

Annual Report

2011-12



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

Foreword

The National Academy of Agricultural Sciences (NAAS) has the Mission “to gain recognition as a credible think-tank to provide views of the scientific community on all agriculture related policy issues, to encourage talent and promote excellence in science, making it a powerful instrument for the growth of national economy with a vibrant farm sector.”

In pursuance of the above mission, the Academy has been organizing congresses, conferences, brainstorming sessions, consultations, lectures and dialogues on important research, innovation, development and policy issues, and communicating their outcomes to the concerned stake-holders towards promoting ecologically sustainable, economically vibrant and socially equitable agriculture.

During the year 2011-12, the Academy organized eight brainstorming sessions, five interactive sessions and three lectures, including the Foundation Day Lecture by Prof. Abhijit Sen, Member, Planning Commission. Several path-setting and policy-informing publications, such as “The Hungry Child Cannot Wait”, “Towards an Ever Green Revolution – The Road Map”, and “Bio-safety Assurance for GM Foods in India” were brought out. Hopefully, these events and publications were helpful in policy and investment decisions, particularly as these coincided with the launch of the XII Plan.

The year under report had several firsts. The year marked the historic release of the Academy’s journal – Agricultural Research, which has received far and wide acclamation. For the first time an exclusive NAAS-ICAR interface meeting was held wherein key officials from both sides participated and converged on priority issues, challenges and actions. Other salient events and initiatives during the year included the revamping of the quarterly NAAS-News and the reactivation and invigoration of the Regional Chapters.

Reiterating that quality education leading to the creation of dynamic human capital is fundamental to desired agricultural transformation for development, and recognizing that all-is-not-well with the prevalent agricultural education system in the country, the Academy paid special attention to this serious issue. In this context, it organized two Round Table preparatory meetings involving eminent educationists, focusing on Agricultural Education – Shaping India’s Future, the theme of the XI Agricultural Science Congress to be held on 7-9 February 2013 at Orissa University of Agricultural and Technology, Bhubaneswar. The Academy solicits enthusiastic contribution and support of the entire Fellowship, other educationists and stakeholders in the revival of agricultural education in India.

I place on record my gratitude to the NAAS Executive Council, especially Dr. S. Ayyappan and Prof. Lalji Singh, Vice-Presidents; to Prof. Anwar Alam and Prof. N.K. Singh, Secretaries; and to Dr. C. Devakumar and Prof. P.K. Chhonkar, Editors, for their guidance and untiring efforts. I am grateful to the Conveners of the brainstorming sessions and other events. My sincere thanks are due to the NAAS Secretariat: Shri H.C. Pathak, Shri P. Pande, Ms. Minu Tiwari, Shri P. Krishna, Shri Umesh Rai, Shri Jai Singh, Shri Kamal Singh and Shri Banwari Lal.

Finally, I am thankful to the ICAR for its financial support.



R.B. Singh
President

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1. Introduction

1.1 Background

The National Academy of Agricultural Sciences (NAAS), established in 1990. It owes its origin to the vision of the late Dr. B. P. Pal, FRS. The Academy focuses on the broad field of agricultural sciences including crop husbandry, horticulture, animal husbandry, fisheries, agro-forestry, and interface between agriculture and agro-industry. The Academy's role is to provide a forum to agricultural scientists to deliberate on important issues of agricultural research, education and extension, and present views of the scientific community as policy inputs to planners and decision/opinion makers at the various levels. The Academy organizes and supports national and international congresses, conferences, seminars, symposia, workshops and brainstorming sessions on the critical issues in the field of agricultural sciences.

The Academy has emerged as a vibrant national level body devoted to agricultural sciences. The Fellows of Academy, recognized for their contributions to science, include distinguished personalities in the field of agriculture and allied sciences, both from India and abroad.

1.2 Objectives

The major objectives of the Academy, inter-alia, are to:

- promote ecologically sustainable agriculture,
- recognize and promote excellence of individual scientists in the field of agriculture,
- promote interaction among research workers of different institutions and organizations within the country, and with the world scientific community,
- organize inter-disciplinary analysis of issues of importance for farmers and farming, and prepare further policies designed to advance agricultural research, education and development
- carry out such activities as are relevant to the accomplishment of the above goals.

2. Management

2.1 General Body

The General Body: The General Body of the Academy constituted by its Fellows, met on 5 June 2011 and adopted the Annual Report and Audited Statement of Accounts for the year 2010-11.

2.2 Executive Council

Composition: The Executive Council was re-constituted on 1.1.2012 with changes in the incumbency of offices of the Vice-President, Secretary, Editor, and four Members of the Council. The composition of the Executive Council for 2011 and 2012 is as under:-

	2011	2012	Tenure
President	Prof R.B. Singh	Prof R.B. Singh	Dec 2013
Immediate Past-President	Dr Mangala Rai	Dr Mangala Rai	Dec 2013
Vice-President	Dr H.K. Jain	Dr Lalji Singh	Dec 2014
Vice-President	Dr S. Ayyappan	Dr S. Ayyappan	Dec 2012
Secretary	Dr A.K. Srivastava	Dr N.K. Singh	Dec 2014
Secretary	Dr. Anwar Alam	Dr Anwar Alam	Dec 2013
Foreign Secretary	Dr S.M. Virmani	Dr S.M. Virmani	Dec 2012
Editor	Dr P.S. Pathak	Dr P.K. Chhonkar	Dec 2014
Editor	Dr C. Devakumar	Dr C. Devakumar	Dec 2013
Treasurer	Dr Himanshu Pathak	Dr Himanshu Pathak	Dec 2012
Member	Dr S.A.H. Abidi	Dr B.S. Dhillon	Dec 2014
Member	Dr (Ms.) Rintu Banerjee	Dr Gopakumar	Dec 2014
Member	Dr S.K. Datta	Dr S.K. Datta	Dec 2013
Member	Dr (Ms.) P. Geervani	Dr Gita Kulshrestha	Dec 2014
Member	Dr H.S. Gupta	Dr H.S. Gupta	Dec 2012
Member	Dr Raj K. Gupta	Dr Raj K. Gupta	Dec 2013
Member	Dr (Ms.) Shailaja Hittalmani	Dr Biswapati Mandal	Dec 2014
Member	Dr G. Kalloo	Dr G. Kalloo	Dec 2012
Member	Dr A.N. Mukhopadhyay	Dr A.N. Mukhopadhyay	Dec 2012
Member	Dr B.S. Pathak	Dr B.S. Pathak	Dec 2013
Member	Dr R.P. Singh	Dr R.P. Singh	Dec 2012
Member	Dr M.P. Yadav	Dr M.P. Yadav	Dec 2013
Member	Sh Rajiv Mehrishi, Secretary, ICAR	Sh Rajiv Mehrishi, Secretary, ICAR	(ICAR nominee)

During 2011-12, four meetings of the Executive Council were held on: (i) 4 June 2011, (ii) 17 September 2011, (iii) 28 November 2011 and (iv) 31 January 2012. The meeting of the Annual General Body was held on 5 June 2011.

Some of the important items considered were as under:

- Review of implementation of Academy's programmes and formulation of proposed activities of the Academy for the year 2011-12.
- 11th Agriculture Science Congress.
- Academy launched an international journal 'Agriculture Research' on 31 January 2012.
- Adoption of (a) Annual Report and (b) Audited Statement of Accounts of the Academy for the year 2010-11.
- Appointment of Auditors for the year 2011-12 and fixation of their remuneration.
- Recommendations of Sectional Committees and the Conveners' Group for finalization of Academy's Fellows/Associateship for the year 2012.
- Election of the (a) Office Bearers and Members of the Executive Council for the year 2012 and (b) Fellows 2012.
- Review and rating of scientific journals.
- Calendar of activities of the Academy for the year 2012.
- Revised guidelines and proforma for Academy's Awards
- Guidelines for organizing the Brainstorming Sessions.

3. Fellowship

3.1 Sectional Committees

A total of 8 **Sectional Committees** were constituted, which met in September 2011, and short-listed candidates for electing Fellows and selecting Associates for 2012. They presented their recommendations to Executive Council for approval and election by ballot.

3.2 Election of Fellows

During 2012, twenty-one Fellows were elected. As on 31.03.2012, the total number of Fellows (in the live register) is 528, which includes 49 Foreign Fellows and one Corporate Fellow. Brief details of the new Fellows elected in 2012 are as follows:

Section I : Crop Science

Dr. J.S. Chauhan

*Director, Directorate of Rapeseed-Mustard Research, Sewar,
Bharatpur, Rajasthan*

Contd...

Contd...

