the Congress, including Plenary Lectures to be delivered, was presented to the Council. The EC was also apprised of the finalization of the report on "Screening of Actionable Points from NAAS Policy/ Strategy papers and preparation of Roadmap for Further Action".

119th Meeting

The 119th meeting of the NAAS Executive Council was held on August 6, 2021 (in virtual mode) under the chairmanship of Dr T. Mohapatra, President of the Academy. The

progress regarding preparations for the XV Agricultural Science Congress to be held at Banaras Hindu University from November 13-16, 2021, was presented by Dr Rakesh K. Singh, Organizing Secretary. The Technical Programme of the Congress including Plenary Lectures, was also presented.

The President appreciated the activities carried out by the Regional Chapters. Despite the limitations due to the COVID pandemic, programmes were organized particularly for students at school and graduate level. The President reiterated that Regional Chapters are providing a much needed platform for students by harnessing the expertise of the NAAS Fellows. As per the review of the Regional Chapters undertaken on June 23, 2021, a Committee was constituted to relook into the guidelines for the Regional Chapters. The Committee would deliberate to address the constraints and concerns of the Regional Chapters and come out with specific recommendations to strengthen the Regional Chapters.

120th Meeting

The 120th Executive Council Meeting was held on 23rd October 2021 under the chairmanship of Dr T. Mohapatra, President of the Academy. The listed agenda was discussed, and approval was granted where required. The Council deliberated on the (i) academic standing of scientific societies, (ii) compendium on impacts of NARS, (iii) MoUs with international organizations, (iv) election of office bearers, and (v) election of new Fellows and Associates.

121st Meeting

The 121st Executive Council Meeting was held on 13th November 2021 under the chairmanship of Dr T. Mohapatra, President NAAS at BHU, Varanasi. The EC reviewed (i) the status of preparations for the XV Agricultural Science Congress 2021, and (ii) sought suggestions on the themes and venues for the next Agricultural Science Congress to be held in 2023.

122nd Meeting

The 122nd Meeting of the Executive Council was held on 14th December 2021 under the chairmanship of Dr T. Mohapatra, President NAAS. Dr Mohapatra complimented the fellowship on the successful organisation of the XV Agriculture Science Congress at BHU, Varanasi and appreciated the Local Organizing Committee for its tireless efforts in making the Congress a grand success.

123rd Meeting

The 123rd Meeting of the Executive Council was held in hybrid mode at 11.30 A.M. on 18 January 2022 under the Chairmanship of Dr T. Mohapatra, President NAAS. The EC was apprised on (i) the NAAS website, (ii) status of the XV Agricultural Science Congress, (iii)

likely themes and venues of the XVI ASC, (iv) the potential speakers for the Foundation Day lecture on June 5, 2022, and (v) evaluation on non-impact factor journals.

124th Meeting

The 124th Meeting of the Executive Council was held in hybrid mode at 10.00 A.M. on 18 February 2022 under the Chairmanship of Dr T. Mohapatra, President NAAS. EC was apprised of the status of (i) the report on 'Academic Standing of the Scientific Societies' and (ii) collaboration with Scientific Academies in other countries. XVI Agricultural Science Congress was decided to be held at ICAR-CMFRI. The theme of the Congress shall be '*Transformation of Agri-Food Systems and Sustainable Development Goals*'. Prof P. Balaram, former Director, Indian Institute of Science, Bengaluru, to deliver the Foundation Day lecture.

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, 2022 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.

Programmes Planned for 2022

Topic	Convener
1. Draft Regulation for GM Food and Feed Imports and Detection of Unauthorized GM Events	Dr K.C. Bansal, NAAS
2. Food Fortification Issues and Way Forward	Dr K. Madhavan Nair, NIN
3. Self-sufficiency in Edible Oil Production	Dr Sanjeev Gupta, ADG, ICAR
4. Sustaining Pulse Revolution	Dr Anjani Kumar, IFPRI
5. Promoting millets production, value addition and consumption'	Dr O.P. Yadav, CAZRI, Jodhpur
6. Impact of COVID 19 on Livestock (Animal Health and Dairy/Poultry/Meat/Feed Industry)	Dr R.K. Singh, NAAS
7. Plant based vs Dairy Milk-myths and facts	Dr A.K. Srivastava, ASRB
8. Scaling up Innovative Agricultural Extension Models	Dr Ashok Kumar Singh, DDG (Extn), ICAR

