NAAS NEWS

RESEARCH EDUCATION AND TECHNOLOGY POLICY FORUM

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Editors

Dr K.K. Vass

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From the President's Desk

NAAS Future Role

It is indeed a matter of privilege and an honour for me to have been given the responsibility to serve this prestigious Academy. Ever since its inception in June 1990, NAAS has established itself as a 'think tank' to provide independent views on a broad spectrum of issues related to agriculture development. Over a period of 26 years, the Academy has emerged as a powerful institution that is engaged in discussion on important cross cutting multi-disciplinary and multi-institutional issues to suggest technological, institutional and policy solutions to various problems relating to agriculture research, education and development.

The advisory services that NAAS expertise can provide cut across various departments/ministries in central and state governments viz. Agriculture (crops, animal husbandry, fisheries, food processing), Natural Resources (soil, water and biodiversity), Environment and Forest, Non-conventional Energy, IT, Rural Development, Chemicals and Fertilizers, Human Resource Development, Science and Technology, Earth Sciences, Tribal Affairs, Niti Aayog, SAUs/CAUs, ICAR Institutes etc. and even some UN organizations, to name a few. While we have been associating ourselves with the Ministry of Agriculture and Farmers Welfare and National Agricultural Research System (NARS) to a large extent, our association with other related ministries/departments, Niti Aayog and private sector has been limited.

There is enough scope and opportunity to enhance the visibility and impact of the Academy. Our role will largely be advisory and to prepare documents like policy papers, road maps, assessment and evaluation of programs/ projects etc. on demand. To assume this role we may have to strengthen the interaction with stakeholders involved in government programs (centre and state) and other organisations. NAAS is fully geared and committed to the cause of promoting its mission for excellence in science education and research for accelerated, inclusive and sustainable

agricultural development. We would seek more involvement with the development departments, academic institutions and other agencies engaged in agriculture and rural development.

Presently Academy's programs and activities are based mostly on the suggestions of the Fellowship and very little as a result of discussions between NAAS and user departments or on the demand of stakeholders. In future NAAS would encourage programs that are demand driven and emanating from the user agencies, be it government or private.

NAAS can play an important role in several programs recently initiated by the government *viz*. more crop per drop (water), doubling farmer's income in next five years or independent projects like MNREGA, crop insurance, soil health card, neem coated urea etc. Our advise on GM crops and seed act to the stakeholders in past have been independent and honest. In certain cases where we feel things are not in farmers' and national interest we should not hesitate in putting forth our frank and honest opinion and find acceptance in larger interest. Our role as an individual consultant or as group from the Fellowship through its Regional Chapters can play a role of game changer on various issues of importance relating to national agricultural scenario. We should be more proactive to assume this role in the national interest.

No doubt in all these years Academy has done exceedingly well on developing documents on emerging issues which we will continue, but more focus be given on science of communication to enhance the utilisation of our efforts to attract the attention of user agencies and prompt them to pose issues to us for seeking advice or services.

To make this happen we need to devise a mechanism so as to be an important and integral part of the national policy planning and programming. The key elements of an approach that emerged after discussion with some NAAS-EC members and also during the XIII ASC with the Regional Chapters Conveners include (i) a summarised version of important recommendations with actionable pathways / suggestions made in our more than 100 policy papers, policy briefs, and base papers should be culled out and sent to all user agencies for their use and receiving feedback for future programs of the Academy; (ii) create awareness about NAAS strength, its technical expertise in different areas and the activities that NAAS can partner/share with government departments at state and center and other institutions and organisations. This could be achieved by individual interaction, communicating to all concerned, special group meetings and brain storming sessions especially designed for this purpose; (iii) strengthen and empower Regional Chapters to play an important role in sensitising concerned agencies in the respective regions about NAAS activities. Such a strong technical group could be of immense use to the authorities from program conceptualisation, formulation, and its implementation and even in the evaluation and assessment; (iv) creation of advocacy groups comprising Fellowship from NAAS and other academies, intellectuals, reputed scientists at Regional Chapters and also at central level to make our voice heard. This group should link up through continuous dialogue with the governments and other stakeholders and also make efforts to involve them in our regular activities; (v) Academy should express its independent views on various issues regularly on topical and emerging issues through leading newspapers, magazines and electronic media. A small group in NAAS office should take this responsibility and make it a regular feature; (vi) convergence building with state and central governments for creating better mechanism to deal with issues. We should prevail upon them to put NAAS as member of the committees and programs of the government, Niti Aayog etc. Regular meetings with those "who matter" at the center and state levels to sensitise them about NAAS activities and strength; (vii) promote involvement of NGOs, progressive farmers to let them serve as NAAS ambassadors and also invite them to debate on regional issues and programs to have feedback for the future activities of the Academy; (viii) NAAS secretariat should request universities/institutes to utilize the Fellowship as adjunct professors in educational institutions in the region; (ix) more efforts needed to include private/corporate intellects in NAAS ambience for spreading the visibility of the Academy and making it more effective; and (x) strengthening the science of communication for conveying the outputs from the Academy's programs and activities effectively. NAAS publications could be customised in regional languages for their wider circulation and use. Our efforts in future will also focus on this issue.

Panjab Singh
President

99th Executive Council Meeting

The 99th meeting of the Executive Council of NAAS was held on February 20, 2017 at UAS, GKVK, Bengaluru. The meeting was chaired by Prof Panjab Singh, President, NAAS. Dr H. Shivanna, Vice-Chancellor, UASB and Convener, XIII ASC also attended this meeting as special invitee. He briefed the members about the final arrangements, different events and programme of the Congress. Following were the notable decisions.

EC approved the constitution of the sectional committees for election of Fellows / selection of Associates for the year 2018. The programme for AGM, filling up of casual vacancies for EC, revised guidelines for developing status/strategy paper/policy brief, and proposed changes in NAAS Yearbook format were deliberated and approved. The EC also nominated conveners for a few regional chapters. The issue of future role of regional chapters also came up for discussion. Dr K.V. Prabhu, Secretary, also briefed the EC about the Action Taken Report on 98th meeting.

XIII Agricultural Science Congress on Climate Smart Agriculture

Prof Panjab Singh, President, NAAS welcoming the Chief Guest.