Dr. (Ms.) Karabi Datta	<i>Reader, Department of Botany, University of Calcutta, Kolkata, W.B.</i>
Dr. S.S. Mehetre	<i>Director of Research, Directorate of Research, Mahatma Phule Krishi Vidyapeeth, District: Ahmednagar, Rahuri, Maharashtra</i>
Dr. M.V. Rajam	<i>Professor, Department of Genetics, University of Delhi South Campus, New Delhi</i>
Dr. S.K. Rao	<i>Dean, College of Agriculture, Rewa and Director, Farms, Jawaharlal Nehru Krishi Vishva Vidyalyaya, Jabalpur, M.P.</i>

Section II : Horticulture Science

Dr. D.P. Ray	<i>Vice Chancellor, Orissa Univ. of Agriculture & Technology, Bhubaneswar, Orissa</i>
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Section III : Animal Sciences

Dr. V.K. Batish	<i>Secretary, Probiotic Association of India, Molecular Biology Unit, Dairy Microbi. Div, National Dairy Research Institute, Karnal, Haryana</i>
Dr. S.M.K. Naqvi	<i>Principal Scientist & Head, Division of Physiology and Biochemistry, Central Sheep and Wool Research Institute, Avikanagar via Jaipur, Rajasthan</i>

Section IV : Fisheries Sciences

Dr. A. Gopalakrishnan	<i>Principal Scientist & Officer-in-Charge, National Bureau of Fish Genetic Resources, NBFGR Cochin Unit, CMFRI Campus, Kochi, Kerala</i>
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Section V : Natural Resource Management

Dr. G. Kar	<i>Principal Scientist, Directorate of Water Management, Chandrasekharapur, Bhubaneswar, Odisha</i>
Dr. Arvind Kumar	<i>Deputy Director General (Education), Division of Education, ICAR, New Delhi</i>
Dr. Ashwani Kumar	<i>Director, Directorate of Water Management, Chandrasekharapur, Bhubaneswar, Odisha</i>
Dr. U.C. Sharma	<i>222 - Adarsh Enclave, Trikuta Nagar, Sector - I Extension, Jammu, J&K</i>

Section VI : Plant Protection

Dr. M.R. Khan	<i>Associate Professor, Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh, U.P.</i>
Prof. S.R. Niranjana	<i>Professor, Department of Studies in Biotechnology, University of Mysore, Manasagangotri, Mysore, Karnataka</i>

Contd...

Contd...

Dr. L.C. Rai *Professor of Botany, Molecular Biology Section,
Department of Botany, Banaras Hindu University, Varanasi,
U.P.*

Section VII : Agricultural Engineering and Technology

Dr. S.N. Jha *Head, Division of Agricultural Structure &, Environment
Control, CIPHET, Ludhiana, Punjab*

Dr. K.N. Tiwari *Professor, Agricultural & Food Engineering Department,
IIT, Kharagpur, West Bengal*

Section VIII : Social Sciences

Dr. Prajneshu *Head, Div. of Biometrics & Statistical Modelling, IASRI,
Pusa, New Delhi*

Foreign Fellows

Dr. G.S. Vijaya Raghavan *James McGill Professor, McGill University, Dept. of
Bioresource Engineering, Canada*

Dr. Ram J. Singh *Agronomist - Soybean Cytogenetics, Department of Crop
Sciences, National Soybean Research Center, Univ. of
Illinois, USA*

3.3 Fellows deceased

The Academy condoled the demise of its following Fellows during 2011-12:

1. **Dr. A.R. Seshadri**, expired in Apr 2011
2. **Dr. P.V. Dehadrai**, expired in Jun 2011
3. **Dr. S. Kannaiyan**, expired in Oct 2011
4. **Dr. S.L. Intodia**, expired in Dec 2011
5. **Dr. Sankar Mukhopadhyay**, expired in Feb 2012

3.4 NAAS-Associateship

The following were selected as NAAS Associates during 2012, thereby making the total number of Associates to 30.

Sl. No.	Name & Affiliation	Specialization
1.	Dr. S. Bandyopadhyay , Scientist (Senior Scale), Indian Veterinary Research Institute, Eastern Regional Station, Kolkata, W.B.	Animal Health
2.	Dr. Deepu Mathew , Assistant Professor, Centre for Plant Biotech. & Mol. Biology, College of Horticulture, Kerala Agril.Univ, Thrissur, Kerala	Vegetable Science

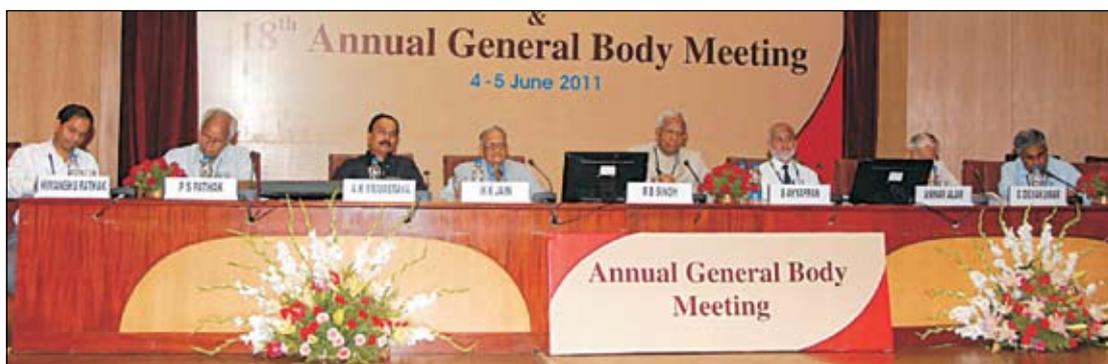
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3.	Dr. Sumanta Nandi , Senior Scientist, Animal Physiology Division, National Inst of Animal Nutr. & Physiology, Bangalore, Karnataka	Animal Physiology
4.	Dr. S. Rajkhowa , Senior Scientist (Veterinary Medicine), National Research Centre on Pig, Indian Council of Agricultural Research, Guwahati, Assam	Animal Health (Veterinary Medicine)
5.	Dr. E.S. Rao , Senior Scientist, Division of Vegetable Crops, Indian Institute of Horticultural Research, Bangalore, Karnataka	Vegetable breeding
6.	Dr. Anirban Roy , Senior Scientist, National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi	Plant Pathology

4. Foundation Day

About 170 Fellows attended the Foundation Day celebrations and 18th Annual General Body Meeting, scientific sessions, Foundation Day Lecture and business session on 5th June 2011. The 76th meeting of the Executive Council was held in the forenoon of 4th June 2011.



4.1. Scientific Sessions (Presentations by the Newly Elected Fellows)

Two scientific sessions were organized, where the newly elected Fellows of the Academy briefly presented their scientific contributions. The first scientific session was held in the afternoon of 4th June, 2011, Co-chaired by Dr. H.K. Jain, Vice-President and Prof. R.B. Singh, President



of the Academy and the second in the forenoon of 5th June 2011, chaired by Dr. S. Ayyappan, Vice-President, NAAS. The following presentations were made:

Name of the Fellow	Topic of the Presentation
Dr. H.S. Balyan	<i>Application of Molecular Markers for Genetic Dissection of Grain Quality Traits and Their Improvement Using Marker-Assisted Selection in Bread Wheat</i>
Dr. A.K. Singh	<i>Molecular Approaches: A New Paradigm in Basmati Breeding</i>
Dr. S.P. Tiwari	<i>Serving from Crop Breeding to Agricultural Education</i>
Dr. Narendra Tuteja	<i>Role of DNA Helicases in Abiotic Stress Tolerance</i>
Dr. O.P. Yadav	<i>Genetic Improvement of Pearl Millet for Drought-Prone Environments of Arid Zone</i>
Dr. Pious Thomas	<i>Plant – Microbe Association in Tissue Cultures</i>
Dr. Madhoolika Agrawal	<i>Tropospheric Ozone A Threat to Food Production in India</i>
Dr. B.S. Dwivedi	<i>Soil Fertility Evaluation and Balanced Fertilization to Improve Soil Health, Nutrient Use Efficiencies and Farm Profits</i>
Dr. P.K. Ghosh	<i>On- and Off-farm Resource Management Options for Enhancing Agricultural Productivity</i>
Dr. R.C. Srivastava	<i>Rain Water-harvesting in High Rainfall Plateau Region- A New Approach</i>
Dr. K.P.R. Vittal	<i>Taming the Abiotic Stresses.....</i>
Dr. Madhuban Gopal	<i>Utilizing Chemistry for Agricultural Waste and Pesticide Management</i>
Dr. H.S. Prakash	<i>Perspectives of Molecular Detection of Seed-borne Pathogens</i>
Dr. A.K. Saxena	<i>Prospecting Extreme Environments for Microbial Diversity and Genes for Abiotic Stress Tolerance</i>
Dr. Arun Goyal	<i>Exploring Structure and Biotechnological Applications of Glucans from Lactic Acid Bacteria Isolated from Microbial Diversity Hot Spot Assam</i>
Prof. Bhavanath Jha	<i>New Genes and Microbes Conferring Climate Resilience for Sustainable Agriculture</i>
Dr. G.R. Patil	<i>Technology Upgradation of Indigenous Dairy Products</i>
Dr. R.C. Sobti	<i>Characterization of Genome Diversity of Indian Zebu Cattle (Bos Indicus) Utilizing Neutral and Functional Markers</i>
Dr. D.S. Jayas	<i>Storing Grain for Increased Food Security and Safety</i>
Dr. R.T. Patil	<i>Post Harvest Technologies for Assuring Food and Nutritional Security</i>
Dr. V.K. Bhatia	<i>On Some Robust Estimation of Heritability</i>
Dr. Rajender Parsad	<i>Experiments with Mixtures Methodology in Agricultural Research</i>

4.2. Presidential Address

The **Presidential Address** “*The Hungry Child Cannot Wait*” was delivered by Prof. R.B. Singh, President NAAS. Brief highlights of his address are as follows:

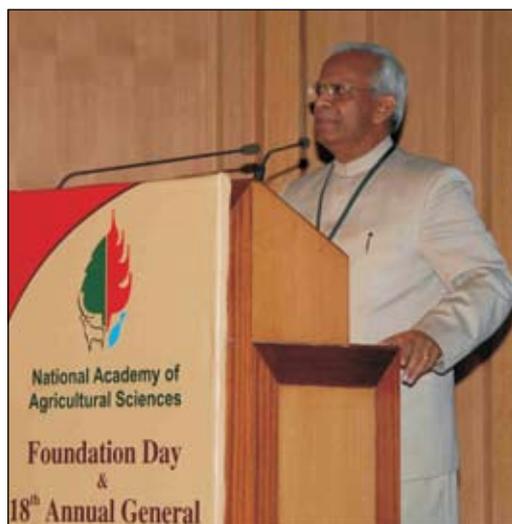
Saliently, Prof. Singh’s address graphically analyzed the global and Indian dimensions of hunger and poverty. He focussed on child malnutrition, underweight at birth, stunting of child, wasted childhood and on the unholy alliance of negative forces leading to high child-malnutrition in the country and India’s high Global Hunger Index (GHI). He said that these “Children of the Lesser God” put at stake a whole generation of the future adult citizens. He alluded to India having 8-9% overall GDP growth rate and therefore, the highest hunger and poverty, 40% of the world’s malnourished children being our own children, an enigma, that must be resolved.