9. Public-Private Partnership in Agriculture: Current Opportunities and Challenges	Dr Ch. Srinivasa Rao, Director, NAARM
10. Sea Weed Cultivation and Utilization	Dr J.K. Jena and Dr A Gopalakrishnan
11. Beyond Price Support and Subsidy	Dr P.S. Birthal, NAAS
12. Service Delivery Mechanism in Livestock Sector	Dr P.S. Birthal, NAAS

FINANCIAL STATEMENT

The Academy received from the Department of Agricultural Research and Education (DARE), New Delhi, Grant-in-Aid of Rs 99 lakh during the year 2021-22. The Accounts of the Academy are audited by Chartered Accountants appointed with the approval of the General Body. The Utilization Certificate for the year 2021-22 has been submitted to the DARE.

A brief Audited Statement of Accounts and Auditor's Report for 2021-22 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



Pawan Shubham & Co.
CHARTERED ACCOUNTANTS

601, ROOTS TOWER
7, District Center
Laxmi Nagar, Delhi-110092
Pawan@pawanshubham.com
Tel 011-45108755

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 (hereinafter "Academy")**, New Delhi as on 31st March 2022, the Income and Expenditure Account, the receipts and payment accounts and notes annexed for the year ended on that date (hereinafter "Financial Statements").

Emphasis of Matter

During the year, Academy changed its accounting policy from "cash basis of accounting" to "accrual basis of accounting". Impact for this change has been made in the current financial year. Due to this, interest accrued on deposits has been booked for previous financial years amounting to Rs. 51,93,400. For the current year, interest accrued has been booked amounting to Rs. 83,73,812. Corresponding credit has been given to interest income.

Our opinion is not qualified in this respect.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation of these financial statements. This responsibility includes maintenance of adequate accounting records for safeguarding of assets of the Academy and for preventing and detecting frauds and other irregularities; selection and application of appropriate policies; maintenance of adequate internal control for ensuring the accuracy and completeness of the accounting records relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with the Standards on Auditing issued by the Institute of Chartered Accountants of India. Those Standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Academy's preparation of the financial statements





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CHARTERED ACCOUNTANTS

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that give a true and fair view. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of the accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

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 give a true and fair view:

- a. In the case of balance sheet, of the state of affairs as at March 31, 2022.
- b. In the case of Income and Expenditure Account, of the excess of Income over Expenditure for the year ended on that date.
- c. In the case of Receipts and Payments Accounts, of the receipts and payments for the year ended on that date.

For **PAWAN SHUBHAM & CO.**
Chartered Accountants
ICAI Firm's Registration No.: 011573C

(CA Pawan Kumar Agarwal)
Partner
M. No. 092345
UDIN: 22092345AJZOXPH700



Place: New Delhi
Dated: 31.05.2022



Pawan Shubham & Co.
CHARTERED ACCOUNTANTS

601, ROOTS TOWER
7, District Center
Laxmi Nagar, Delhi-110092
Pawan@pawanshubham.com
Tel 011-45108755

1. Basis of preparation of financial statements

The financial statements have been prepared under the historical cost convention on going-concern basis in accordance with the generally accepted accounting principles and in accordance with the mandatory accounting standards issued by the Institute of Chartered Accountants of India.

2. Recognition of Income and Expenditure

Revenues/Income is accounted on accrual basis as and when they are earned in accordance with the generally accepted accounting principles.

3. 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 investment has been recognized on accrual basis.

4. Fixed Assets and Depreciation

Fixed assets are stated at written down value less depreciation calculated as per the rates of Depreciation provided in the Income Tax Act 196, read with the rules made there under.

5. Income Tax Provision and Contingent Liabilities

- a. Income Tax Order dated 30-12-2019 raising the demand of Rs.1,11,91,925/- for AY 2017-18 has been passed U/s 143(3) of the Income Tax Act. Academy has filed an appeal against the same before the CIT(A) Delhi. However, Rs. 22,34,385/- has been deposited against the grant of stay. Management is of the view that no addition should sustain hence, no provisions is made.
- b. Appeal has been filed against refund due Rs.24,25,978 for AY 2019-20 for which assessment order no. ITBA/AST/S/143(3)/2021-22-1032627782(1) dated 23rd April 2021 passed after scrutiny, tax to be deposit of Rs. 38,26,000.