The XIII Agricultural Science Congress (XIII ASC) 2017 was held under the aegis of NAAS in collaboration with the University of Agricultural Sciences, Bengaluru, Karnataka, (UASB) during February 21-24, 2017. The theme of the Congress was "***Climate Smart Agriculture***" keeping in tune with the global climate change and the need for developing adaptation and mitigation strategies for achieving sustainable agriculture in the country. The Congress was attended by over 1500 participants representing the faculty and students from various SAU's in Karnataka and other parts of the country, traditional universities, ICAR Institutes, representatives from central and state governments, farmers, NGO's, representatives of industry including IT sector and financial institutions. The international representations included University of Kassel, Germany, University of Massachusetts, Boston, USA; The World Bank, Washington, USA, and ICRISAT, Hyderabad, India.

Chief Guest along with other dignitaries performing "Water the Earth Ceremony"

The Congress was inaugurated on February 21, 2017 by the Chief Guest Hon'ble Governor of Karnataka, and Chancellor of the University, Sri Vajubhai Vala Ji, with a special "Water the Earth Ceremony" organized on this occasion. Sri Krishna Byregowda, Hon'ble Minister for Agriculture, Government of Karnataka and Pro-chancellor of the University, Dr T. Mohapatra, Secretary, DARE and DG, ICAR, Dr Ramesh Chand, Member, NITI Aayog, Government of India, and Dr S. Ayyappan, Immediate Past President, NAAS were guests of honour. Prof Panjab Singh, President, NAAS presided over the function. Dr H. Shivanna, Vice-Chancellor, UASB graced the function as Convener of XIII ASC.

Dr S. Ayyappan, Past President, NAAS, extended a hearty welcome to the Chief Guest and all dignitaries on the dais, distinguished participants and delegates and gave an overview of XIII Congress. Prof Panjab Singh, President, NAAS extended a warm welcome on his behalf and on behalf of the Academy to the Chief Guest, dignitaries and all distinguished participants. In his remarks, he mentioned that the Academy has completed 26 years and established great credentials in agriculture science, technology and education at national/international level. Prof Singh highlighted some key strategies and wished the Congress a success and hoped that Academy would look forward for good actionable recommendations as the output from the Congress.

Dr T. Mohapatra, Secretary, DARE and DG, ICAR, in his remarks said that climate change is a big obstacle in achieving the targeted food production and the country needs to tackle it. He expressed confidence on our agriculture scientists and was hopeful that this Congress

Dr T. Mohapatra addressing the participants

will come up with very useful recommendations which will be vibrant enough to face the challenges of climate change by finding appropriate solutions for developing suitable technologies under enabling policies.

Dr Ramesh Chand, Member, Niti Aayog, Government of India called upon farm scientists to come out with region-specific impact assessments. He also suggested that cropping patterns that are climate friendly and consistent with natural resources should be evolved so that they are sustainable in the long-term. Impressing upon scientists not only to look at the adaptation strategies but also focus on mitigating the impact of climate change. Prof M.S. Swaminathan, Chairman, M.S. Swaminathan Research Foundation, who could not attend the Congress in person addressed the participants through his video message and highlighted some key strategies that need to be followed for making Indian Agriculture climate smart.

Dr Ramesh Chand addressing the participants

Karnataka State Agriculture Minister, Sri Krishna Byregowda in his remarks exhorted scientists to start creating awareness both among the public and policy makers including national and state leadership, on the efficient use of water and sustainable use of land resources, which could help to tackle the challenge of climate change.

Sri Vajubhai Vala Ji, Hon'ble Governor of Karnataka, presented the Academy awards to the scientists selected by NAAS, and released publications brought out by NAAS and UASB for this Congress.

Dr (Ms) Uma Lele receiving award from the Chief Guest

Release of Publications

In his address, Hon'ble Governor of Karnataka, congratulated the Academy for this timely initiative of holding this important Congress in Karnataka state, facing drought for last 4-years. He was highly appreciative of scientists who undertook large scale experimentation and found solutions to state problems and congratulated all the awardees. He drew comparison of modern scientists with "Rishi-Munis" of yester-years, who on the strength of their knowledge, used to provide leadership and impart understanding to the communities, in different areas of daily activities. He emphasized that if we save water, water in turn will save us. He impressed upon all stakeholders of agriculture to join hands to promote, innovate climate smart technologies which in holistic way will lead us

Chief Guest, Hon'ble Governor of Karnataka delivering inaugural address

to achieve the objective of Climate Smart Agriculture resulting in Green Economy. He declared the Congress open and wished all participants intellectually beneficial discussions, desired implantable outputs from the Congress and memorable stay at Bengaluru.

The inaugural session concluded with a formal vote of thanks proposed by Dr H. Shivanna, Vice-Chancellor, UASB, GKVK, and Convener, XIII ASC.

Several plenary lectures were delivered by eminent speakers *viz.* Dr Andreas Buerkert, University of Kassel, Witzenhausen, Germany; Dr Anil Kakodkar, Former Chairman, Atomic Energy Commission of India; Dr Kamaljit S. Bawa, Professor of Biology, University of Massachusetts, Boston, USA; Dr V. Prakash, Former Director, CFTRI, Mysore and Vice-president, IUNS; Dr K. Kasturirangan, Former Chairman, ISRO, and Former Member, Planning Commission, Government of India; Dr (Ms) Uma Lele, Independent Researcher and Former Senior Advisor, The World Bank, Washington DC, USA; Dr David Bergvinson, Director General, ICRISAT, Hyderabad; Sri Krishna Byregowda, Hon'ble Minister of Agriculture, Government of Karnataka and Dr Prashant Gupta, Principal Director, Microsoft Cloud & Enterprise Division, Hyderabad.

Dr Anil Kakodkar delivering plenary lecture

Dr Andreas Buerkert delivering plenary lecture

During four day Congress, 12 technical sessions were organized covering 15 sub-themes in which very eminent 84 invited speakers presented their research in each specific sub-theme area. In the Congress three panel discussions were held in which very senior level experts involving scientists, policy makers, development departments and farmer groups actively participated and presented their views. Three poster sessions were organized, in which young scientists presented their work. These were evaluated by expert judges for selecting Best Poster papers. On this occasion Agri-Expo was inaugurated by Sri Krishna Byregowda, Hon'ble Minister and it was followed by Farmers – Scientists interaction at the same venue and large number of farmers raised many issues concerning impact of climate change on their crop production, and the scientists present satisfactorly explained them the coping strategies that farmers need to adopt to minimize production loss.

