NAAS NEWS

RESEARCH EDUCATION AND TECHNOLOGY POLICY FORUM

Vol. 16 No. 4 **October-December 2016**

CONTENTS

Editors

Dr K.K. Vass
Prof V.K. Gupta

From the President's Desk

Climate is changing, Agriculture also must

Across the country, farmers bring up several issues during interactions, concerning seed, markets, water and so on. In spite of a comparatively better monsoon during this year, problems of both plenty and shortage of water, continue to be discussed and conclusion is that Climate is changing. The high inter and intra-seasonal variability in rainfall distribution, extreme temperatures and rainfall events, along with new biotic and abiotic stresses, are causing crop damages and enormous losses to farmers. The task at hand is not only to sustain agricultural productivity with these challenges but also to preserve the natural resource base. Enhanced physical infrastructure can afford some protection against events associated with climate change such as floods, extreme weather events or coastal erosion. Adoption of new crop varieties and innovative agricultural practices can neutralise the impacts of changes in temperature and water availability. Education, training and rural extension services can help in adaptation endeavours. Better weather forecasting and improved communications can assist in contingency planning.

Climate smart agriculture (CSA) integrates all dimensions of sustainable development in addressing food security and climate concerns in a forward looking perspective. It choices with a win-win potential between food security and climate change adaptation on one side, and mitigation on the other side, enhancing the capacity of the agriculture sector in order to sustainably support food supplies to the growing population. Application of state-of-art scientific tools and technologies, for crop improvement and development of designer crops, coupled with associated resource management practices including integrated farming and indigenous knowledge, can provide the desired solutions.

Water and energy will be the most important natural resources threatened, if sustainable management approach is not followed in the near future. Conservation agriculture with efficient soil management, water harvesting and judicious use of inputs will be important pillars in sustainable water management in agriculture. Water Smart Agriculture, therefore, forms an important component of CSA, which mainly involves conserving water,

improving delivery systems and adopting judicious application methods in addition to water quality management, including treatment and use of poor quality water. Water budgeting for agriculture vis-à-vis other sectors of the economy and drinking water requirements, as also crop plans and water saving systems and devices keeping in view the water-guzzling crops, need immediate attention for scientific management of water resources. Conservation tillage ranging from no-till to minimal tillage is another effective way to meet water demand of crops under water scarce conditions. Both aspects of biological dimensions, pests and pollinators for example, are to be addressed in order to reduce the damages as also enhance productivity in agriculture.

A National Consultation with regard to the national programme on climate resilient agriculture had emphasised on the positive role of agriculture as an integrated mitigation tool, developing agro-meteorological warning systems accessible to farmers, enhancing researches on resilient varieties and breeds, integrating and diversifying farming practices, evolving system-specific market tools / mechanisms that reward farmers and communities for their carbon-efficient action, reinforcing outreach through ICTs and dynamic extension approaches and involvement of public leadership. Much ground has been covered in the last five years, with regard to carbon sequestration, smart and sensor-based precision farming, crop insurance and so on, and a paradigm of 'New Agriculture' is emerging, with seamless partnerships. The Academy is showcasing these as well as the future possibilities in the forthcoming XIII Agricultural Science Congress in February, 2017, with the theme of 'Climate Smart Agriculture'.

This quarter is also the time for me to lay down my pen as the NAAS President for the last three years, that I deem a privilege, particularly at the time of the Silver Jubilee of this Agri-Think Tank. I would like to place on record my gratitude to the Esteemed Fellowship, Former Presidents, Office bearers and the Secretariat, for giving me this opportunity, guidance and support. This was an association in the cause of Indian agriculture, that I would cherish all my life. I believe the best is yet to come and wish all the best to the Academy and the Fellowship in the New Year and further years. Thank you and Good Bye.

S. Ayyappan
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98th Executive Council Meeting

The meeting held on November 22, 2016, was Chaired by Dr S. Ayyappan, President, NAAS. It was attended by 15 EC members including Prof R.B. Singh, the immediate Past President. Dr H. Shivanna, Vice-Chancellor, UAS, Bengaluru and Convener XIII ASC was a special invitee. He presented the update and progress regarding organizing the XIII ASC. The EC noted the results of ballots for election of Office Bearers and EC members, to various vacant positions in EC with effect from 01.01.2017, and ratified the election of the following Fellowships:

Election of the Office Bearers and Members of Executive Council:

President	Prof Panjab Singh
Secretary	Dr J.K. Jena
Editor	Dr V.K. Bhatia
Members	Dr K.C. Bansal
	Dr K.N. Ganeshaiah
	Dr S.N. Jha
	Dr Raj Kumar Singh

The EC also ratified the election of following to the Academy Fellowship for 2017 under different sections:

Fellows

Section I: Crop Sciences

1. Dr Kuldeep Singh
2. Dr N.P. Singh
3. Dr H.D. Upadhyaya
4. Dr A.K. Shasany
5. Dr R.R.Hanchinal
6. Dr S. Robin

Section II: Horticultural Sciences

1. Dr R.K. Pal
2. Dr Bijendra Singh
3. Dr R.R. Sharma

Section III: Animal Sciences

1. Dr T.K. Bhattacharya
2. Dr (Ms.) Sunita Grover
3. Dr (Mrs.) G. Taru Sharma
4. Dr V. Balamurugan

Section IV: Fisheries Sciences

1. Dr A.S. Sahul Hameed
2. Dr S.D. Roy

Section V: Natural Resource Management

1. Dr A.K. Shukla
2. Dr Y.S. Shivay
3. Dr Pratap Bhattacharyya
4. Dr Gulshan Mahajan
5. Dr C.B. Pandey

Section VI: Plant Protection Science

1. Dr Lata
2. Dr Supriya Chakraborty
3. Dr P.K. Chakrabarty
4. Dr Irani Mukherjee

Section VII: Agricultural Engineering & Technology

1. Dr A. Sarangi

Section VIII: Social Sciences

2. Dr Hukum Chandra
3. Dr Narayan Bhaskar

Foreign Fellow

1. Dr Albrecht E. Melchinger (*Germany)*
2. Dr Sorgeloos Patrick (*Belgium)*

Pravasi Fellow

1. Dr Kshirod K. Jena (*Philippines)*
2. Dr Vijay K. Juneja (*USA)*

NAAS Associates Selected for 2017 under different Sections:

	Name	Section
1.	Dr M.K. Pandey	Crop Science
2.	Dr S. Srivastava	Crop Science
3.	Dr A. Kaur	Social Science
4.	Dr V.K. Prajapati	Animal Sciences
5.	Dr S.K. Mangrauthia	Crop Science
6.	Dr Y.S. Saharawat	NRM
7.	Dr Gajanan Behere	Plant Protection
8.	Dr N.K. Singh	Animal Sciences
9.	Dr Amit Kumar	Animal Sciences
10.	Dr N.C. Bisht	Crop Sciences

Awardees of Academy Awards for the biennium 2015-16

Name of Award	Name of Awardees
Memorial Awards	
Dr B.P. Pal Award	Dr (Ms.) Uma Lele
Dr K. Ramiah Award	Dr (Ms.) Shailaja Hittalmani
Dr K.C. Mehta Award	Dr A.N. Mukhopadhyay
Dr M.S. Randhawa Award	Dr Mruthyunjaya
Dr N.S. Randhawa Award	Dr Milkha Singh Aulakh
Dr P. Bhattacharya Award	Dr Devki Nandan Kamra
Endowment Awards	
Dr L.C. Sikka Endowment Award	None
Dr (Ms.) Prem Dureja Endowment Award	Dr (Ms.) Rintu Banerjee
Recognition Awards	
Plant Improvement	Dr J.C. Rana
Plant Protection	Dr K.R. Kranthi
Soil, Water & Environmental Sciences	Dr S.K. Chaudhari
Animal Sciences	Dr Parimal Roy
Social Sciences	Dr Rajender Parsad
Young Scientists' Awards	
Plant Improvement	Dr Rachit Saxena, Scientist, ICRISAT, Patancheru
Plant Protection	Dr P.L. Kashyap, Scientist, IIW&BR (Reg. Station), Shimla
Soil, Water & Environmental Sciences	Dr Surender Singh, Scientist, IARI, New Delhi
Animal Sciences	Dr V.K. Prajapati, Assistant Professor, Central University of Rajasthan, Ajmer
Agricultural Engineering & Technology	None
Social Sciences	Dr R.K. Paul, Scientist, IASRI, New Delhi

The EC also approved new six programme to be organized during 2017. The revised designations of the existing Secretariat staff of NAAS were also approved. The Executive Council whole-heartedly lauded the contributions of the outgoing Office-bearers and members of the EC *viz*, Dr S. Ayyappan, President; Prof M.P. Yadav, Secretary; Prof V.K. Gupta, Editor; Dr K.M. Bujarbaruah, Member; Dr M. Mahadevappa, Member; Dr K.K. Singh, Member; Dr Anil K. Singh, Member. The EC members gave a standing ovation to Dr S. Ayyappan, for providing leadership and taking the Academy to new heights during his tenure as President of NAAS. Prof R.B. Singh also appreciated the efforts put in by Dr Ayyappan to promote and initiate many activities during his tenure. Dr S. Ayyappan, expressed that he was highly thankful to all EC members, fellowship and members of secretariat staff for excellent support that enabled him to discharge his duties effectively as President for last three years. He wished the new Executive Council all the best and hoped that it would take the Academy forward to more excellence and recognition.

Artificial Ocean fertilization and marine fisheries – An Introduction

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With terrestrial resources exploited beyond optimum levels, greater attention is being given to increased utilization of oceans. A recent area of interest in oceans is to undertake artificial fertilization of ocean waters to enhance productivity and exploit the positive outcomes from such geo-engineering manipulations. India's first scientific attempt to explore this idea is through the "LOHAFEX"- iron fertilization experiment conducted in the southern Atlantic by a group of oceanographers led by Dr S.W.A. Naqvi the former director of CSIR-National Institute of Oceanography.