For PAWAN SHUBHAM & CO.
Chartered Accountants
Firm Registration Nos.:011573C

(CA Pawan Kumar Agarwal)
Partner
M. No. 092345
Place: New Delhi
Dated: 31.05.2022



National Academy of Agricultural Sciences

Secretary

Treasurer



NATIONAL ACADEMY OF AGRICULTURAL SCIENCES

BALANCE SHEET AS ON 31.03.2022

LIABILITIES	AMOUNT (Rs.)	ASSETS	AMOUNT (Rs.)
CAPITAL FUND		FIXED ASSETS (Ann. B.S. 1)	
Opening Balance	15,95,51,278	Opening Balance	1,66,41,736
Add: Transferred from Accumulated Fund	4,14,06,925	Additions during the year	13,51,134
Add: Excess of Income over Expenditure during the year	91,18,880	Write off during the year	-
Less: Funds transferred to Specific Reserve Fund	3,41,02,881	Depreciation for the year	(19,28,970)
			1,60,63,900
SPECIFIC RESERVE FUND		Deposits in Approved Securities (Ann. B.S. 2)	29,88,09,556
Opening Balance	17,36,32,618	Deposits in Approved Securities Interest Accrued (Ann. B.S. 5)	1,35,67,212
Add: Addition during the year	3,41,02,881		
Less: Utilized during the year	4,14,06,925	CURRENT ASSETS	
		Bank Balances (Ann. B.S. 3)	16,86,040
ENDOWMENT FUND		Cash Balances (Imprest A/c)	578
Opening Balance	20,00,000	Royalty Receivable	6,27,868
Received during the year	-		
CURRENT LIABILITIES		ADVANCES	
National Soil & Land Use Policy		Advances with NAAS Regional Chapters (Ann. B.S. 4)	4,36,128
Developing Proforma to Rank ICAR Institutions		Income tax receivable	1,60,72,314
Compendium on Impact of NARS		GST Receivable	4,61,372
Earnest Money (MM ACTIV)			
PFMBY Project			
Sundry Creditors (Ann. B.S. 6)			
Other Current Liabilities (Ann. B.S. 6)			
TOTAL	34,77,24,969	TOTAL	34,77,24,969

Refer Notes Attached To and forming part of Accounts.

As per our report of even date attached

For Pawan Shubham & Co
Chartered Accountants

(Signature)

Pawan Kumar Agawal

Partner

Firm Registration No.-011573C

M.NO.-092345

Place: New Delhi

Date: 31.05.2022



National Academy of Agricultural Sciences

(Signature)
Secretary

(Signature)
Treasurer

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31ST MARCH, 2022

EXPENDITURE	AMOUNT (Rs.)	INCOME	AMOUNT (Rs.)
To Expenditure towards NAAS activities (Ann. I.E. I)	2,18,90,290	By Grant-in-Aid from D.A.R.E.	99,00,000
To Depreciation (Ann. B.S. 1)	19,28,970	By Interest on Investment	2,82,02,955
To Excess of Income over Expenditure	1,63,01,776	By Interest, Contribution from Subscriptions, Publications and Other receipts towards NAAS activities (Ann. I.E. II)	20,18,082
Total:	4,01,21,037	Total:	4,01,21,037
To Income tax of earlier year	71,82,896	By Excess of Income over Expenditure	1,63,01,776
To Excess of Income over Expenditure after tax	91,18,880		
	1,63,01,776		1,63,01,776

Refer Notes Attached To and forming part of Accounts.