Farmers - Scientists Interactive Meet

Sri D.V. Sadananda Gowda**,** Hon'ble Minister for Statistics and Programme Implementation, Government of India, presided over the valedictory function on February 24, 2017. Two Hon'ble MLA's from Karnataka State Assembly, Sri S.R. Vishwanath and Sri Y.A. Narayana Swami were guests of honour. Sri Gowda in his remarks stressed the importance of science and scientists in solving societal problems and hoped that the deliberations of the Congress would enable and empower the nation in dealing with impacts of climate change in agriculture. The recommendations that emerged from the different technical sessions led to drafting and adoption of Bengaluru Declaration of XIII ASC presented on page 6.

Sri D.V. Sadananda Gowda, Hon'ble Minister for Statistics and Programme Implementation delivering valedictory address

XIII Agricultural Science Congress - 2017

21-24 February 2017, Bengaluru, India

Bengaluru Declaration - 2017

Climate change and climate variability have become major concerns for Indian agriculture. Global warming caused by increased emission of greenhouse gases is manifesting in terms of increased temperature, erratic and heavy rainfall, floods, droughts, heat-waves, frost and hail storms. These events are taking a heavy toll on agricultural production. The short to medium term (2015-2039) impacts of climate change are projected at 4.5 to 9.0 per cent decrease in annual food grain production which translates to 1.5 per cent of GDP. Farmers suffer huge economic losses following crop failures due to droughts, floods, and unseasonal rains while the central and state governments incur enormous expenditure on compensation. Considering the importance of the subject, the National Academy of Agricultural Sciences (NAAS) selected **Climate Smart Agriculture (CSA)** as the theme of the XIII Agricultural Science Congress held at University of Agricultural Sciences, Bengaluru during 21-24 February, 2017. CSA means adopting and promoting smart agricultural practices which help farmers to cope with climate variability. Over a 1000 agricultural scientists from India and abroad deliberated at length on the various impacts of climate change, the current status of CSA, future research needs, public policies and capacity building needs of farmers. The congress made the following resolution as the ***Bengaluru Declaration*** for Climate Smart Agriclture.

The congress noted that large parts of our country are vulnerable to the impacts of climate change and urgent steps are required to quantify the current and future impacts on different crop commodities, livestock, poultry, fisheries and evolve cost effective climate resilient technologies. Research programmes are to be strengthened on development of multiple abiotic stress tolerant and climate ready crop varieties, precision farming methods to reduce emission of greenhouse gases, efficient water and nutrient management in irrigated crops, alternative options to crop residue burning, development of sensor based precision farming technologies, protected cultivation, soil carbon sequestration, innovative feeding methods and manure management to reduce methane emissions from livestock. The advantages of integrated farming systems approach in adaptation and mitigation needs to be assessed. Cost effective improvements in capture and culture fisheries are required to offset the losses due to temperature rise and water shortage. The country needs to invest on improvement of agro-meteorology and weather forecasting infrastructure and develop a robust agro advisory and forewarning system across the country. Design of new schemes in agriculture, rural development, energy and water sectors need to consider climate change adaptation as the focal point. Considerable investments are needed on modernizing irrigation methods and financial support for implementation of contingency crop planning. Incentives for prudent use of natural resources like water and chemical inputs to reduce carbon foot print. Convergence of schemes under the Ministry of Agriculture and re-orient them to promote adoption of smart agricultural practices. Lastly massive effort of capacity building and awareness generation among farmers, NGOs and other stake holders is necessary to make Indian agriculture climate smart.

University of Agricultural Sciences, Bengaluru, Karnataka
National Academy of Agricultural Sciences, New Delhi

Programmes held

New Year Get-together

Academy organized a get-together of Delhi based Fellows at NAAS complex on January 2, 2017, it was chaired by Prof Panjab Singh, President. Others present on the dais were Prof R.B. Singh, Past President, Dr T. Mohapatra, Secretary, DARE and DG, ICAR, Prof Anupam Varma, Vice-President, Prof M.P. Yadav, Past Secretary, Dr K.V. Prabhu, Secretary, Dr J.K. Jena, Secretary, Prof V.K. Gupta, Past Editor, and Dr V.K. Bhatia, Editor. Dr Prabhu extended a very warm welcome to the new President and to all distinguished Fellows. He introduced to the house, the new members of EC including the newly elected Fellowship and Associates present on the occasion.

Prof Panjab Singh, President, NAAS addressing the Fellowship

Prof Panjab Singh, President of the Academy also welcomed the Fellowship and greeted them with a New Year 2017 wishes. He also thanked Fellowship for bestowing him the responsibility as the President of the Academy. He pointed out that the Academy is capable to extend strong knowledge support to ICAR and to the government especially for the policy makers. He further stressed that the Academy needs to match its programs and activities to fulfill the objectives of various government programs for development of agriculture. The President prioritised five areas viz., (a) simultaneous increase in production, protection and resources, needing innovative technology and defined investment priorities; (b) serious efforts for enhancement of pulses and oilseeds production; (c) strong monitoring mechanism and appropriate review on government's national crop insurance scheme, procurement of agriculture produce at MSP etc.; (d) arresting the declining enthusiasm among teachers and researchers in education and research; (e) production of trained and skilled manpower right from farmer level and upward. He emphasized that the Academy should develop mechanism to get involved with two important initiatives of the government viz., (i) more crop per drop of water, and (ii) doubling farmers' income in next five years. He also pointed out that there are ways to fulfill these gigantic tasks as the Academy has enormous strength of talent. He also appraised the house about activities planned and progress made on the organization of the XIII ASC at UAS, Bengaluru during February 21-24, 2017.

Participation of NAAS Fellowship

Release of the publications of NAAS

On this occasion Academy's publications, viz., strategy/ policy papers, NAAS Yearbook 2017, NAAS-NEWS October-December 2016, and NAAS Planner 2017 were released.