Since ocean fertilization experiments generally promote enhanced production of oceanic phytoplankton community which will heavily consume atmospheric carbon dioxide and release oxygen, the ocean fertilization experiments may reduce the carbon footprint for the country. With increasing pressure on countries to reduce carbon footprint, many policy makers find the artificial ocean fertilization experiments as a mechanism to improve carbon sequestration and reduce their pressure on carbon footprints. As an output of the enhanced productivity, the general belief is that the secondary and tertiary productivity in the area also will improve resulting in better fish production. However no ocean fertilization experiments have been conducted in Indian marine waters. The researchable issues in Indian marine fisheries context would be to: (i) Identify and map the permanent and seasonal mesoscale eddy formation in the Northern Indian Ocean; (ii) Quantify the primary productivity enhancement occurring naturally in our marine ecosystem due to natural events such as cyclones, seasonal upwelling and others; (iii) Identify and map the limiting nutrients in our ecosystem and the quantum of their requirement in artificial fertilization to enhance productivity; (iv) MESOCOSM or lab based experiments to understand the natural ecological succession; (v) Identify the potential negative impacts in case of an undesirable ecological succession which may produce large quantity of obnoxious algae and create deleterious effects on the marine food web; (vi) Economic estimation of the positive and negative impacts of such processes which would be useful in settling any dispute which may arise among adjoining countries when an artificial fertilization experiment is carried out in oceanic waters.

Quantifying natural production processes

Fixation of inorganic carbon to organic carbon in the ocean is driven purely by phytoplankton. Phytoplankton carbon fixation plays an important role in maintaining the quasi steady state level of atmospheric carbon dioxide. Relative contribution of marine primary productivity to global photosynthetic production is between 10 and 50%. The magnitude ranges from 20 to 55 Giga tones of Carbon / year. Ocean-atmospheric coupled climate models predict changes in the ocean circulation and hypothesize that such changes will stimulate phytoplankton biomass production in the nutrient depleted areas in the open ocean. The effect on atmospheric carbon dioxide is uncertain because the relationship between the enhanced primary production and air-sea exchange of carbon dioxide is not understood. The challenge is to study the magnitude and variability of primary productivity, its time scale changes in atmosphere forcing and upscaling it into secondary (micro / meso zooplankton and planktivorous small pelagic fish productivity) and tertiary productivity (marine fisheries productivity).

The Northern Indian Ocean (NIO) comprises a unique variety of biogeochemical provinces, including eutrophic, oligotrophic, upwelling, and oxygen-depleted zones, all within an area of relatively small geographic extent. This reflects the pronounced semiannual reversals in regional winds (the seasonal monsoons- summer and winter) that make this region a focus for intense study. Previously published sea-air flux estimates indicate that the NIO could account for 12-52% and 0.1-133% respectively, of the known oceanic sources of nitrous oxide and methane. Even though the uncertainties are large, particularly for methane, the Arabian Sea / NIO could be an important contributor to the marine methane source and a dominant global source of atmospheric nitrous oxide. The atmospheric inventories of nitrous oxide and methane are currently both increasing by about 0.3% per year. Both gases are strongly active and together account for 18% of enhanced greenhouse levels. Nitrous oxide is implicated in the generation of stratospheric nitrite, which influences stratospheric ozone levels, and methane participates in the photochemistry of tropospheric ozone as well as hydroxide and in the formation of stratospheric water vapor or moisture content. Existing estimates of oceanic nitrous oxide and methane sources are dominated by disproportionately large contributions from biologically productive areas such as the NIO. However, the spatial and temporal coverage of such regions remains limited, global estimates remain unsatisfactory. Future,

climatically induced modifications to the upwelling and circulation characteristics of the NIO and other regions experiencing strong wind-driven upwelling may have profound effects on future green-house gas emissions from the oceans.

Integrated *in-situ* column primary production (PP) can be estimated and PP can be computed at biome level using in-situ and satellite (SRS) remote sensing data by adopting suitable mixed layer PP model. Chlorophyll is an important indicator of the quality of aquatic ecosystems that is amenable to in-situ and space borne measurement. Phytoplankton blooms (indicated by rapid increase in chlorophyll concentration) and spurts in primary productivity are important for maintaining the marine organisms at higher tropic levels, but when associated with eutrophication and harmful algal blooms, as noticed in the coastal waters of India, such events are directly linked (negatively) to the quality of water. Another important measure of water quality in the coastal environment is the suspended sediment load. Optical instruments such as spectral radiometers are able to monitor changes in chlorophyll and suspended sediment load in real time. Furthermore, such measurements can form the basis of local algorithms for application in remote sensing, allowing the results to be extrapolated to the entire study area through remote sensing. Optical methods for monitoring water quality and productivity have been established in other marine environments, for example in the USA. In India, a start in this direction has been established and operationalized by the SATCORE programme of ESSO-INCOIS.