Comparing the performance of major fast growing developing economies, Prof. Singh underlined that, India is far behind China and Brazil (the other fast growing economies) in ameliorating mother and child mal-nutrition, know-how for leveraging agriculture for improving food and nutrition demanding strategies and new initiatives and policy options and actions. Underpinning the importance of focused attention to the cause, he highlighted that President Lula of Brazil succeeded in eliminating under- and mal-nutrition in Brazil essentially through his Zero-Hunger Mission. It is a paradox that on one hand, our food stocks are getting rotten and spoiled and on the other hand, over 40% of world’s malnourished children are our own Indian children. He flagged the following strategies in improving child nutrition:

- A comprehensive national programme or approach specifically aimed at improving nutrition, resulting in lack of convergence and synergy among existing programmes.
- A focus with nutrition as an outcome in the government programmes.
- Adequate monitoring of delivery to the right target groups. Enhance national systems to collect and analyze data on nutrition outcomes as well as to enrich data for monitoring and decision making.
- Strengthen implementation and governance which together impact on the effectiveness of most of well-conceived programmes and National Food Security Mission etc.

Prof. Singh alluded to the global initiatives to reach the hungry and fight malnutrition and cited the following common principles to tackle the malady:

- Strong government action, coordinated across sectors and at Central, State, and local levels; strengthening of existing health systems;



- Significant scaling up of public spending;
- Leadership and commitment at all levels;
- Focus on and empowerment of vulnerable populations, households, and age groups; and
- A strong monitoring and evaluation culture that provides a basis for incentives and correction of policy actions in the context of implementation.

He referred to the pending Food Bill, which is based on the Right to Food reaffirmed by the World Summit on Food Security in 2009, and desired that its contents should be well defined and actionable so that no individual in need is left out. In this context, he strongly advocated adoption of the Life Cycle Approach to target resources towards the critical nutritional periods of the human life cycle which includes the following: vulnerable women during pregnancy, the first two years of life of the child and during adolescence.

The President advocated the following charter for the Academy in this mission:

The Academy's forte lies in augmenting and sharpening policy-science synergy in harnessing the whole bioeconomy to free India from the stubborn twin curse of poverty and malnutrition in the context of a mammoth rising population, incomes and climate change. The ethically unacceptable level of child and women under-nutrition needs policy-science champions among the academia to help alleviate the deprivation. The Academy may come up with a shared set of well-researched indicators to guide the various stakeholders in their actions.

Prof. Singh raised the bar of hope for harnessing the knowledge, technologies and resources to free the child from undernutrition. He declared "*This is our chance to name the Hungry Child, 'Today'. 'Tomorrow', is too late*".

4.3. Foundation Day Lecture

Foundation Day Lecture on Agriculture - 12th Five Year Plan Priorities was delivered by **Prof. Abhijit Sen, Member, Planning Commission**. He highlighted main issues in agriculture. He expressed concern about the welfare of the farmers and their families and lamented that the inclusive growth is somehow eluding. Acknowledging that the agricultural scientists are doing well, he urged them to introspect about the return of investment in agricultural research, find new ways to bridge the gap in the delivery of the technologies to the farmers and to frame an architecture by which the lab-to-land efficacy can be enhanced.



Prof. Sen asserted the need to diversify in the area of secondary agriculture with priority in post-harvest technology. We need to re-visit the return we get from research in different sectors such as crops, horticulture, fisheries, livestock etc. because profitability and high returns are keys to development. In the conservation of natural resources, opportunity costs should decide the priority. He pointed out that the agricultural growth in 2005-06 was low but today with buoyant growth there is glut in the market. Farmers are finding it hard to sell their produces. There is apparently a demand constraint. We have noticed 60% increase in food prices in the last year. He hoped that higher production should pull down the inflation. We have to learn some lessons in containing inflation and food prices and at the same time manage the large quantum of foodgrains rotting in godowns.

Prof. Sen said that the average annual farm sector growth would be 3 – 3.5 per cent in the 11th Plan as against the targeted 4 per cent. In the first year of the 11th Plan, the farm sector growth was 4.7 per cent but slowed down to 1.6 per cent in 2008-09. The annual average farm growth target of 4 per cent for the 10th Plan (2002-07) was also not achieved as it remained 2.13 per cent. The target for XII Plan should not be less than 4 per cent. As a guiding principle, the annual growth rate in any sector, be it cereals, pulses, horticulture produce, milk, meat etc. should not be less than that of the human population. It is likely that the pattern of agricultural growth could change with farmers opting for high value crops in preference to foodgrains. In such a situation can we think of exporting our horticulture produce and importing cereals in turn?

Prof. Sen opined that the growth rate of production of foodgrains is likely to be stabilized around 1.5 per cent per annum. By increasing the productivity per unit area or per unit of water, we can release the extra land and water for crops of higher return. Considering the short supply of water and other resources, we need to focus on efficient methods of cultivation. We must set some minimum acceptable rate of attainment. It is time, we looked beyond per hectare output, said Prof. Sen.

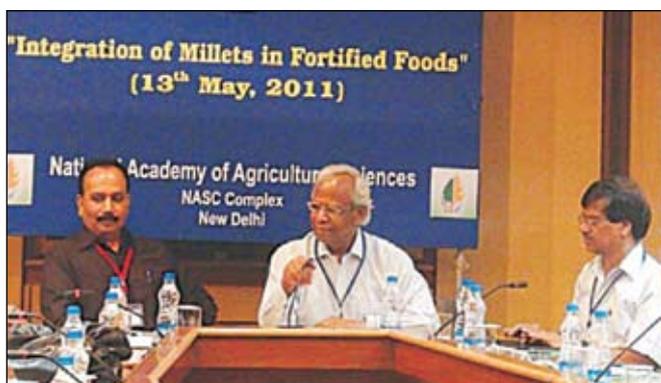
He noted that the Rashtriya Krishi Vikash Yojana (RKVY) gives flexibility to States if district action plans are properly executed and desired more participatory approach in the development, including an active role of the Gram Panchayats. He also alluded that the Reserve Bank of India (RBI) has recently projected some structural changes in the demands of foodgrains etc. It is now generally agreed that the demand for pulses, fish, egg, meat, milk and horticulture produces would be increasing and the market should meet these challenges. Creation of supply chains is more expensive and investment and related logistics must come from the private sector. In the 12th Plan, we must identify right types of solutions for the challenges in the production-consumption chain. He foresaw a faster growth in maize and other coarse cereals and in livestock, such as the shift from rice cultivation to maize in Punjab mainly due to increasing water scarcity as well as towards meeting the increasing demand for biofuel.

5. Brainstorming Sessions

The following eight sessions were held in the year under report:

5.1 Integration of Millets in Fortified Foods

The Brainstorming Session on this theme was organized on 13th May, 2011 at NASC Complex, New Delhi and was attended by 45 invited participants from research and academic institutions, government agencies, industries and entrepreneurs. Dr. A. K.



Srivastava, Secretary, NAAS and the Convener of the Brainstorming session welcomed the participants and highlighted the importance of composite dairy foods based on milk-millets in ensuring the nutritional security of the nation. Prof. R.B. Singh, President of the Academy inaugurated the Session and emphasized the significance of combining the milk-millet components for enhancing the nutritional and therapeutic profile

of fortified products. He further stressed the need for concerted efforts including the aspects of varietal improvement through allele mining, elucidation of genomics of millets, appropriate production packages, post-harvest processing and value addition.

During the session, eleven presentations were made by eminent experts on wide-ranging topics on two major thematic areas, viz., 'Production and Consumption of Millets' and 'Post Harvest Management, Value Addition and Popularization of Millets'. Further, it was suggested to constitute a committee consisting of various stakeholders to critically analyze the issues and to prepare a concrete action plan.

5.2 Bio-safety Assurance for GM Foods in India

The Brainstorming Session on this theme was organized at the Academy Headquarters on 22nd June 2011. The Session was co-chaired by Dr. Manju Sharma, Former Secretary, Department of Biotechnology and Prof. R.B. Singh, President of the Academy. Around 30 noted experts from ICAR, Department of Biotechnology, CSIR, universities, other public sector institutions, private



sector and civil society organizations had participated in the deliberation. This resulted in to a Policy Paper (No. 52) which was published by the Academy.