Prof R.B. Singh, Past President, in his remarks conveyed New Year Greetings to all Fellowship, extended hearty welcome to the President Prof Panjab Singh and thanked Dr S. Ayyappan, Immediate Past President for his significant contribution in promoting the Academy activities during his tenure of three years. He also appreciated the work of the entire secretariat for untiringly attending to day to day activites of Academy. He stressed and supported the correct thinking of the government's two initiatives on more crops per drop of water and doubling of farmers' income. Highlighting the priorities, he pointed out that natural resource management; nutrition management and food security require support of inclusive policies

and implementation plan. Finally he advocated a full synergy between ICAR/DARE and Academy to decide the pathways of different activities for reaching the unreached. Prof M.P. Yadav, Past Secretary and Prof V.K. Gupta, Past Editor in their remarks thanked the Academy for providing them an opportunity to work for NAAS activities and appreciated the support received from EC members and secretariat staff.

Dr T. Mohapatra, Secretary, DARE and DG, ICAR wished everyone a very happy and prosperous new year 2017. He also congratulated New President, Secretary, Editor, Fellows and Associates. He emphasized on ICAR and NAAS relationship, lauding the role of NAAS in providing guidance to government and scientific committees. He pointed out that NAAS can play a very vital role of extending advisory services to government in accelerating the process of implementation of the developmental programs, which in turn will enhance the visibility of NAAS. He, however, cautioned NAAS to chose topics very carefully so as to avoid repetition and should have only novel actions for implementation. He desired that ICAR should be true beneficiary of NAAS. He pointed out that Fellowship should not be complacent on quality but constantly improve the benchmark for electing Fellowship. He also mentioned that rating of the journals should be very stringent.

Several Fellows expressed their views in the open house discussion and gave valuable inputs on the issues regarding; rating of the journals, distress of farmers, general IPR policy, farmer guided policies, impact of policy papers, concept of seed hub, threats of bio-safety, post harvest management and integration of production value chain, projecting the independent views of Academy in print media, doubling farming income and marketing for new crops.

President in his concluding remarks assured that all the suggestions and views of the Fellowship would be deliberated upon to churn out the important ones for establishing a close linkage with government.

The programme ended with a vote of thanks proposed by Dr J.K. Jena, Secretary to all the dignitaries present on the dias, distinguished Fellowship, members of executive council and members of staff of Academy secretariat.

Activities of the Regional Chapters

Kochi

A special lecture organized by NAAS, Kochi Chapter at CMFRI, Kochi on January 09, 2017, was attended by NAAS Fellowship in Kerala, scientists, technical officers, and research scholars of CMFRI, CIFRI, PMFGRC, and NBFGR and faculty from Cochin University of Science & Technology, Kochi. The lecture was delivered by Dr Pranab Mukhopadhyay, Professor of Economics, Goa University on the topic 'Economics and Nature'.

Welcoming the speaker by Director, CMFRI

Dr A. Gopalakrishnan, Director, CMFRI and Convener of Kochi Chapter welcomed all distinguished participants and introduced the speaker.

Dr Pranab Mukhopadhyay, in his lecture gave an introduction of the basic principles of economics that are applied in the study of nature. He highlighted the services provided by the nature to the human and society and how they are valued including economic principles underlying such valuations. He mentioned that the concept of GDP measured today excludes the cost of services provided by the nature to the society. The concept and methodology followed in green accounting wherein the GDP included the social and environmental costs of the services provided by the nature were elaborated by him.

Dr Mukhopadhyay also presented a case study conducted by him on valuation of coastal and marine ecosystem and informed the house that provisionally about 3.1% of the Net National Product (NNP) comes from marine ecosystem. Out of this, the provisioning services, accounts for 26% of the total contribution of marine ecosystem; regulation services contribute 44% and recreational services 30%. He mentioned that a gap exists in such green accountings due to the difficulties in valuation of non-traded goods and services and loss of livelihoods of the local residents in certain cases. For such cases in natural resources valuation, the concept of shadow prices is adopted. Dr Mukhopadhyay concluded that the valuation of natural resources and their services is very much essential and important in arriving at the economic development indicators of the country.

At the end Dr A. Gopalakrishnan, Convener, thanked the speaker for a thought provoking lecture on economic evaluation of ecological services of natural resources.

Hyderabad

A special lecture was organized by NAAS-Hyderabad Chapter at CRIDA, Hyderabad on January 13, 2017.

Dr J.C. Katyal delivering lecture

The lecture on "Climate Smart Agriculture – Concept for Sustainable Land Management" was delivered by Dr J.C. Katyal, Former Vice-Chancellor, CCS HAU, Hisar. It was attended by respected Fellowship of local chapter, scientists, research associates and senior research fellows from CRIDA, Hyderabad.

At the outset Dr Ch. Srinivasa Rao, Director, CRIDA and Convener, NAAS Hyderabad Chapter extended a warm welcome to the chief guest. Further, in his remarks, he highlighted the activities of NICRA and development of 619 district agriculture contingency plans and implementation of NICRA models at ground level.

Dr J.C. Katyal in his lecture highlighted the impact of Green Revolution on productivity as well as on natural resources under climate change scenarios. Non-judicious use of natural resources such as ground water, imbalanced fertilizers, and lack of organic matter recycling resulted in soil health degradation and production plateau. He highlighted different measures to overcome the adverse effects of climate change on Indian Agriculture. He further emphasized that the integration of research, policy and development measures is must for the success of Climate Smart Agriculture. He stressed that the success of climate smart agriculture is also linked with increased interaction level of scientists with farmers. The lecture ended with useful discussion and deliberations among participants.

Ludhiana

A special lecture was delivered by Dr Tilak Raj Sharma, Director, National Agri-Food Biotechnology Institute (NABI), Mohali on March 1, 2017 at Punjab Agricultural University, Ludhiana, under the aegis of Ludhiana Chapter of National Academy of Agricultural Sciences. Dr Sharma talked on 'Cloning and Characterization of Genes and their Application in Rice Improvements - A Success Story'. The lecture was attended by Dr Baldev Singh Dhillon, Vice-Chancellor, PAU, and the Convener of the Ludhiana Chapter; Dr A.S. Nanda, Vice-Chancellor, GADVASU; NAAS Fellows; the PAU Deans; Directors; Heads of the Departments; faculty members and students. Dr Tilak Raj Sharma presented the research work on identification, gene cloning, validation and characterization of the rice blast resistance gene *Pi54* ultimately leading to its commercial utilization for the development of rice varieties carrying this gene. The lecture entailed the work carried out by Dr Sharma and his team over the last two decades which is a beautiful example of basic research leading to an applied product. A large number of students and young researchers were intrigued and had informative discussion with Dr Sharma.