Marine resources, especially fishery resources, have a strikingly important place of prominence in the biodiversity map of the earth. In the Indian context the importance of marine fisheries can never be overstated with a prominent chunk of future requirement of socio-economic and nutritional sustenance being centered in the marine sector. Towards establishing a scientifically deduced relationship between the marine environment and the resource availability on a realistic basis, there is a need for a focused application of easy-to-survey oceanic, geophysical and physicochemical parameters and their direct or latent influence upon the plankton which are the self-replenishing source of food and nutrition for the fishery resources spread in our EEZ. The spatio-temporal fluctuations of the plankton richness which can be remotely sensed have long been established as a major factor in predicting resource richness in general and congregation and catchable availability in particular. Taking a cue from these established models; resource availability can be predicted from these easy-to-observe parameters after a thorough validation of the prediction scenarios juxtaposed with the estimated catch attributable to various fishing grounds. The change in the pattern of fishing, period of absence and the composition of fish caught per haul, when analyzed for a range of geospatial expanses would help refining and augmenting the existing models resulting in a comprehensive prediction algorithm. Further, such models would come in handy in the assessment of marine resource potentials and there periodic revalidation on a homogenous platform with a proper measure of confidence interval. ICAR-CMFRI has a major research programme named Chlorophyll based Remote Sensing assisted Indian Fisheries Forecasting System which is operationalizing the “primary productivity to biomass model” in Indian EEZ under the auspices of the Jawaharlal Nehru Science Fellowship, Govt. of India, Prof Trevor Platt, FRS is coordinating along with Dr Shubha Sathyendranath.

The scientific community needs to be sensitized about the possible outcome of artificial ocean fertilization experiments. There is an urgent need to understand the ecological progression or succession of artificial ocean fertilization experiments which can support policy decisions related to ocean and marine fisheries management in the context of an artificial ocean fertilization experiment. If the experiment leads to negative impacts, there should be mechanisms for mitigating such negative impacts and supporting economic estimations realising proper dispute settlement between two countries which are involved / affected in such an experiment and India may look forward in developing research programmes which can resolve such challenges.

References

1. Glibert, P.M.; Azanza, R.; Burford, M.; Furuya, K.; Abal, E.; Al-Azri, A.; Al-Yamani, F.; Andersen, P.; Anderson, D.M.; Beardall, J.; Berg, G.M.; Brand, L.; Bronk, D.; Brookes, J.; Burkholder, J.M.; Cembella, A.; Cochlan, W.P.; Collier, J.L.; Collos, Y.; Diaz, R.; Doblin, M.; Drennen, T.; Dyhrman, S.; Fukuyo, Y.; Furnas, M.; Galloway, J.; Graneli, E.; Ha, D.V.; Hallegraeff, G.; Harrison, J.; Harrison, P.J.; Heil, C.A.; Heimann, K.; Howarth, R.; Jauzein, C.; Kana, A.A.; Kana, T.M.; Kim, H.; Kudela, R.; Legrand, C.; Mallin, M.; Mulholland, M.; Murray, S.; O'Neil, J.; Pitcher, G.; Qi, Y.Z.; Rabalais, N.; Raine, R.; Seitzinger, S.; Salomon, P.S.; Solomon, C.; Stoecker, D.K.; Usup, G.; Wilson, J.; Yin, K.D.; Zhou, M.J.; Zhu, M.Y. (2008). Ocean urea fertilization for carbon credits poses high ecological risks. *Marine Pollution Bulletin* 56(6): 1049-1056.

2. Jones, I.S.F. & Young, H.E. (1997). Engineering a large sustainable world fishery. *Environmental Conservation,* 24 (2): 99–104. Doi:10.1017/S0376892997000167.

3. Matear, R. J. & B. Elliott (2004). Enhancement of oceanic uptake of anthropogenic CO2 by macronutrient fertilization. *J. Geophys. Res.* 109 (C4): C04001, Doi:10.1029/2000JC000321, Bibcode: 2004JGRC.10904001M.

4. Mayo-Ramsay, J P. (2012). Climate Change Mitigation Strategies: Ocean Fertilisation, the Argument for & against. LAP Lambert Academic Publishing, ISBN: 978-3659258992.

5 Mission, G. (1999). WWF's marine police: saving the Sulu Sea. http://gina.ph/Cyber Dyaryo/features/cd1999_0930_005.htm

6. Smith, S.V., Kimmerer, W.J., E.A., Brock, R.E., Walsh, T.W. (1981). Kaneohe Bay sewage diversion experiment: perspectives on ecosystem responses to nutritional perturbation. *Pacific Science* 35: 279-395.