5.3 Biopesticides – Quality Assurance

The Brainstorming Session on this theme was held at the Academy on 24th June 2011. The session was chaired by Prof. R.B. Singh, President of the Academy. Twenty seven experts from different organizations had participated in the deliberation. The highlights of the brainstorming are:

Ensuring quality control in bio-pesticide products

- Substandard quality of biopesticide is one of the most important factors resulting in failure at the field and lack of farmers' confidence in the product. It was suggested that there should be separate testing laboratories with adequate infrastructure and manpower to check the quality of biopesticides at various stages of production, marketing and applications. Perhaps this can be done through SAUs, and Agriculture and Horticulture departments in different States of the country. More than anything, there should be honesty in the production unit to ensure a quality product, especially as the agroeconomic and environmental implications of spurious and substandard bio products are extremely severe.
- For bioefficacy testing, selected universities and institutions having good expertise and infrastructural facilities may be notified by CIB. Using such accredited laboratories and technical expert committees (constituted by CIB) should submit reports regarding eligibility of production centres and their products which must be the basis for registration, notification or denotification by the CIB under section 9(3B) or 9(3).



Removing bottlenecks in gaining faith on biopesticides among the farming community

- Most of the farmers in the country do not have sufficient and clear knowledge on the use of biopesticides. The farmers need to be educated. In order to educate farmers, educating and training extension workers is important. This can be done through demonstration trials on the cultivators' field, as seeing is believing. An

intense publicity programme can be done through media like TV, radio, seminars, exhibitions and write-ups in local newspapers.

- For effective implementation and monitoring of biopesticides, usage cluster mode approach was recommended.
- For promoting microbial mediated bioeconomy, socioeconomists should be involved to assess the impact of biocontrol agents.
- Lack of supply of quality material from State governments and retailers was a major limiting factor.

Relaxing norms for biopesticides registration from the level of those for chemical pesticides

- Registration requirements for biopesticides are unnecessarily too stringent, hence should be relaxed and rationalized especially the exhaustive requirements of toxicological data. Since some of these agents also have the ability to increase plant growth, these could be considered also as plant growth promoting agents. If the expensive toxicological data was dispensed with, the cost of registration may be reduced.
- There is an urgent need to consider redefining biopesticides as biocontrol agents (BCAs) in order to simplify the registration procedures by CIB.
- A separate board may be setup to monitor quality control and registration of biocontrol agents.

Biological Seed Treatment

- Seed industries must be sensitized to use biological seed treatment. Since the current day emphasize is on sustainable agriculture, possibility of seed/planting material treatment and biopriming of nurseries with biopesticides should be given priority. Keeping in mind pro-poor efficacy of biopesticides, their use should be promoted by Ministry of Agriculture and State Governments.

Research and Development

- Proper packaging of predators and parasites be developed. Also strong repository of parasitoids and predators be established.
- There is an urgent need to develop barcoding of microbes used in commercial production of biopesticides.
- More focus may be given to develop low-cost technologies for mass production of biocontrol agents.
- Attention be given to develop post-harvest disease management practices using BCAs.
- On the lines of Bt crops, genetic manipulation in plants using Trichoderma genes could be promoted.
- Interface with industry and research organizations should be strengthened, including development of microbial consortia.

5.4. Brainstorming Session on Fish Stock Certification and Ecolabelling

The Brainstorming Session on the theme was held at the Academy on 27th August 2011. The Session was chaired by Prof. R.B. Singh, President of the Academy. Twenty six experts from different organizations had participated in the deliberation.

Certification, ecolabelling and traceability in fisheries have increasing significance in international fish trade and marketing. There is a growing number of private and public standards and schemes for sustainability. They have acquired significance under the perception that public regulatory frameworks are not achieving the desired outcomes in the context of long-



term sustainability of fisheries, protection biodiversity and environment and responsible fisheries management. A principal aspect of certification is to prevent, deter and eliminate illegal, unreported and unregulated (IUU) fishing in accordance with the FAO International Plan of Action. The procurement policies of most large retailers typically include a significant sustainability component, as an insurance against boycotts from environmental groups and negative media coverage and prescribe wild-caught fish to be certified to an ecolabel and for farmed fish and seafood to be certified to an aquaculture certification scheme. The impact of certification and ecolabelling is likely to increase, including in developing countries, as supermarket chains consolidate their role as the primary distributors of fish and seafood products, and as their procurement policies move away from open markets towards contractual supply relationships. Certification is also becoming increasingly important in the context of food safety, quality and environmental sustainability in the expanding aquaculture industry. The economic consequences of certification and how different standards and methods of certification, including requirements for traceability, influence the market for fish and fish products and affect the stakeholders, particularly in the small-scale sector, need to be studied in detail.

Taking cognisance of the growing importance of the market-driven conservation in international trade in seafood, NAAS organised a one-day Brain Storming Session on Certification and Ecolabelling in Fisheries to discuss various aspects of fish stock certification and ecolabelling, in the context of Indian fisheries, on 27th August 2011, at New Delhi. Dr. T.K. Srinivasa Gopal, Director, CIFT, Cochin was the convener of the Session. Twenty-six distinguished invitees including leading experts in the field of fisheries research, education, management and policy development and representatives from industry, Marine Stewardship Council (MSC), WWF-India and GS1-India participated in the programme. Dr. S.A.H. Abidi, former Member, ASRB; Dr. B. Meenakumari,

DDG (Fisheries), ICAR; Dr. Madan Mohan, ADG (Marine Fisheries), ICAR; Dr. S.D. Singh, ADG (Inland Fisheries), ICAR; Dr. G. Syda Rao, Director, CMFRI; Dr. J.K. Jena, Director, NBFGR; Dr. A.P. Sharma, Director, CIFRI; Dr. P.C. Mahanta, Director, DCFR; Mr. B. Vishnu Bhat, Fisheries Development Commissioner; Dr. K. Gopakumar, former DDG (Fisheries), ICAR; Dr. K.K. Vass, former Director, CIFRI; Dr. Dilip Kumar, former Vice Chancellor (CIFE); and Dr. Anwar Alam, Secretary, NAAS were among the participants.

Prof. R.B. Singh, President, NAAS who chaired the Session highlighted the importance of the topic and the necessity for evolving pilot schemes and implementable action plans. Keynote address by Dr. K. Gopakumar, former DDG (Fisheries), ICAR traced the historical development of ecolabelling schemes and set the tone for the brainstorming session. The pros and cons of marine fish stock certification and ecolabelling in the Indian context were presented by Dr. C. Ramchandran, Sr. Scientist, CMFRI. Dr. A.P. Sharma, Director, CIFRI presented the approaches for inland stock certification and ecolabelling. Aquaculture certification and ecolabelling approaches were presented by Dr. Sriprakash Mohanty, Sr. Scientist, CIFA. Seafood traceability aspects were presented by Dr. K. Ashok Kumar, Sr. Scientist, CIFT and RFID applications in seafood traceability by Mr. Atul Mahajan, Sr. Technical Manager, GS1 India, New Delhi. Status of MSC certification of needle squid, oil sardine and short-neck clam fishery in Kerala was presented by Dr. Oluyemisi Oloruntuji, Programme Manager (Developing World Fisheries), MSC, UK and Mr. Vinod Malayilethu, Sr. Coordinator, Marine Conservation Programmes, WWF-India.

There was unanimity about the need for fish stock certification and ecolabelling schemes for bringing together elements of the market, industry, environmental interests and communities and provide additional tools to move towards sustainability of capture fisheries and aquaculture. Adoption of fish stock certification and ecolabelling schemes for marine and inland capture fisheries and aquaculture will certainly be useful for supporting fisheries conservation efforts in India. In order to be credible and successful, such ecolabelling schemes (i) need to be aligned and harmonised with FAO guidelines for ecolabelling of fish and fish fishery products from marine and inland capture fisheries and aquaculture, (ii) compliant with relevant international standards such as ISO and ISEAL, (iii) have a robust and transparent governance structure, whether operated in public or private domain, (iv) be affordable with an acceptable cost structure and an equitable distribution of benefits across the value chain and (v) should not lead to creation of indirect trade barriers. Recognising the difficulties in applying the principles and criteria of the existing ecolabelling schemes for tropical fisheries, it has been recommended that India should take initiative to develop fish stock certification and ecolabelling scheme by formulating benchmarks and principles relevant to tropical fish stocks. Department of Animal Husbandry, Dairying & Fisheries (DAHD&F), ICAR fisheries Institutions, MPEDA, Export Inspection Agency (EIA), Fishery Survey of India (FSI), NFDB and State Departments of Fisheries should facilitate the implementation of Fisheries Management Plans and fish stock and aquaculture certification and ecolabelling in collaboration

with fishermen organisations, exporters, NGOs and other stakeholders. Traceability is an important aspect both in terms of seafood safety and certification and due attention is needed in developing a system, which is viable, cost-effective and appropriate for Indian fisheries.

As a first step, the ecolabelling initiatives need to focus on fish stocks targeted at export markets and organized domestic markets. The knowledge base on status of fish stocks and the biological indicators need to be expanded in order to facilitate certification and ecolabelling process. The Seafood safety and carbon footprint need to be integrated into the ecolabelling schemes. Harmonisation of the schemes on international level is needed and equivalency is required to be established on compliance with FAO relevant guidelines.