Lecture by Dr Tilak Raj Sharma

Another lecture in the series was delivered by Dr Arun Kumar Joshi on March 9, 2017 at Punjab Agricultural University, Ludhiana. Dr Arun Kumar Joshi is the South Asia Regional Director, CIMMYT and Managing Director, Borlaug Institute of South Asia. The title of his lecture was "Expectations from Wheat for Food Security".

Dr Joshi outlined the historical importance of wheat, tracing its evolutionary origin, its domestication as evident from archaeological studies, its significance in early civilizations and emergence as a global crop. He portrayed the journey of agricultural revolutions in the backdrop of Malthusian challenge. Dr Joshi went on to outline the case for wheat as a major component of national food security and took up the core issue of challenges facing wheat productivity enhancement in the face of projected demand by 2050. This would be the time when world population would tend to stabilize,

he mentioned, that maintaining food security under continuing population growth upto this point would be an uphill task.

Lecture by Dr Arun Kumar Joshi

Dr Joshi commented on current genetic gain for yield in global wheat improvement programmes and showed it to be mostly below 1 per cent per annum. He spelt out the major challenges in form of climate and weather perturbations and emergence of new pathogens, citing the case of blast disease on wheat in Bangladesh. He demarcated the vulnerable regions in India based on geo-physical parameters. At the same time, he showed some bright spots, for instance high wheat productivity potential in Iran and central India. He discussed the CIMMYT strategy based on massive germplasm churning, starting with a set of diverse 70,000 genotypes. He showed how progress could be made through systematic and painstaking work in wheat breeding, agronomy, soil sciences and crop protection and cited the example of biofortified wheats, which have now been released for cultivation as a result of continuous support and investment by national and international programmes. He highlighted that adequate investments in food security would be the key to a prosperous future. The urgency of the timely investments needs to have greater policy and media support. Dr Joshi also discussed technological strategies, including latest crop breeding and biotechnological approaches including hybrid wheat.

Dr Joshi concluded his highly informative lecture on an inspirational note on how various disciplines can contribute to the all important cause of food security. A lively and wide-ranging discussion followed after Dr Joshi's lecture.

The concluding remarks were made by Dr B.S. Dhillon, Vice-Chancellor, PAU and Convener of the Chapter.

NAAS Regional Chapters: Conveners Meeting

In the afternoon of February 22, 2017 the meeting of NAAS Regional Chapters Conveners and EC Members was held at UAS, Bengaluru during XIII Agricultural Science Congress and was Chaired by the President, Prof Panjab Singh and Co-chaired by the Secretary, Dr K.V. Prabhu. It was attended by the conveners of various regional chapters, members of EC and other special invitees. The note of President on the "NAAS Future Role" circulated earlier to all conveners/ Fellowship was discussed at length. The responses on note received from Fellowship were debated and new suggestions of the conveners present in the meeting were discussed in detail that resulted in emergence of many useful suggestions. Main focus was to develop strategies to create general awareness about the technical strength of NAAS among different stakeholders including policy makers at regional and national level. In this connection, NAAS headquarters will initiate communication with concerned agencies and subsequently regional chapters will follow it up. A summarized version of NAAS policy briefs with identified actionable points will be made available to all concerned agencies for their use and feedback. The exact mechanism to follow-it up will be formulated shortly.

International Linkage: NAAS-JHU interaction

The NAAS recently interacted with one of the world's leading research universities – Johns Hopkins University (JHU), Washington DC, USA. On January 11, 2017, a JHU delegation visited the Academy and held discussion with selected Delhi-based NAAS Fellows and IARI students. The Indian Council of Food and Agriculture (ICFA), a Delhi-based NGO, also participated.

The JHU delegation was led by Dr Sharon Yanagi, Associate Director of the School of Advanced International Studies (SAIS), JHU. The group was keen to know as to how India handles developmental and strategic challenges in agriculture, which is pivotal to the nation's food, nutrition, and livelihood security.

Prof R.B. Singh, on behalf of the NAAS welcomed the JHU delegation and other participants. He reiterated the centrality of the NAAS as the nation's think tank for transforming agriculture to reshape India. Prof Singh highlighted the milestones of development in agriculture

during the journey from the Green Revolution to the Right to Food Bill. He emphasized the Academy's role in putting Agriculture in the middle of Science, Technology, Engineering and Mathematics to transform STEM into STEAM, thus facilitating wider collaboration among disciplines, research and educational institutions, industrial development and employment opportunities to attain the New Normal and Green Economy.

Dr Suresh Pal, Director, NIAEPR and NAAS Fellow followed by Dr P.K. Joshi, Director - South Asia, IFPRI and NAAS Fellow reiterated that creation and reforms of Agricultural Price Commission, Food Corporation of India, National and State Seed Corporation, Seed Act, Model APMC Act, National Market for Agriculture, Public-Private Partnership, Peoples Participation, and structural reforms undertaken in the past have been instrumental in fighting hunger and poverty. Lately, the Government has shifted focus on productivity and income of the farmers (doubling farmers income by 2022), human capital development and social safetynet programs (skill, information, health etc), risk management in agriculture (PM Fasal Bima Yojana), and equity concerns. Mr N.S. Randhawa, Executive Director, ICFA, highlighted the role of the Council in strengthening national and international linkages, particularly in facilitating exchange visits of students and faculty.

Climate Smart Agriculture: Can it insulate farming from global warming?

B. Venkateswarlu, FNAAS
Vice-Chancellor

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The Prime Minister of India has called for doubling of farmers income by 2022. As per the discussion paper of NITI Aayog, this requires all round improvements in Indian agriculture including productivity growth, investments on irrigation, post harvest processing and value addition, market reforms, insurance and research and development. The paper also acknowledges the challenge posed by climate change in achieving the goal. Evidence over the past few decades has established that significant changes in climate are taking place worldwide as a result of enhanced anthropogenic activities. Despite the spectacular success of the Green Revolution and achieving self-sufficiency in food production, there are increasing concerns on sustaining the pace of agricultural growth. Lack of yield breakthroughs, deteriorating soil health, ground water depletion, declining size of operational holdings and labour shortage are cited as prime reasons for slow agricultural growth. Added to these factors are the climate change and climate variability which are now emerging as major concerns.