As per our report of even date attached

For Pawan Shubham & Co
Chartered Accountants



Pawan Kumar Agawal

Pawan Kumar Agawal

Partner

Firm Registration No.-011573C

M.NO.-092345

Place: New Delhi

Date: 31.03.2022

National Academy of Agricultural Sciences



[Signature]
Secretary

[Signature]
Treasurer

EXECUTIVE COUNCIL

Position	2021	2022
President	Dr T. Mohapatra	Dr T. Mohapatra
Immediate Past President	Prof Panjab Singh	Prof Panjab Singh
Vice-President	Dr J.C. Katyal	Dr Anil K. Singh
Vice-President	Dr Anil K. Singh	Dr K.M. Bujarbaruah
Secretary	Dr P.K. Joshi	Dr P.K. Joshi
Secretary	Dr K.C. Bansal	Dr K.C. Bansal
Foreign Secretary	Dr U.S. Singh	Prof Rajeev K. Varshney
Editor	Dr P.S. Birthal	Dr P.S. Birthal
Editor	Dr Malavika Dadlani	Dr Malavika Dadlani
Treasurer	Dr R.K. Jain	Dr Rajender Parsad
Member	Dr Madhoolika Agrawal	Dr J.S. Chauhan
Member	Dr J.S. Chauhan	Dr M.S. Chauhan
Member	Dr M.S. Chauhan	Dr S.K. Datta
Member	Dr S.K. Datta	Dr B. Mohan Kumar
Member	Dr Arvind Kumar	Dr W.S. Lakra
Member	Dr W.S. Lakra	Prof A.R. Podile
Member	Dr Rajender Parsad	Dr Ch Srinivasa Rao
Member	Prof A.R. Podile	Dr C.N. Ravishankar
Member	Dr (Ms) Taru Sharma	Dr (Ms) Taru Sharma
Member	Dr Brahma Singh	Dr Ashok K. Singh
Member	Prof Rajeev K. Varshney	Dr P.S. Sirohi
Member	Dr R. Visvanathan	Dr R. Visvanathan
ICAR Nominee	Dr Ch. Srinivasa Rao	Sh. Sanjay Garg

SECRETARIAT

Dr Sanjeev Saxena, Executive Director

Shri Jai Singh, Office Management Jr. Executive

Shri Miraj Uddin, Budget & Accounts Executive

Shri B.L. Yadav, Driver cum Office Assistant

Ms Minu Tiwari, Programme Executive

Shri Kamal Singh, General Office Assistant

Shri P. Krishna, Programme Executive

LIST OF ACRONYMS

ABI	: AgriBusiness Incubators
ADB	: Asian Development Bank
ADG	: Assistant Director General
AGM	: Annual General Body Meeting
AI	: Artificial Intelligence
AIIMS	: All India Institute of Medical Sciences
AINP	: All India Network Project
AMS	: Aggregate Measurement of Support
ANGRAU	: Acharya N. G. Ranga Agricultural University
AoA	: Agreement on Agriculture
ASC	: Agricultural Science Congress
ASRB	: Agricultural Scientists Recruitment Board
BAAG	: Bangladesh Academy of Agriculture
BAU	: Birsa Agricultural University
BHU	: Banaras Hindu University
CAU	: Central Agricultural University
CCSHAU	: Chaudhary Charan Singh Haryana Agricultural University
CIAB	: Center of Innovative and Applied Bioprocessing
CMSC	: Carbon Management and Sequestration Centre
CNNS	: Comprehensive National Nutrition Survey
CoA	: Committees on Agriculture
COP	: Conference of the Parties
CPM&B	: Center for Plant Molecular Biology and Biotechnology
CS	: Crop Sciences
CSIR	: Council of Scientific and Industrial Research
DALYs	: Disability-Adjusted Life Years
DARE	: Department of Agricultural Research and Education
DBT	: Department of Biotechnology
DDG	: Deputy Director General
DG	: Director General
DMC&H	: Dayanand Medical College & Hospital
DNA	: Deoxyribonucleic Acid
EC	: Executive Council

ERP	: External Reference Prices
FAO	: Food and Agriculture Organization
FPOs	: Farmer Producer Organisations
FRS	: Fellow of the Royal Society
FSSAI	: Food Safety and Standards Authority of India
GE	: Genetically Modified or Engineered
GEF	: Global Environment Facility
GEO	: Genetically Engineered Organisms
GGIC	: Government Girls Intermediate College
GHI	: Global Hunger Index
GM	: Genetically Modified
GMO	: Genetically Modified Organisms
GNSS	: Global Navigation Satellite System
GPS	: Global Positioning System
ICAR	: Indian Council of Agricultural Research
ICAR-ATARI	: ICAR-Agricultural Technology Application Research Institute
ICAR-CAZRI	: ICAR-Central Arid Zone Research Institute
ICAR-CIAE	: ICAR-Central Institute of Agriculture Engineering
ICAR-CIAE	: ICAR-Central Institute of Agricultural Engineering
ICAR-CMFRI	: ICAR-Central Marine Fisheries Research Institute
ICAR-CPCRI	: ICAR-Central Plantation Crops Research Institute
ICAR-CSSRI	: ICAR-Central Soil Salinity Research Institute
ICAR-DMAPR	: ICAR-Directorate of Medicinal and Aromatic Plants Research
ICAR-IARI	: ICAR-Indian Agricultural Research Institute
ICAR-IISS	: ICAR-Indian Institute of Soil Science
ICAR-IISWC	: ICAR-Indian Institute of Soil and Water Conservation
ICAR-IIVR	: ICAR-Indian Institute of Vegetable Research
ICAR-NAARM	: ICAR-National Academy of Agricultural Research Management
ICAR-NBPGR	: ICAR-National Bureau of Plant Genetic Resources
ICAR-NDRI	: ICAR-National Dairy Research Institute
ICAR-NIANP	: ICAR- National Institute of Animal Nutrition and Physiology
ICAR-NIAP	: ICAR - National Institute of Agricultural Economics and Policy Research
ICAR-NIASM	: ICAR-National Institute of Abiotic Stress Management
ICAR-NRCG	: ICAR-National Research Centre For Grapes