5.5. Sustaining Agricultural Productivity through Integrated Soil Management

The Brainstorming Session on this theme was organized on 10th October, 2011 at NAAS premises, New Delhi and was attended by 21 invited participants from research and academic institutions. Dr. A. Subba Rao, the Convener of the Brainstorming Session welcomed the participants. Prof. Anwar Alam, Secretary, NAAS while chairing the session

underlined the crop yield plateauing and decline in soil organic matter status. He also highlighted the need for efficient organic waste recycling, avoiding burning of organic residues at the cost of valuable manure for soil. Dr. A.K. Singh, DDG (NRM) and the Chief Guest emphasised the importance of soil, seed, tillage and nutrients in sustaining the crop



productivity and the need for maintaining good soil health through balanced and integrated nutrient supply, site-specific nutrient management and precision agriculture. He reiterated the need for nutrient use efficiency, use of organic residues in conservation agriculture and the government's initiatives in improving the soil health. Dr. A. Subba Rao, the Convener made an overview presentation based on the draft paper. This was followed by eleven presentations on different aspects of soil and water management in different climatic zones and representative soils. Each presentation was followed by thorough discussion on the topic.

The highlights:

Meeting the food demand mostly depends upon the supply of plant nutrients and water as well as the functional capacity of soil in relation to nutrient cycling and rhizospheric environment. Supply of plant nutrients through fertilizers is getting squeezed with rise in the cost and various national and international policies. Availability of water always remained uncertain due to its dependence on rainfall and groundwater recharge and the situation is getting tough due to competition from other sectors. Currently, the major constraints are decline in soil productivity and groundwater quality as well as loss in soil biodiversity. Hence, a pressing need has arisen for managing our precious soil resources efficiently to meet the growing demand for food and to safeguard the quality of the environment.

Integrated soil management (ISM) involves a combined strategy of effective crop, nutrient, water, soil and land management for sustainable agricultural production and other forms of land use. ISM can be tailored to the characteristics of site and soil and more importantly, to environmental, economic and social constraints faced by the farmers. ISM technologies should enhance soil structure, improve nutrient and water use efficiency, conserve valuable soil and water resources, and wherever possible, increased cropping intensity.

The integrated soil management also involves the technologies for arresting soil degradation; reclamation of degraded lands; water harvesting, conservation and management; organic resource management; balanced nutrition to crops; manipulation of soil biota and remediation of problematic and contaminated soils.

Policy needs

1. Strengthening of soil testing programme

The existing soil testing laboratories need to be upgraded with state of art facilities and qualified and trained personnel for efficient, rapid and reliable soil analysis including some physical and microbiological parameters and for providing soil test based site-specific recommendations to the farmers. The laboratories may also periodically monitor the soil health in their respective agro-climatic zone. ICT may be exploited for faster dissemination of soil test based recommendations and soil health cards to farming community.

2. Establishment of framework for monitoring the soil quality

A national database center linked to research institutions and various soil testing laboratories may be created to enable access to soil health data by farmers, administrators and planners. Data mining tools must be fast and reliable. The soils in different agro-climatic zones need to be mapped for their health based on well accepted minimum data set for each zone.

3. *Efficient recycling of organic wastes*

Organic materials help to build good soil structure and maintain healthy microbial activity in addition to supplying plant nutrients. Management of crop/farm residues (both off-site and in-situ), safe and acceptable agro-industrial and municipal organic wastes through composting, and mulching in conservation agriculture may to be promoted. Efficient composting techniques may be popularized through subsidies and large-scale burning of crop residues must strictly be banned.

4. *Need for effective land use policy*

An effective land use policy framework which must also demarcated areas not suitable for farming because of their ecologically fragile nature may be formulated for each State. These can alternatively be used for agroforestry/forestry/ range lands. Diversion of fertile lands for industry and other developmental purposes should be restricted.

5. *Encouraging carbon sequestration in soil under Kyoto Protocol Agreement*

In recent agreements under the Kyoto Protocol, C sequestered in soil qualifies for the inclusion in Carbon footprint (Article 3.4) with subsequent benefit of C credit. Inclusion of soil C sequestration for accounting purpose requires authentic database for an independent assessment and verification. Thus, there is need to generate verifiable soil C baseline data for SOC under agroforestry, grass land and arable agriculture.

6. *Measures to protect fertile soil from chemical, biological and physical pressures*

A soil protection policy needs to be formulated and implemented at national level. This policy should regulate the entry of pollutants to soil from gas-dust releases from power plants, metal smelting, the burning of raw materials for cement; heavy metals from fertilizers (e.g. Cd through phosphatic fertilizer), pesticides (e.g., Zn, Cu, Sn, Hg, organic pollutants) and industrial effluents; salts and heavy metals from contaminated surface water and groundwater. Both the private and public organizations such as corporations, municipalities, Town and Country Planning Departments, Ministry of Industries, Mining, Urban Developments etc. and entrepreneurs/ industries with likeliness of causing soil pollution should be brought under Environment Protection Act.

7. *Remediation of degraded, problematic and polluted soils*

Physically and chemically degraded soils pose risks to all strata of organisms including humans, livestock and crops and hence, must not be left untreated. Economic feasibility in particular makes it difficult to carry out remediation of eroded soils and those affected with salinity, sodicity, acidity, and contaminated with pollutants. A Land Reclamation Board may be set-up to facilitate monitoring of programmes related to soil reclamation and remediation with adequate resources. The Board may also work

on preventing risks from pollution, enabling a minimum of agricultural activity on the reclaimed land.

8. *Promoting balanced nutrition of crops*

Fertilizer policy needs to be oriented towards ensuring balanced nutrition to major crops through nutrient based subsidy, micro-nutrient fortified major fertilizers and soil test based site-specific nutrient management. The Government may also provide subsidy to soil amendments including mineral and byproduct sources for reclaiming sodic and acidic soils.

9. *Creation of public awareness about the crucial role of soil in the ecosystem and its vulnerability*

Institutions that provide training and education for people in soil-related occupations such as farmers and gardeners must be linked to a nodal institution at national level which can provide requisite logistics and resource materials for public awareness including design of course curricula for school education.

Research needs

1. Basic research on water, carbon and nitrogen footprints and their role in soil-crop management with special reference to climate change
2. Developing efficient techniques of water and nutrient management for their economic use in different agro-ecosystems
3. Efficient technologies for utilization of biomass from different sources (agricultural, agro-industrial, municipal etc.) for improving soil productivity under integrated nutrient management and organic farming
4. Role of resource conservation agriculture in abiotic and biotic stress management with special reference to climate change
5. Identifying and characterizing microbes as both individuals and as consortia in soil and water and their roles in regulating different soil functions and their interaction with plants
6. Soil quality assessment and monitoring through identification of minimum data sets under different agroecosystems.
7. Research on soil-plant-animal / human continuum in different agroclimatic zones with reference to micronutrient dynamics and pollution levels of heavy metals must be scaled up for safeguarding the animal and human health.
8. Research is required to unlock the interrelations between climate change and soil quality and to develop models for predicting the impact on soil quality under different climate change scenarios.
9. Technology for reclamation of waterlogged sodic soils.

5.6. Livestock Infertility and Its Management

Livestock sub-sector is one of the main pillars of India's agrarian economy, food and nutritional security and livelihood. Its ownership is highly egalitarian and the growth in this sub-sector is highly pro-poor. India possesses the highest cattle population of



around 199 million (15% of the total world's cattle population). Buffaloes numbering around 105 million in the country contribute to more than 53% of the total milk production. The sheep and goat are also important livestock species of India which contribute greatly to the agrarian economy, especially in the arid/semi-arid and mountainous terrains where crop and/

or dairy farming are not economical. Good reproductive performance is essential for efficient livestock production. However infertility is a serious bottleneck in our quest for making livestock rearing a profitable venture. Various issues related to amelioration of livestock infertility are highlighted:

- **Anestrous and repeat breeding** in buffaloes and bovines are two of the most serious reproductive problems affecting 30-40% of the total cattle and buffalo population. On a conservative estimate, the country is losing 20-30 million tonnes of milk annually and in economical terms, about ` 40,000-50,000 crores on these accounts.

Issues related to artificial insemination

- The average productivity of cows and buffaloes is still very low because the bulls used for semens do not possess high genetic superiority and the AI though has been in existence for over 60 years has only benefited 20% of our breedable livestock. Conception rate due to A.I. is also low. A.I. facilities are not available at the farmers' doorsteps. Semen available for A.I. is not of required quality. There is shortage of qualified para-veterinarians.
- Application of artificial insemination has made crossbreeding between *Bos taurus* and *Bos indicus* populations very widely possible for substantial increase in milk yield. However, the male crossbred offsprings are often inferior to purebreds in semen production. The proportion of males reserved for breeding and reaching successful freezing stage is the lowest in crossbred bulls.