Climate change impacts on agriculture are being witnessed all over the world, but countries like India are more vulnerable in view of the high population depending on agriculture, excessive pressure on natural resources and poor coping capabilities. The negative effects of year to year climate variability are already evident. The countrywide rainfall deficiency during 2005-06 has brought down the production of coarse cereals and oilseeds sharply and caused severe fodder shortage across the country, but the current year (2016-17) estimates a record food production of 272 million tonnes backed by a good monsoon. Therefore, climate has become central to agricultural planning and decision making in the country. Besides droughts which are common, floods due to heavy rainfall, cyclones, heat wave, cold wave, frost and hail storms are already taking heavy toll on crop yields and farmer's income every year in some parts of the country or the other. The impact of future climate change on agriculture is more worrisome if we do not respond to the wake up call and continue with business as usual approach.

Production Losses

Modeling studies by ICAR under the Network Project on Climate Change (NPCC) indicate that in the medium term (2010-2039), impacts on food production are in the range of 4.5 to 9 per cent, while in the long term (2070-2099) the production could decrease by as much as 25 per cent. Since agriculture makes up roughly 17 per cent of India's GDP, a 4.5 to 9 percent negative impact on production implies a cost of climate change to be roughly up to 1.5 per cent of GDP per year. For every one degree increase in temperature throughout the growing season, the production of wheat in the country may reduce by 4-5 million tonnes. Rise in minimum temperature is happening during *kharif* season @ 0.19^{o}C 10 yr^{-1} in most part of the country which has a

negative impact on paddy yields over 50% of cultivated area. (Bapujirao et al, 2014). With decreasing summer rainfall trends in Chattisgarh, Jharkhand and eastern MP, paddy yields are also likely to decrease in parts of eastern India where the crop is grown as rainfed. Most climate models predict a marginal increase in total rainfall in the country but the number of rainy days are projected to decrease, causing heavy intense rainfall in few days followed by long dry spells. This is likely to cause flash floods, inundation of crop fields and soil erosion affecting kharif crops across the country. Warming during winter season has implications for production of rabi crops like wheat, mustard and chickpea in the Indo-Gangetic plains. Rabi season is now contributing nearly 50 per cent of the foodgrains and this contribution is likely to increase in future. Therefore insulating rabi crops from the impacts of climate change is key for ensuring food security.

Impact on Sunrise Sectors

Based on the recent growth rates in production and contribution to agricultural GDP, horticulture, dairy, meat and poultry are considered sunrise sectors. These sectors are also equally vulnerable to global warming. Horticulture crops are particularly sensitive to temperature, unseasonal rainfall, hailstorms and pest and diseases caused by climate variability. The yields of apple in Himachal Pradesh are declining in the traditional areas because of rise in temperature and inadequate chilling environment (NPCC, 2007). Farmers are shifting the crop to higher elevations on the hills in order to realise acceptable yields. Mango is another typical example of a premier crop in India suffering production losses due to climatic variability. In addition to the indiscriminate use of placrobutazol, unseasonal rains and temperature fluctuations are mainly attributed to the flowering, fruit drop and quality problems in Alphonso mangoes, grapes, oranges and pomegranate in Maharashtra and kinnow in Punjab and Himachal Pradesh repeatedly suffer heavy losses due to hail storms. Climate change impacts pollination in fruit crops, as high temperature affects the pollinators.

Global warming is likely to lead to a loss of 1.6 million tons in milk production by 2020 and 15 million tons by 2050. High producing crossbred cows and buffaloes will be affected more. Based on temperature-humidity index (THI), the estimated annual loss in milk production at the all-India level by 2020 is valued at Rs.2662 crores. (Upadhyay et al, 2009). While the commercial poultry is highly vulnerable to heat wave, the industry has already responded quickly by improving the designs of the poultry farms and installation of foggers etc. after suffering heavy losses due to heat stress during the last one decade.

Besides direct effects on crops, climate change is likely to impact natural resources like soil and water. Increased rainfall intensity in some regions would cause more soil erosion leading to land degradation. Increased temperatures will also increase crop water requirement. A study by ICAR-CRIDA, Hyderabad on major crop growing districts in the country for four crops, viz., groundnut, mustard, wheat and maize indicated a 3% increase in crop water requirement by 2020 and 7% by 2050 across all the crops/locations. Irrigation requirement in arid and semi-arid regions is estimated to increase by 10% by every 1°C rise in temperature. The frequency of extreme weather events like hail storms is also increasing in recent period. Hail storms usually cause localized damage and generally occur in Punjab and Himachal Pradesh regularly. However during 2014 and 2015 rabi seasons (February – March), widespread hail storms occurred in most parts of the country, i.e. Gujarat, Maharashtra, Karnataka and Telangana causing heavy damage to field crops and horticulture.

Vulnerable Regions

Climate Change (CC) does not impact every one equally. For example rainfed agriculture is more vulnerable because of the dependence on monsoon. A vulnerability mapping of Indian agriculture to climate change by ICAR-CRIDA (C.A. Ramarao et al, 2013) indicated that many districts in the western Indian states like Rajasthan, Gujarat and Karnataka are highly vulnerable to droughts, while parts of eastern UP and Bihar are sensitive to flood damage. Small and marginal farmers are more vulnerable due to their poor coping abilities. Extreme events like hail storms, severely impact horticulture crops like grapes, oranges, mango, banana causing flower and fruit drop and sometimes farmers loose the entire crop for the season. Agricultural labourers loose wage income when crops fail but no systematic study has been made on the impact of CC on them.