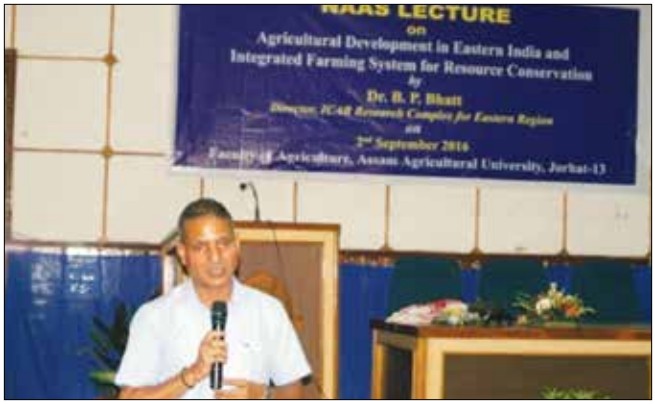
Activities organized by Regional Chapter

NEH Chapter - Lecture Series

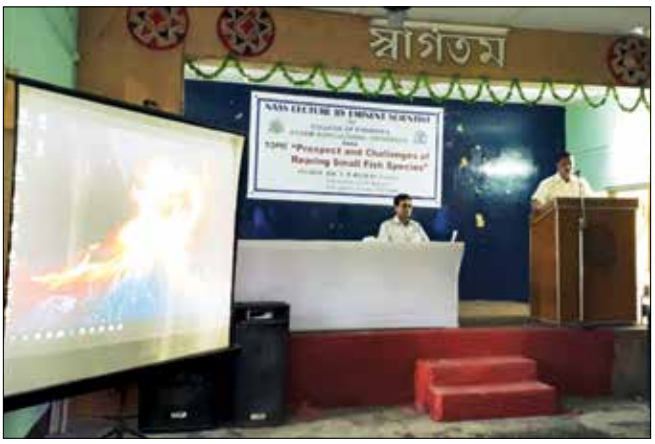
The Chapter organized on June 10, 2016 at the College of Home Science, Assam Agricultural University (AAU), Jorhat, a lecture on "Relevance of Home Science Education to Address Socio-Economic Issues" delivered

by Dr Minaxi Pathak, Former Dean, Faculty of Home Science, AAU. She highlighted the important socio-economic issues confronting Assam as well as other north eastern states of India which could be effectively addressed by the home science scientists.

The Chapter also organized on September 02, 2016 at the College of Agriculture, AAU, Jorhat, a lecture on "Agricultural Development in Eastern India and Integrated Farming System for Resource Conservation" delivered by Dr B.P. Bhatt, Director, ICAR Research Complex for Eastern Region (ICAR-RCER), Patna. Dr Bhatt made an excellent exposition on problems and prospects of Agriculture in the North Eastern (NE) India and elaborated on the prospect of Integrated Farming System (IFS) for rural livelihood promotion with some unique Integrated Farming Systems (IFS) models. Dr Bhat also explained the prospect of utilization of resources of Eastern India to usher the 2nd green revolution in the realm of organic agriculture potentials of NE India.

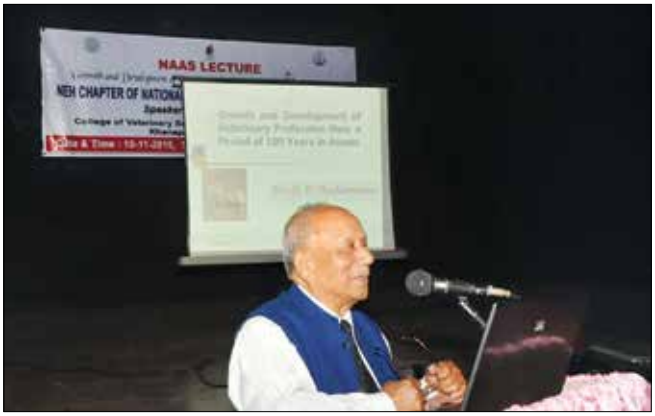


Dr S.P. Biswas, Professor, Department of Life Sciences, Dibrugarh University and an eminent fishery scientist of the region, delivered a lecture on "Prospects and Challenges of Rearing Small Fish Species" at the College of Fisheries, Raha, Assam Agricultural University, on October 25, 2016. Dr Biswas highlighted the potential of ornamental fisheries in North-East India and also discussed the challenges to be met. He emphasised on substantial market demand of



indigenous ornamental fish species and expressed his concern on the declining trend of ornamental fish biodiversity due to various anthropogenic stresses and clandestine trade. Highlighting the nutritive value of small indigenous food fish species (SIFFS) he opined that potential scope exists to address the malnutrition problem of rural poor in India by cultivating small indigenous species.

Dr C. K. Rajkonwar, Former Associate Dean, Lakhimpur College of Veterinary Science, AAU, and former Director, Department of Animal Husbandry and Veterinary, Govt. of Assam, delivered a lecture on



"Growth and Development of Veterinary Profession over a Period of 100 Years in Assam" at the College of Veterinary Science, Khanapara, on November 10, 2016. He deliberated upon the transformation of the Veterinary Profession right from the British era till today encompassing education, research and service delivery system. He dwelt upon the overall scenario of animal husbandry and veterinary sector in the country with special reference to the North East, and Assam in particular. Dr Rajkonwar stressed on animal health and animal welfare issues and gave a clarion call to the veterinary and animal husbandry scientists to engage themselves more on field oriented research so that the ultimate stakeholders *i.e.* the farmers can reap the benefit of this science.