- **Feed resources:** Our country is ill-equipped with respect to feed resources to fulfil the nutritional requirements of dairy animals. In conditions when sufficient nutrients, particularly energy are not available to the cows, buffaloes, sheep or goats, a loss in body condition results causing decrease in milk production, and reproductive activity is compromised.
- **Advances in embryo biotechnological research** with tremendous progress in basic embryo transfer techniques, *in vitro* maturation of oocytes and *in vitro* fertilization and production of buffalo calves by IVF technology have been made but their extensive use is still elusive.
- **Infectious agents** that have a deleterious effect on the animals are also known to interfere with reproduction. Bacterial infections of the uterus, vagina and vestibulae can lead to anestrus and repeat breeding, delayed return to oestrus after mating, early embryonic death and sometimes, abortion. However, nearly half of the cows are still capable of breeding, indicating that pathological conditions do not necessarily render cows permanently sterile. Their seriousness depends on the location of the infection. Many diseases can therefore be substantially reduced by vaccinations.
- **Fertility Therapy:** Considering the exorbitant cost of fertility-enhancing drugs and hormones for treating the livestock, alternate therapeutic methods have been identified. Our country is also rich in terms of expertise in recombinant technology and peptide synthesis. These options must be exploited on priority.
- The overall incidence of mastitis, retention of fetal membranes (RFM), metritis, endometritis and pyometra in crossbred cattle are more in comparison to native cattle. Suppressed immune status due to harsh Indian climatic condition is one of the major hurdles limiting their reproductive performance and hence productivity. Periparturient period is the most critical period for a dairy cow as the future productive and reproductive capability is related to a smooth transition from pregnancy to lactation. Reduction in the use of antibiotics treatment is the need of the hour. The beneficial effects of herbal preparations are similar to synthetic preparations and they can be easily prepared. Time has come to exploit indigenous natural resources possess valuable therapeutic properties for the betterment of livestock population through improved immunity and fertility.

Livestock fertility improvement and management assumes great importance for finding solutions to bridge the gap between available knowledge and its application at the farmers' door-steps. Accordingly, a Brainstorming Session was convened by Dr. B.S Prakash, Head, Division of Dairy Cattle Physiology, NDRI, Karnal, on October, 15, 2011 at NAAS premises, New Delhi. Dr. A.K. Srivastava, Director NDRI moderated the Technical Session of the programme which was inaugurated by Padma Bhushan Prof. R.B. Singh. In addition to valuable presentations by experts in their relevant areas related to various aspects of infertility viz. endocrinology, nutrition, infections, biotechnologies, etc. there was an active participation of the experts from the industry and Central and State animal husbandry departments.

5.7. Value-added Fertilisers for Site-specific Nutrient Management (SSNM)

The brainstorming Session (BSS) on Value-added Fertilizers and SSNM was held on 17th October 2011 in the premises of NAAS under the convenership of Dr Rajendra Prasad, Ex ICAR National Professor. It was attended by 22 participants, who came from ICAR institutes, Ministry of Agriculture (INM), Fertilizer Association of India and the fertilizer industry. There were four sessions, which were respectively chaired by Professor R.B. Singh, President, NAAS, Prof. H. S. Gupta, Director, IARI, Dr. Virendra Kumar, ex Director Marketing, IFFCO and Prof. Anwar Alam, Secretary, NAAS.



While introducing the topic, Dr. Rajendra Prasad pointed out that the value addition is not limited to the fortification of fertilizers with secondary and micronutrients as per soil test recommendations (SSNM) resulting in customized fertilizers. It includes issues such as increasing the efficiency of applied plant nutrients, development of water-soluble fertilizers containing primary, secondary and micro-nutrients and even matters related to improvement of storage and handling of fertilizers.

Prof. R.B. Singh in his opening remarks stated that the fertilizer is the key input in not only augmenting the food production but also in overcoming the malnutrition due to deficiency in micro-nutrients, such as iron, whose deficiency leads to anaemia, which is quiet common in pregnant women in Asian and African countries. Similarly, zinc deficiency in food can lead to child diarrhoea, endemic in several Asian and African countries. These problems can be easily overcome with the use of customised fortified fertilizers for different crops and regions. In view of this, BSS on Value Added Fertilizers resulting in a policy paper is quite timely.

Prof. H.S. Gupta pointed out that in view of low fertilizer nitrogen use efficiency, use of low-cost and indigenous nitrification inhibitors can play an important role. He observed that the Indian Agricultural Research Institute (IARI), New Delhi has played a lead role in this direction by developing neem-coated urea. He informed the participants that some new nitrification inhibitors are being developed at IARI. Dr. Virendra Kumar congratulated NAAS for organising the BSS on this very important topic. He observed that IFFCO has been always a front runner in this direction and it had a long back organised field trials with Urea Super Granules (USG) and ammonium polyphosphate (APP). He appealed to ICAR and Govt of India to find out the areas and crops where they can be suitably employed. He also informed that recently IFFCO has come out with boronated NPK fertilizers for the eastern India in consultation with the soil scientists and agronomists and the product is in the market.

Dr. Alam pointed out that with the continued increase in area under micro-irrigation (drip and sprinkler) there is an urgent need to develop water-soluble fertilizers having primary, secondary and micro-nutrients as per the crop and soil needs and suitable equipment for application of liquid fertilizers, Also there is a need to develop suitable applicators for the placement of USG. He observed that there is sufficient technical manpower in the country to develop these equipments and what is needed is a serious attempt to do this fast. He hoped that the policy paper emanating from this Brain Storming Session will be able to accentuate the process of developing new value-added fertilizers and suitable equipment for their application.

The following are the major recommendations:

Policy

- The process of approval, pricing and incorporation of Value Added Fertilizers (VAFs) in the Fertilizer Control Order must be faster.
- An advanced centre on Value-added Fertilisers may be established without any further delay. This centre should provide leadership and guide R&D units of the fertilizer industry in developing VAF.
- Agronomic evaluation of newly developed VAFs should be restricted to the crop and region for which these are developed, doing away an All-India evaluation.
- Pilot-scale production of urea super granules (USG) may be approved for a few manufacturers. USG is already in use in Bangladesh and Philippines.
- Strict quality assurance on VAFs including water-soluble and liquid fertilizers should be enforced.

Research

- In the development of crop / region-specific customized fertilizers. precautions are necessary in the dosing of boron, copper, manganese and molybdenum in N/NP/NPK fertilizers, because there is a narrow margin between deficiency and toxicity limits for plants for these nutrients.

- Development of low-cost indigenous nitrification inhibitors.
- Coating of N/NP/NPK fertilizers with bio-degradable polymers, nano-clay, gypsum and other low cost indigenous materials.
- Use of nano-technology in development of VAFs.
- Development of bio-impregnated phosphatic fertilizers.
- Development of suitable equipments for the application of USG and liquid fertilizers.

5.8. Fighting child malnutrition

The BSS was convened by Dr. V. Prakash, Distinguished Scientist of CSIR at National Institute of Nutrition (NIN), Hyderabad on 13th November, 2011 to address various issues in “*Fighting Child Malnutrition*”.

The session was inaugurated By Prof. Dr. Sheela Ramachandran, Vice-chancellor of Avinasingam Deemed University, Coimbatore and the key note address was delivered by Dr. R.B. Singh, President, NAAS, New Delhi. The session included presentations



by Dr. V. Prakash, Dr. Sasikeran, Director, NIN, Hyderabad; Dr. Ms. Mahtab Bamji, Hon INSA Scientist, Hyderabad, Dr. Ramesh Bhat, Consultant FAO, Hyderabad and Dr. Shivkumar, former Director of NIN. This was followed by a panel discussion in which a number of participants from around the country representing universities, research institutions, representatives from industry and the State Government and NGO organizations.

The key message was that today's need for fighting malnutrition in children must encompass a life cycle approach covering the first 1000 days of a child clearly and must necessarily include the maternal nutrition from day one of the conception to the 3rd or 4th year of the child all the way to adolescent age. The concerns being low birth weight and exposure to many nutritionally related diseases, micronutrient enrichment especially in the supplementary and complementary foods, as well as the ever-needed protein, calorie make up in the diet are essential. The diet must include plenty of vegetables and fruits during the growing years. Mineral nutrition especially that of iron+ folic acid, calcium, zinc etc. was emphasized. The vehicles for such supplementation and complementary foods were also discussed. The role of PUFA and MUFA as well as iodine and beta carotene was underlined. Illustrating with the successful State models, the State policy matter regarding the nutrition food reaching the malnourished children was raised. The proposed Policy Paper is expected to provide a roadmap with many layers of concentric rings upto the village level for reaching the nutrition power to the unreached.

6. Interactions

6.1 NAAS-ICAR Interface Meeting

For the first time, an interface meeting between ICAR and NAAS was held at the Academy on November 21, 2011. It was intended to address food and nutritional security, livelihood to the rural people and associated issues of research, education and extension education, issues which are so vital that stakeholders, major or minor, articulate on the subject and



give voice to their perceptions. Many a times their perceptions are inaccurate damaging the cause and image of both the organizations, possibly due to lack of live linkages and communication channels. Academy prepared a background note to facilitate focussed discussion which covered the following 7 topics.