In view of the economic impact of climate change on agriculture sector and its implications on food security, adaptation and mitigation measures are urgently required at different levels. Individual farmers have to be provided with innovative technologies and products that enable them to reduce farm level production declines and minimize risks, while States and Nations have to put in place the required policies that sustain

aggregate level production. This is to check price volatility and avoid huge relief payments on compensation of losses. Adaptation, particularly has a prominent role in developing countries like India. Since global warming is an issue that cuts across international borders, co-operation among developed and developing countries in technology exchange and financial assistance are of paramount importance. This is particularly critical in mitigation. The recently concluded Paris Agreement has mandated partner countries to reduce GHG emissions by certain percentage so that the temperature rise can be contained below 2°C. The establishment of Green Climate Fund is an important step in this direction.

CSA Framework

Sustaining agricultural production in the face of climate change requires a series of scientific inputs and practices which is broadly known as Climate Smart Agriculture (CSA). As defined by FAO, CSA is an integrated approach that addresses the interlinked challenges of climate change and food security with the objectives of i) Sustainably increasing productivity to support equitable increases in farm incomes, ii) Adapting and building resilience of food production systems to climate change at multiple levels and iii) Reducing greenhouse gas emission from agriculture (including crops, livestock and fisheries). CSA is not a technology but an approach which relies on use of modified production technologies, new policies and investments on managing risks. While this broad frame work of CSA is relevant to all countries, the actual implementation strategy varies depending on the local circumstances of each country or state or production system.

Regional and National Initiatives

CGIAR has initiated a major research programme on the application of CSA approach to reduce the vulnerability of farming in developing countries (https://ccafs.cgiar.org/), while the Indian Council of Agricultural Research has launched a mega project on Climate Resilient Agriculture in India i.e. National Initiative on Climate Resilient Agriculture (NICRA) (http://www.nicra-icar.in/). Considered as one of the few major projects in developing countries, NICRA has the twin objectives of generation of appropriate climate resilient technologies in crops, horticulture, livestock, fisheries and poultry and its demonstration on farmers fields through more than 150 Krishi Vigyan Kendras to provide the farm level resilience.

Experience of the NICRA clearly indicated that by adoption of already available technologies and practices with a whole village approach, we can bring much needed resilience to agriculture against climate change. By adopting scientific water conservation methods, ground water recharge, use of drought tolerant varieties, adjusting the planting dates, modifying the fertilizer and irrigation schedules and adopting zero tillage, farmers are able to realize acceptable yields even in deficit rainfall and warmer years. These interventions have also led to positive carbon balance in the villages quantified by using FAO, EX-ACT model (Srinivasarao et al, 2016).

Emerging Technologies

Internationally, extensive research is under way on evolving climate resilient technologies and practices. Varieties are being developed in different crops with multiple abiotic stress tolerance. The first such example is the identification of *sub*-1 gene in paddy by IRRI, Philippines which confers submergence tolerance. The introduction of *sub*-1 in a mega variety like *Swarna* has resulted in *Swarna sub*-1 which is now grown successfully in large parts of eastern India and northeast where paddy crop gets inundated during *kharif* season. In wheat, ICAR-NBPGR has screened more than 300 germplasm lines of wheat and identified several promising heat tolerant lines. Biodiversity conservation is important in fighting climate change. Several local germplasm lines may be low yielding but may contain very useful traits like heat and drought tolerance.

Other Climate Smart Practices relate to water and nutrient management. Direct seeded rice for example emits less methane compared to puddled rice. Neem coated urea and application of nitrogen fertilizers in wheat, maize and paddy based on leaf colour charts reduce the total N requirement and indirectly cut down the N_2O emission. Crop residue burning releases tons of carbon dioxide into the atmosphere in states like Punjab where paddy straw is burnt every year in order to vacate the field for wheat planting. Conservation agriculture practice under which wheat is planted with zero tillage offers an alternative to burning which is now being promoted. Innovations in water management including extensive use of micro irrigation is by far the most important input for CSA.

The country needs to provide robust agro advisories to farmers based on real time basis. This requires a huge effort of weather data collection, assessment of crop

condition, soil moisture, pest and diseases under field conditions on real time basis and translating this entire data into a simple advisory which the farmer can follow. Lot of investments are made on installation of automatic weather stations in different states but no serious efforts are made to actually utilize the weather data for climate resilient agriculture. With the use of dynamic models like CLIMEX and DYMEX, we can assess the spatial distribution and abundance of important pests and study how future climate change may cause emergence of new pests and biotypes.

While the impacts of climate change and variability are to be assessed on regional basis, the adoption of climate smart practices can best be done at village level with a goal of creating Climate Smart Villages across the country (Aggarwal, 2009). These villages will basically adopt weather smart, water smart, energy smart, carbon smart and nitrogen smart practices. Besides technologies, policy inputs on prudent use of water, nutrients, carbon and energy are essential to promote CSA. (Venkateswarlu and Shankar, 2009). To sum up, investments on generation of new production and conservation technologies, policies that support rational use of resources, sharing of global best bet practices and capacity building of farmers will go a long way towards making agriculture climate smart.

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Forthcoming Programmes

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

Obituaries

1945 - 2016

Dr S. Nagarajan, an internationally renowned Wheat Pathologist was born in Chennai, Tamil Nadu, India on 7 November, 1945. He graduated in Agriculture from Agricultural College, Coimbatore 1962-66; M.Sc. at IARI, 1969; Ph.D. from University of Delhi in 1973. On Alexander von Humbolt Fellowship he worked at University of Giessen 1978-80.He was a Visiting Fellow at the Department of Pathology, University of Bonn, 1998 and Distinguished Fellow, University of Giessen in 2003 and 2011.

During his career he held many coveted positions; joined the IARI / ICAR in 1974 as Wheat Pathologist and became Head, IARI Regional Station, Shimla 1980-86, Assistant Director General (Plant Protection), ICAR, 1988, Project Director, Directorate of Wheat Research, Karnal, 1993-2002, Director, IARI, New Delhi, 2002-2005; Chairperson, Protection of Plant Varieties and Farmers' Rights Authority (PPVFRA), Government of India, New Delhi, 2005-10. He was also Agricultural Advisor to MSSRF, Chennai for many projects till recent past.