Convener, NEH-Chapter: Dr K.M. Bujarbaruah
V.C., AAU, Johrat

Academy's Collaboration with Other Major Events

1st International Agrobiodiversity Congress

The Academy collaborated with the Indian Society of Plant Genetic Resources (ISPGR) and Bioversity International in organizing the 1st International Agrobiodiversity Congress held in New Delhi from November 06-09, 2016. The Congress, inaugurated by the Hon'ble Prime Minister of India, and attended

by 900 participants from 60 countries, discussed various aspects of access, conservation and use of agrobiodiversity in 16 technical sessions, four satellite sessions, a genebank roundtable, a public forum, a farmers' forum and poster sessions. The Congress alerted that the world is facing rapid loss and extinction of biodiversity, and loss of a gene is a major loss for our future generations. It underpinned that, if conserved and used sustainably, agrobiodiversity could make an important contribution towards resolving problems of hunger, food insecurity, malnutrition and climate change, thus help in attaining the Sustainable Development Goals (SDGs). But, limitations in policies, investment, infrastructure, technical capacity as well as cross-sectoral coordination and partnerships have often prevented efficient use of agrobiodiversity.

Based on the presentations and comprehensive deliberations, the delegates adopted the following declaration:

- "We call upon nations to accord top priority to the agrobiodiversity conservation and their sustainable use towards achieving targets of SDGs relating to poverty alleviation, food and nutritional security, good health, gender equity and partnership.
- We recognize the importance of traditional knowledge on agrobiodiversity of farm men and women, pastoralists and other tribal and rural communities and their central role in its conservation and use for a food and climate resilient world. We, therefore, call upon countries to develop the necessary funding, legal and institutional mechanism to ensure and facilitate their continued active participation.
- We urge researchers and policy-makers to initiate, strengthen, and promote complementary conservation strategies to conserve and use

agrobiodiversity including crop wild relatives in more dynamic way to ensure a continuum between *ex situ, in situ* and on farm conservation strategies to combat food and nutrition insecurity as well as adverse effects of climate change, land degradation and biodiversity loss.

- We invite researchers to employ modern technologies including, but not limited to, genomic, space, computational, and nano-technologies for characterization, evaluation and trait discovery using genetic resources. The aim should be to achieve efficiency, equality, economy and environmental security in agricultural production systems and landscapes.
- We reemphasize the necessity of global exchange of plant, animal, aquatic microbial and insect genetic resources for food and agriculture to meet the ever-growing food and nutritional needs of each country. Nations also need to harmonise their multiple legal systems and prioritize the improvement of their phytosanitary capacities to facilitate safe transfer of genetic resources using latest technologies and trans-boundary partnerships.
- We strongly recommend that the governments and societies put greater emphasis on public awareness and capacity enhancement programs on agrobiodiversity conservation and use.
- We strongly suggest developing and implementing an agrobiodiversity index to help monitor conservation and use of agrobiodiversity.
- We urge public and private sector partnerships to actively invest in and incentivize the utilization of agrobiodiversity to address malnutrition, increase the resilience and productivity of farms, and enhance ecosystem services leading to equitable benefits and opportunities with particular emphasis on women and youth.
- The UN is urged to consider declaring soon a 'Year of Agrobiodiversity' to draw worldwide attention and to catalyze urgent action.
- We unanimously recommend that a congress focusing on agrobiodiversity be held each 3-5 years in order to maintain emphasis on this important area that we have realized in Delhi, for which a continuing committee be formed."

4th International Agronomy Congress

The Academy collaborated with the Indian Society of Agronomy and the ICAR in organizing the 4th International Agronomy Congress on "Agronomy for Sustainable Management of Natural Resources, Environment, Energy and Livelihood Security to Achieve Zero Hunger Challenge", held at New Delhi on November 22-26, 2016. The theme discussed was extremely topical and addressed emerging challenges and possible solutions towards a Zero Hunger World.

Main Findings of NAAS-Short Term Studies

NAAS-sponsored short-term study on *"A Decade of Research in Developing Water-wise Technologies for Various Crops in India",* conducted by Dr S.K. Gupta, Fellow of Academy, has been completed and report has been submitted by him. The report is based on the review of 300 published papers categorized under, water audit and policy, crop neutral technologies and crop specific technologies. Some of the major points emerging from the review on water audit are: on-farm water measurement, that is not even in its infancy and needs to be popularised for best use of the available water, modifications in *warabandi* system to match with advanced irrigation scheduling methods and / or critical growth stages. Demand management strategies need to be popularised in rain fed, canal, tank and groundwater irrigated lands. On crop neutral technologies, the farmers are raising doubts over water saving aspects of laser land levelling, it could be addressed by training of service providers so that suitable equipment is put in place for harnessing the desired benefits of technology. Drip / sprinkle irrigation saves water and increases crop yield but not to the extent as claimed, as a policy support to this, there is a need to relax the farm size limitation in providing micro-irrigation (MI) subsidies and efforts need to be made to manufacture improved sprinklers in India. On crop specific technologies with regard to rice a basket of technological interventions have been developed that range from simple to complex with no investment to high investment. These result in saving of water to more than 50% in some cases, synergetic effects have been observed in several of these interventions