1. NAAS - contact with public
2. NAAS Fellows on Mission
3. Mentoring of Young Scientists
4. Genetically Modified Crops in NARS
5. Hybrid Seeds: Harbingers of Food and Nutritional Security

6. SWOT Analysis of the Higher Agricultural Education India
7. Krishi Vigyan Kendras

Action Points

1. ICAR-NAAS interface meetings be held at periodic intervals to collectively address the issues of agriculture, agricultural research, education & extension.
2. Regional Chapters of NAAS be activated creating active linkages with regional / State authorities in matters of agricultural research, education and extension education.
3. Mentoring of students and young faculty be institutionalised in a healthy manner.
4. NAAS Fellows be put on specific task relevant to the region/State in the interest of agricultural education, research and agriculture in general.
5. For strengthening agricultural education, capacity utilization of SAUs be enhanced and avenues of new universities be examined with reference to quality and the needs.
6. KVKs be owned and nurtured by NARS, as they are the only mechanism of active linkage between SAUs and their stakeholders.
7. Public awareness be created about GM crops developed in the country. Bt-based varieties be developed so that dependence on corporate-bred seeds can be minimised.
8. NAAS Fellows may be facilitated as National Lecturers visiting SAU Campus or ICAR Institute for a week delivering lectures to students and staff on relevant topics.
9. NAAS could be utilized for independent evaluation of R & D and educational programmes.
10. Negative voices, that are unjustified, be counteracted by NARS and NAAS through proactive mechanisms.
11. Proactive role be played in creating awareness about ICAR, SAUs, KVKs functions, highlights of achievements, success stories.
12. For better public contact, NARS and NAAS should prepare documentaries and bulletins on relevant topics and current issues.
13. Mechanization is the need of the hour, skills of the operators and extension workers be enhanced.
14. Academy should flag issues, raise alarm bells, and voice on critical issues.
15. There is need to increase scientific manpower. Excessive vacancies and restrictions on recruitment are impeding work at SAUs.
16. NARS and NAAS should strengthen their science base and formulate agricultural science policy.
17. Innovative research results need to be highlighted for public consumption through print and electronic media.

6.2 NAAS - ttz Bremerhaven Interaction

A German team comprising of Dr. Gerhard Schories, Technical Director and Dr. (Ms.) Barbara de Mena, Project Manager (Waste Management) of **ttz Bremerhaven** visited the Academy on 7th June 2011 and interacted with selected NAAS Fellows, Office Bearers and a few invited scientists. They had met Prof. R.B. Singh prior to their visit. Dr. S.M. Virmani, Dr. B.S. Pathak, Dr. Anwar Alam, Dr. C. Devakumar, Dr. A. Bandyopadhyay, Dr. B.B. Nayak, Dr. D.K. Singh and Dr. H.V. Raghu participated in this meeting.

Dr. Virmani made a statement on the organization, objectives and activities of NAAS. This was followed by a presentation by Dr. Schories in which he explained that ttz Bremerhaven was a private organization and its research interests included the subjects of water, energy and landscape management. It was mostly self-financed except for a small Govt. grant. Bremerhaven was looking for joint programmes with research organizations outside Germany on the basis of each participant finding financial support to implement its part of the joint programme.



Dr. B.S. Pathak briefed on utilization of cellulosic biomass and other prospects of biomass utilization. Dr. Devakumar underlined the scope of collaboration in the areas of nutrient use efficiency and carbon sequestration in soils. Dr. Bandyopadhyay also made valuable comments. Dr. D.K. Singh made a presentation on the extent of water contamination and its adverse effect on urban and periurban agriculture. Dr. Nayak made a brief presentation on effluent from fish processing plants. Dr. Gerhard suggested for recycling of such water.

Treatment of industrial effluents and biomass management were identified as the two areas of common interest. Research proposals are to be developed.

Dr. Gerhard suggested two channels for collaboration with them, (i) European Union and (ii) Bilateral Collaboration (on energy). It was explained to the visiting EU team that NAAS will assist, coordinate and arrange workshops of the interested institutes. NAAS has excellent facilities for such activities. The EU team indicated that on their return to Germany, they will submit a proposal to EU for approval.

6.3 Roadmap of Indian Agriculture

The NAAS Committee on the Roadmap of Indian Agriculture in its meeting on July 1, 2011 agreed on the following seven chapters and their multiple authors:

1. Overview of India's Agriculture, Food and Nutritional Security and Rural Poverty - R.B. Singh and V.S. Vyas
2. Bridging Yield, Productivity and Income Gaps - H.K. Jain, Bijay Singh, J.N.L. Srivastava and Mruthyunjaya
3. Water and Land Use, Resilience to Climate Change, Sustainability and Management of Rainfed Agriculture - A.K. Singh, P.K. Aggarwal, Raj K. Gupta and T.K. Adhya
4. Farm Mechanization and Value-Chain Management - Anwar Alam, M.M. Pandey, S.S. Acharya, Gajendra Singh and Pitam Chandra
5. Agricultural Research Technologies, Best Practices, Innovations and Regulations for Development - S. Ayyappan, P.L. Gautam, K.D. Kokate, H.S. Gupta, M.P. Yadav and S.P. Ghosh
6. Policies, Strategies and Institutions: Pricing and Marketing, Diversification, Public-Private-Partnership, National Food Security Bill, Investment in Agriculture, Knowledge Platform, Governance, Institutional Support, Human Resources - Ramesh Chand, P.K. Joshi and Anjani Kumar
7. The Path Ahead: Road Map - V.S. Vyas and R.B. Singh



6.4 Water in Agriculture

A one day Brainstorming Session was held at the National Academy of Agricultural Sciences on 31.5.2011 in which President, NAAS, Professor R.B. Singh, immediate Past President, Dr. Mangala Rai, Vice Presidents, Dr. H. K. Jain and Dr. S. Ayyappan and several other Fellows of the Academy participated. The aim of the brainstorming session was to define the outline of proposed NAAS document on "Water in Agriculture". The agreed outline, chapters and their authors are as below.

- **Every Drop Counts** (A.K. Singh*, B.R. Sharma, U. Lall (Columbia University, Water Center), T.B.S. Rajput, Alok Sikka, Mruthyunjaya, K.M.L. Pathak, D.K. Sharma, Ashwani Kumar)
 - a. Shrinking supply of water



- b. Growing demand for water in crop, livestock and fisheries
 - c. Deteriorating water quality
 - i. Saline and sodic water
 - ii. Fluorine, arsenic pollution
 - iii. Biological/bacterial contamination
 - d. Low water productivity
 - e. Water wastage, poor quality water and waste water related infrastructure
 - f. Water-poverty nexus
 - g. Water and gender
 - h. Water and energy
 - i. Climate change
- **Technology Frontiers** (N.H. Rao, A.K. Singh, V.K. Dadhwal, V.U.M. Rao, B.R. Sharma, S.K. Gupta, K.V. Vittal, P.K. Joshi, S.M. Virmani, Kalpana Sastry, M.L. Jat, Raj K. Gupta, B. Venkateswarulu, K.D. Kokate, T.K. Adhya, P. Krishnan, A. Sarangi, Anushree Malik and S.K. Deshmukh)
 - a. Modern water saving and conservation technologies
 - i. Drip, sprinkler
 - ii. System of Rice Intensification
 - iii. Conservation agriculture
 - b. Land use and water productivity
 - c. Water management in rainfed and dryland agriculture
 - d. Genetic improvement for high water efficiency
 - e. Watershed management for high water use efficiency
 - f. Improving quality of water for agriculture
 - g. Use of poor quality water in agriculture

- h. Improving quality of poor quality and waste water
- i. Nanotechnology and water management
- j. Integrated water management
- k. Use of weather forecasting and ICTs for efficient water use
- **Water Policies, Institutions and Governance** (P.K. Joshi, Ramesh Chand, I.P. Abrol, Alok Sikka, P.B.S. Sarma, Vilasrao Salunkhe, Rajeswari Raina, R.P.S. Malik)
 - a. Policies
 - i. Allocation for irrigation in various plan periods
 - ii. Government programs on water and their convergence
 - iii. Investment and subsidies in water sector
 - iv. Water pricing (canal as well as groundwater)
 - b. Water related policies in key States. How sound are the policies and actions?
 - c. Institutions
 - i. Collective action and property rights
 - ii. ICT and water in agriculture
 - d. Governance
 - i. Role of private sector/NGOs (Gujarat, Andhra Pradesh, for example)
 - ii. Integrating different stakeholders

6.5 Agriculture Education in India

Topics and sub-themes of the XI Agricultural Science Congress

It was decided in the meeting of the Executive Council (No. 75) that the theme of the XI Agricultural Science Congress to be held in OUAT, Bhubaneswar will be *Agricultural Education*. The theme has now been slightly revised as *Agricultural Education - Saving India's Future* and is proposed to be held on 7-9 February 2013.

As a sequel, a brainstorming session on this theme as a curtain raiser was organized on 23rd December 2011. Several eminent scientists and educationists participated in the meeting. Several issues such as genesis and evolution of agricultural universities, their historical contribution to capacity building, research and extension, their current status in the background of changing global scenario, challenges being faced by Indian agriculture, the vexing issues of governance-deficit, perennial vacancy of faculty positions, fragmentation of the existing universities, lack of support of the State governments to SAUs, the prevalent silo approach, increasing intervening efforts of the ICAR in the facilitation of enabling environment within the limited financial support etc were deliberated in detail. At the same time, the good performance of some universities was noted with appreciation.

The major thrust areas such as skills and entrepreneurship development, personality development, support for cutting edge areas and high-end research, employability of the students etc. were highlighted. The need to revisit the course curricula, the pedagogical approach, learning resources etc was also emphasized. The minutes of the meeting may be seen in Annexure-III.