ICAR-RCER	: ICAR-Research Complex for Eastern Region
ICAR-RCNEHR	: ICAR-Research Complex for North Eastern Hill Region
ICAR-SBI	: ICAR-Sugarcane Breeding Institute
ICAR-VPKAS	: ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan
ICMR	: Indian Council of Medical Research
ICMR-NIN	: ICMR-National Institute of Nutrition
IFPRI	: International Food Policy Research Institute
IFS	: Integrated Farming Systems
IIT	: Indian Institutes of Technology
ILRI	: International Livestock Research Institute
INSA	: Indian National Science Academy
JIVET	: Juvenile in Vitro Embryo Transfer
JNU	: Jawaharlal Nehru University
KAUST	: King Abdullah University of Science and Technology
KVK	: Krishi Vigyan Kendra
MNCFC	: Mahalanobis National Crop Forecast Centre
MOEF&CC	: Ministry of Environment, Forest and Climate Change
MSME	: Ministry of Micro, Small and Medium Enterprises
MSP	: Minimum Support Prices
NAAS	: National Academy of Agricultural Sciences
NABARD	: National Bank for Agriculture and Rural Development
NARS	: National Agricultural Research System
NASC	: National Agricultural Science Complex
NDUAT	: Acharya Narendra Deva University of Agriculture and Technology
NEP	: National Education Policy
NGOs	: Non-Governmental Organisation
NNMB	: National Nutrition Monitoring Bureau
NRC	: National Research Centre
OIE	: Office International des Epizooties
OUAT	: Odisha University of Agriculture and Technology
PAU	: Punjab Agricultural University
PEQ	: Post-entry Quarantine
PM-KUSUM	: Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan
QPM	: Quality Planting Material

QR	: Quick Response
RFID	: Radio Frequency Identification
RUFS	: Ready-to-use Supplement
RUTF	: Ready-to-use Therapeutic Food
SAARC	: South Asian Association for Regional Cooperation
SARDI	: South Australian Research and Development Institute
SAU	: State Agricultural University
SCNT	: Somatic Cell Nuclear Transfer
SCSP	: Scheduled Caste Sub Plan
SDGs	: Sustainable Development Goals
SDN	: Site-Directed Nuclease Technology
SHGs	: Women Self-help Groups
SIT	: Science, Innovation and Technology
SKUAST	: Sher-e-Kashmir University of Agricultural Sciences and Technology
SLI	: School Lunch Initiative
SRI	: System of Rice Intensification
SSI	: Sustainable Sugarcane Initiative
SSM	: Special Safeguard Mechanism
STIP	: Science, Technology and Innovation Programme
TAAS	: Trust for Advancement of Agricultural Sciences
TAD	: Transboundary Animal Diseases
TBI	: Technology Business Incubator
TNAU	: Tamil Nadu Agricultural University
TNJFU	: Tamil Nadu Dr. J. Jayalalithaa Fisheries University
UBKV	: Uttar Banga Krishi Viswavidyalaya
UNEP	: United Nations Environment Programme
VC	: Vice Chancellor
WHO	: World Health Organization
WTO	: World Trade Organisation

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 Agriculture: Opportunities and Challenge	-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.	Bio drainage: An Eco-Friendly Tool for Combatting Waterlogging	-2015
75.	Linking Farmers with Markets for Inclusive Growth 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	-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 Really	-2019
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