if adopted simultaneously. Similar implications of water saving technologies have been examined with regard to wheat, sugarcane, cotton and maize. In respect of policy interventions key recommendations are; need to end the multiplicity of control on water sector with a multi-disciplinary apex body; need to institute incentice mechanisms to encourage adoption of water saving technologies especially in water scare areas or where water table is declining sharply. Water-energy nexus is now well defined and there is a need to make policy to strike a balance through tariff control of electrical power. Replicating the success stories of one place and appropriate institutional arrangements to be put in place, policy framework for application of bio-regulators to minimize water requirements may be devised for practical applications. Solar energy needs to be tapped to the maximum for agricultural use through appropriate subsidy programme, and the groundwater overuse has to be kept in view, for any policy support.

Fellows Views

Doubling Farmers Income

Niti Aayog has drawn up a splendid, far-reaching program to double rural incomes in the next five years. Indeed, increasing income of the farmers is the only way out to reduce rural poverty. This program deserves the support of all worried about farming, particularly, the NAAS fellowship. The Niti Aayog's blue print aims at marketing reforms to get better access for the farmers to realize higher prices; improve storage and transport. Role of private sector in contract farming, and purchase of the produce directly from the farmers, removing intermediaries, is recommended. Besides these immediate measures, increase in productivity per hectare as well as per person engaged in farming is essential for enhancing incomes. Productivity increase needs sustainable improvement in the natural resource base - soil health and fertility, efficient use of water for irrigation, pest and disease control, with minimal adverse environmental impact. Considering their significant role, genetic enhancement of the planting material (seeds or plantlets), and agronomy needs continuous, long term efforts using the contemporary tools and techniques. Integrated approach at the SAUs and ICAR research institutes should aim to enhance the returns on investment by the farmers to realize the objectives outlined by the Niti Aayog.

Chitranjan Bhatia

Former Secretary, Department of Biotechnology, GoI & NAAS Fellow

Forthcoming Programmes

- Strategy Workshop on Vegetable Oil Economy and Production Problems in India
  (Chair: Dr C.D. Mayee)
- Strategy Workshop on Conservation Policies for Hilsa and Mahseer
  (Chair: Dr K.K. Vass)
- Strategy Workshop on Accelerating Seed Delivery Systems
  (Chair: Dr K.V. Prabhu)
- Status Paper on Saving the Harvest
  (Chair: Prof Anupam Varma)
- Policy Brief on Crop Residue Burning in North-West India
  (Chair: Dr Yadvinder Singh)
- Policy Brief on Mitigating Land Degradation
  (Chair: Dr V.N. Sharda)

Obituaries

Born in Srinagar, India on May 25, 1949, **Dr Bharat Chattoo**, a celebrated microbiologist and biotechnologist, left for heavenly abode on November 15, 2016. Dr Chattoo had his early education from Srinagar, J&K and obtained his Ph.D. degree in the field of Microbial Genetics in 1975 from University of Delhi. He started his research journey at University of Rochester Medical Centre, Rochester, New York, U.S.A, where he worked in the area of yeast molecular genetics during 1975-78. He worked at the Sarabhai Research Centre, Baroda and at the Centre for Cellular and Molecular Biology, Hyderabad. He served as Chairman, Centre of Biosciences, University of Roorkee; Senior Professor with the Department of Microbiology and Biotechnology Centre, and Head of the Department of Microbiology, M.S. University of Baroda, Baroda. He was the Coordinator of Biotechnology Teaching Programme and the Director of Centre for Genome Research as well as the Hon. Director of the Cluster Innovation Centre at M.S. University. He was also the founder Vice Chancellor of the Shri Mata Vaishno Devi University, Jammu (2001-2004).

He has been a Visiting Scientist / Professor, at the Weizmann Institute of Science, Israel; National Institute of Bioscience and Human Technology, Tsukuba, Japan; Rice Genome Programme, Tsukuba, Japan; United States Department of Agriculture, Beltsville, Maryland; and the Friedrich Miescher Institute, Switzerland.

Dr Chattoo made outstanding contributions to functional genomics of fungal pathogens, genomics and proteomics approaches to the study of host-pathogen interactions and in bioprocess development. He was a fellow of the Indian National Science Academy; National Academy of Agricultural Sciences; National Academy of Sciences (Allahabad); Third World Academy of Sciences, and Indian Academy of Sciences (Bangalore). He served on several expert committees of the Govt. of India and was a member of the task force of the Department of Biotechnology, Govt. of India and Gujarat Biotechnology Council of Government of Gujarat. For his brilliant contributions, he was decorated with the National technology award for transfer of technology to industry; Lifetime Achievement Award for Rice Blast Research; and the Acharya J.C. Bose National Fellowship of DST. He was a Member of the Genetics Society of America, International Society of Plant Molecular Biology, American Society of Microbiology, Gujarat Biotechnology Council, Society of Cell biology and member of several review panels. He was also on the editorial board of several professional journals.