Based on his internationally acclaimed work in the areas of plant pathology, epidemiology, wheat improvement, wheat molecular biology and intellectual property rights in respect of PPVFRA, he received many awards and recognitions. To name a few, Rafi Ahmed Kidwai Award 1978-79, M.O.P. Iyengar Lecture Award, 2000, Norman E. Borlaug Award 2005, Dr B.P. Pal Gold Medal at 93rd Indian Science Congress 2006, INSA Silver Jubilee Medal 2006, Lal Bahadur Shastri Memorial Lecture Award 2008, Dr M.S. Swaminathan Award, 2009.

He was elected Fellow of the National Academy of Agricultural Sciences (1992), Fellow, National Academy of Sciences, Allahabad (2002), Fellow of the Indian National Science Academy (2005). At NAAS he served as member of Executive Council 2003-05.

He visited more than 25 countries during his scientific career and authored more than 120 research papers, 50 book chapters and 2 textbooks.

Dr Nagarajan passed away on 25 December, 2016 and on his sad demise the Academy has lost an esteemed fellow and a leader in plant pathology in the country. The entire Fellowship mourns his demise and pays homage to the departed soul.

1952 - 2017

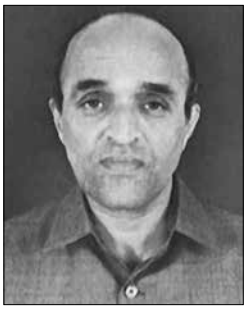
Dr Paramvir Singh Ahuja was born in Patiala, Punjab, on 19 December, 1952. He obtained his graduation and post-graduation degrees from College of Agriculture, PAU, Ludhiana during 1970-77. He worked at the University of Nottingham, UK on Commonwealth Scholarship, for his Ph.D. in 1983. He was a Post-Doctoral NSERC (Natural Sciences and Engineering Research Council of Canada) Fellow at the McGill University, Montreal, Canada and had been a Visiting Scientist to the Ohio State University, Columbus, USA. During his career he held many positions, ICAR – scientist 1977-80, Scientist & Head, Plant Tissue Culture at CIMAP, Lucknow, Scientist-F Plant Biotechnology, at CSIR-Complex, Palampur. He held the position of Director, CSIR-Institute of Himalayan Bio-resource Technology, during 1998-2014 and rose to the position of Director General, CSIR in 2014. Subsequently he was awarded Sir J.C. Bose National Fellow and Adjunct Professor, and worked at Indian Institute of Science Education and Research, Mohali, Punjab from 2015 onwards.

Dr Ahuja's contribution to characterization of the Indian tea germplasm and his research on tea, rose and potato transgenics are landmark achievements that are globally acknowledged. His role in bio-prospection of novel plant genes from high altitudes and their validation and translation to adoption by the industry is noteworthy. Dr Ahuja for the first time successfully made protoplast fusion of *Hyoscyamus muticus* and *Atropa belladonna.* He made significant contribution in extending rural technologies to the remotest tribal locations in the Himalayas.

He was a life member of more than 15 professional bodies. He guided 16 Ph.D. students and several Post-graduate students. He had more than 200 research publications / reviews, and delivered innumerable Academy invited lectures. Dr Ahuja had over 20 patents and some of these are commercialized. He was elected Fellow of the National Academy of Agricultural Sciences in 2003. He was Fellow of other prestigious academies viz., National Academy of Sciences, India and the Indian National Science Academy. He received several prestigious national awards some of them include, Prof P.N. Mehra memorial award 2007, Birbal Sahni Medal of Botanical Society of India in 2009, V. Puri Memorial

Award of Indian Science Congress 2014, Birbal Sahni Centenary Award in 2015.

Dr Ahuja passed away on 21 January, 2017. In his passing away country has lost an eminent Plant Biotechnologist who made immense contribution in research and development of medicinal plants both at national and international levels. The Fellowship mourns the sad demise of one of distinguished fellows and pays its homage to the departed soul.



1946 - 2017

Dr K. Devadasan was born at Ottappalam in Palakkad district of Kerala on 7 August, 1946, he did his M. Sc. in Applied Chemistry from Maharaja's College, Ernakulam. and Ph. D. in Marine Sciences from Cochin University of Science and Technology, Cochin. He joined ICAR services in 1966 at Central Institute of Fisheries Technology, Cochin. Dr Devadasan served ICAR-CIFT for 42 long years in various capacities and rose to the position of Director and occupied this office from 2000 to 2008.

Dr Devadasan worked in the areas of fish processing technology, fishery biochemistry and food technology. He worked as a NORAD research fellow in the reputed Norwegian Herring Oil and Meal Industry Research Institute, Bergen under the world renowned nutrition scientist, Dr Johannes Opstvedt. Dr Devadasan made pioneering studies on the muscle proteins of tropical fishes and significant contributions for improving the quality of cured fishery products. He provided leadership, in developing several new useful technologies which include the methods for making absorbable surgical sutures from fish guts, a collagen-chitosan membrane that can act as an artificial skin in case of severe burns and wounds, and omega 3 poly unsaturated fatty acid concentrates for lowering serum cholesterol levels.

Dr Devadasan was responsible for the first authentic compilation of detailed biochemical composition of tropical fishes. He visited many countries like Norway, Thailand and Sri Lanka and was a team leader in the FAO sponsored and European Union supported nine nation project on 'Improved methods for utilization of low value fish'. He published more than 100 research publications, apart from many books / book chapters. He was the holder of Indian Patent No. 200972 on 'Production of fine grade absorbable surgical sutures from fish gut collagen'. During his tenure as the Director of ICAR-CIFT, the Institute received the ICAR-Sardar Patel Award for Outstanding Institute twice, in the year 2000 and 2006.

Dr Devadasan was an expert member in many national level committees on fish processing and value addition and was fellow of many professional societies. He was elected Fellow of National Academy of Agricultural Sciences, in 2003

Dr Devadasan was a perfect gentleman and devoted his entire life to the betterment of science and to the service of human kind, in life and even after death also, in this context he has donated his mortal body to Kolecherry Medical College, for the future generations of medical doctors to study and perfect their knowledge. Dr Devadasan is survived by Smt. Vijayalaksmy Haridas, his sister.

Dr K. Devadasan passed away on 15 March, 2017 and in his sad demise the Academy has lost an esteemed fellow and an eminent fishery technologist. The entire Fellowship mourns his demise and pays homage to the departed soul.

Editors: Dr K.K. Vass and Dr V.K. Bhatia

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