In his sad demise the academy has lost a distinguished microbiologist and biotechnologist, The Fellowship of the academy deeply mourns and expresses its deepest condolences to the family at the sad demise of Dr Bharat Chattoo.

Dr Swadesh Kumar Handa was born on July 5, 1938 in Gujrawala (now in Pakistan). He left for heavenly abode on October 31, 2016. He obtained his M.Sc. from Vikram University in 1963 and Ph.D. from IARI, New Delhi in 1973. He served ICAR-IARI in various capacities, and superannuated as Head of the Division of Agricultural Chemicals at IARI, New Delhi. He was appointed as first Project Coordinator of All India Coordinating Research Project on Pesticide Residues during 1985-1998, and later joined as Head of the Division of Agricultural Chemicals. He initiated and supervised work on multi location field trials following Good Agriculture Products (GAP) for the evaluation of Safe Waiting period and fixing of Maximum Residue Limit (MRL) for various pesticides. For more than 10 years, he was an expert member of Central Insecticides Board and Registration Committee (CIB&RC), and remained expert member of the scientific Panel on Pesticides & Antibiotic residues of Food Safety Standard Authority of India (FSSAI) from 2009 onwards. He also served as WHO Consultant in Ministry of Health & Family Welfare, Govt. of India, for 3 years. Dr Handa has published a number of books and book chapters and authored several research papers in various national and international journals. His contribution to agrochemical research in general and pesticide residues in particular has been widely recognized. Some products and technologies like pine oil developed by him have been patented, and commercialized in the country.

The Fellowship mourns the sad demise of Dr Swadesh Kumar Handa, a distinguished fellow of the academy and pays its homage to the departed soul, and expresses its heartfelt condolences to the bereaved family.

Prof Panjab Singh, Incoming President of NAAS

Born in Anantpur, District Mirzapur, U.P. on 10 December 1942. Educated at Agra University, B.Sc. 1962, M.Sc. 1964 and Indian Institute of Technology, Kharagpur, Ph.D. 1969.

Chancellor, Rani Lakshmi Bai Central Agricultural University, Jhansi.

Has served in different capacities and with different organizations, including Director, IGFRI, Jhansi; FAO Regional Plant Production and Protection Officer, FAO RAPA, Bangkok; Joint Director (Research), IARI, New Delhi; Director, School of Agriculture, IGNOU, New Delhi; Vice Chancellor, JNKVV, Jabalpur; Director (Vice Chancellor), IARI, New Delhi; Secretary DARE, GOI and Director General ICAR, New Delhi; Vice-Chancellor, Banaras Hindu University, Varanasi; Member, Scientific Advisory Committee, Government of India.

Besides several awards, he has received Life Time Achievement Award of Indian Society of Agronomy and Range Management Society of India, Distinguished Alumni Award, IIT, Kharagpur; D.Sc. (*honoris causa*) Banaras Hindu University, Varanasi, Tamil Nadu Agricultural University, Coimbatore, Poorvanchal University, Jaunpur, N.D. University of Agriculture and Technology, Faizabad, Rani Durgawati University, Jabalpur, and Rajendra Agricultural University, Samastipur, Bihar; President, Range Management Society of India, Indian Society of Agronomy, Indian Society of Agricultural Statistics, Indian Society of Plant Physiology, and Indian Society of Agricultural Sciences. His areas of specialization are Agronomy, Crop Production, Water Management and Agroforestry.

XIII Agricultural Science Congress at University of Agricultural Sciences, Bengaluru, Karnataka, 21-24 February, 2017

The XIII ASC is going to be organized at UAS-Bengaluru from Feb 21-24, 2017 on the theme "Climate Smart Agriculture". The four days event includes six Technical Sessions, Plenary / Public Lectures, Poster Presentations, Inter University student Elocution Contest, three Panel Discussions and two Satellite Meetings. There will be ASC India Expo 2017. A large number of participants cutting across the diaspora of researchers, policy makers, farmers, entrepreneurs and students shall be attending the Congress. Preparations are in full swing at UAS, Bengaluru for hosting this important Biennial event of the Academy. The organizing committee through this announcement is requesting everybody to join this mega-event. Your participation will be very important to developing a view and identifying appropriate technological responses including policy options to achieve "Climate Smart Agriculture" objectives for the country.

Please register for XIII ASC, send Abstracts and find all details about the event at www.agricongress2017.in

Announcement

Nominations are invited for Election of Fellows and selection of Associates of the Academy for 2018. The last date of receipt of Nominations is March 31, 2017. Nominations forms available at website: http://www.naasindia.org.

Editors: Dr K.K. Vass and Prof V.K. Gupta

Published by: H.C. Pathak, Executive Director, on behalf of the National Academy of Agricultural Sciences, NASC, Dev Prakash Shastry Marg, New Delhi 110012; Tel. (011) 25846051-52, Fax. 25846054; Email: naas@vsnl.com; Webside: http://www.naasindia.org