A follow up meeting was convened involving new set of eminent participants on 31st January 2012. In the first phase, the following topics and sub-themes and the conveners/authors have been identified:

1. *Agricultural Education in India – Policy Initiatives, Growth and Trends* - Dr. Arvind Kumar, DDG (Education), ICAR.
2. *Governance of Agricultural Education in India* – Dr. Arvind Kumar, DDG (Education), ICAR and Dr. S.L. Mehta Former DDG (Education) and ex VC, MPUAT, Udaipur.
3. *Global Competitiveness of Agricultural Education: Think Globally and Act Locally* – Dr. C. Devakumar, ADG (Education Planning and Development), ICAR.
4. *Revisiting Land Grant College Concept* – Dr. S.M. Virmani, Former Team Leader, Agronomy, ICRISAT Dr. R.B. Singh, President, NAAS and Dr. Gajendra Singh, Former DDG (Engg.) ICAR
5. *Measures Towards Academic Excellence in Agricultural Education* – Dr. H.K. Jain, Chancellor, CAU, Imphal and Dr. Arvind Kumar, DDG (Education), ICAR
6. *Para-professional Education and Training in Agricultural and Allied Fields* – Dr. K. Pradhan, Chancellor, Siksha 'O' Anusandhan University, Bhubaneswar and Dr. D. Rama Rao, Principal Scientist, NAARM, Hyderabad.
7. *Paradigm Shift in Agricultural Education Towards Entrepreneurial Development and Agri-Business* – Dr. H.S. Gupta, Director, IARI and Dr. H.S. Gaur, Dean & Joint Director (Education), IARI
8. *Central Agricultural Universities to Strengthen Agricultural Education* – Dr. S.N. Puri, Vice Chancellor, CAU, Imphal and Dr. Anwar Alam, Former Vice Chancellor, SKUA&T-K, Srinagar.

Suggestions for new relevant topics and sub-themes are solicited. A copy of the minutes of the meeting is placed in Annexure-IV.

7. Lectures

- Dr. Jagdish Kumar, Principal Soybean Breeder & Leader, Soyfood Program, Hendrick Seeds, Canada and Fellow of the Academy delivered a Lecture on **'Adding Value to Soybeans - Enhancing Functional Traits'** on January 31, 2012

Dr. Kumar's talk on 31.01.2012 covered various facets of soybean such as production and trade, functional and nutraceutical values, and the recent efforts in soybean improvement. The highest soybean productivity recorded is 10 t/ha and the world average is 2.5 t/ha. India with an average of 1-2 t/ha must catch up in productivity. The annual trade of functional food is in the order of 50 billion US\$. This is likely to increase by 50 per cent of the total food trade by 2050. Processed soya foods is becoming popular even in India. Soybean is a storehouse of valuable nutraceuticals such as isoflavones which range between 100-3000 micro g/g averaging about 600 micro - g/g. Soya oil contains linolenic acid which has



to be moderated for health purpose. Plant breeding efforts are underway in removing anti-nutritional factors and reducing the linolenic acid content. The short duration soybean variety with productivity of 2 t/ha is adaptable under Indian situations. It can be harvested for green beans at 65 days after sowing. Molecular maps of soybeans were developed in 2010 and markers are being developed for soybean traits, he informed. There is a negative correlation between protein and isoflavone contents. Similarly, reduction of 1% oil content helps in increasing protein content by 2%. Designer soy-crops have been developed, for example black soybean has only 12% oil and is good for human consumption.

- Dr. Clive James, Chairman, International Service for the Acquisition of Agri-biotech Applications (ISAAA) & formerly DDG, CIMMYT delivered a lecture on **Global Status of Commercialized Bio-tech/GM Crops** on 18th February 2012.

This talk was jointly organized by NAAS and ICAR for the benefit of NAAS invitees and participants in the Conference of Vice-Chancellors of SAUs and Directors of ICAR Institutes in A.B. Shinde Symposium Hall of ICAR on 18th February, 2012.

In his lucid presentation, Dr. James gave an overview on the global status of commercialized biotech/GM Crops. He informed that the commercialization of bio-tech crops is in the 17th year and their cultivation has expanded in area from 1.7 million ha in 1996 to 160 million ha in 2011. This is a phenomenal increase in the history of modern agriculture. India is among the top 10 countries with an area of 10.6 million ha, exclusively under Bt cotton. Even, the European countries have started cultivating biotech/GM Crops. His presentation highlighted country-wise and crop-wise status of bio-tech crops. He underlined the point that biotech is not a panacea but a very important tool

and multiple approaches are needed to harness it. He also revealed the future biotech crops in the pipeline. In 2012, first Stacked Trait – herbicide-tolerant and insect-resistant soybean in Brazil will be under cultivation, In 2013, first drought tolerant maize will be introduced in USA and during 2013-2015, Golden Rice in Philippines, Omega-3 rich soybean and several dual action products are likely to come globally.



He said that in the next fifty years, the world will consume twice as much food as total sum of food consumed since the beginning of agriculture about 10,000 years ago. However, regrettably, the vast majority of global society is completely unaware of formidable challenges of feeding the world of tomorrow and the potential contribution of technology, particularly the role of the new innovative bio-technologies, such as biotech crops. Given this lack of awareness about the challenges and the role of the new innovative crop biotechnologies, ISAAA initiated a programme a decade ago to distribute and share science-based knowledge about biotech crops with global society. More details about Global Status of Commercialized Biotech/GM Crops in 2011 can be accessed at <http://www.isaaa.org/resources/publications/briefs/43/executivesummary/default.asp>

8. Launching The Journal ‘Agricultural Research’



A function to launch the first issue of “**Agricultural Research**”, an international journal of the Academy was held on 31st January 2012 at which Dr. R.S. Paroda, Ex-Secretary, DARE and Director General, ICAR and former President, NAAS was the Chief Guest. Professor R.B. Singh, President of the Academy welcomed Dr. Paroda and others present at the function. Professor Singh also extended warm

compliment to Dr. K.L. Chadha and Dr. V.P. Singh for being honoured with Padamshri Awards of the Government of India.

Professor Anupam Varma, Editor-in-Chief of the Journal introduced the participants from Springer India (Pvt.) Ltd, the publisher of the journal. He further informed that the goal of the journal is to publish articles on the new and emerging areas and concepts for providing future directions to promote agricultural research globally.

The journal will be published quarterly and includes original research papers, critical reviews and opinion articles on emerging fields and concepts, covering both applied and basic research. The articles published in the journal will include all the disciplines of agricultural sciences. The journal encourages contribution of articles from all parts of the world. The journal is published in online and print versions. The online version is published in colour and the print version in black and white. There is no page charge for publication of articles in Agricultural Research.

The journal can be accessed on the homepage of Agricultural Research at <http://www.springerlink.com/content/2249-720x/>.

Dr. Paroda while launching the journal stated that any new beginning has to be seen as a new hope for the future. A lot of thinking has gone in for this journal. He told that starting a new journal is easy, but sustaining it is difficult. He mentioned that he has had the opportunity to work with Prof. Anupam Varma, and he is confident that under Prof. Varma's guidance the journal will do well. Being an online journal, the visibility of the journal will be wide. He suggested that this journal has to be on a higher plank, than the other journals. This journal should not only bring science to people but should also be able to influence the policy makers. It is desirable to include in each issue an article on policy issue. There should be short articles too, he said. Academy should endeavor to nurture it. Academy is our premier institution for sharing knowledge.

At the end, Prof. Anupam Varma proposed vote of thanks and invited participants to contribute articles and also request their colleagues to contributed good articles to the journal. He agreed with the suggestion of the participants that the first issue of every volume should have instructions to authors. Prof. Varma made special mention of the guidance of Dr. H.K. Jain and Prof. R.B. Singh and the hard work of Dr. P.K. Aggarwal at the initial stage, which helped in making "Agricultural Research" a reality. Prof. Varma extended warm thanks to the members of the Advisory Board and Editorial for their help in bringing out this important journal.

9. New Year Get-Together

Prof. Anwar Alam, Secretary, NAAS, welcomed the Chief Guest, the President of the Academy and other participants. Prof. R.B. Singh, President, welcomed Prof. V.L. Chopra the Chief Guest of the function and other Fellows of the Academy. He also conveyed the greetings of Dr. R.S. Paroda, Dr. H.K. Jain and Dr. S. Ayyappan. He thanked the outgoing Members of the EC for their unstinted cooperation. He also



welcomed all the new Office Bearers, the newly elected Fellows and selected Associates. He gave a brief overview of activities of NAAS in the last year. He specifically appreciated the efforts of the Editors in improving the outlook of NAAS News. He also informed about the new journal that would be released in January 2012. He thanked many distinguished Fellows such as Dr. P.K. Aggarwal, Dr. S.M. Virmani for their contributions in NAAS

activities. While acknowledging the support of all EC Members and Office Bearers, he also put on record his appreciation of the excellent support being provided by the Secretariat. He desired that NAAS must be acting as a brain bank of agricultural sciences so that the challenges being faced by the hungry and the poor could be alleviated. On this occasion, a publication entitled '*Towards An Evergreen Revolution – The Road Map*' authored by Prof. R.B. Singh was released by the Chief Guest. Prof. V.L. Chopra in his inaugural speech conveyed his New Year greetings to all the Fellows and congratulated Prof. R.B. Singh for the excellent publication as well as his leadership in the Academy. He desired that NAAS should continue focusing on the promotion of

excellence in science without wavering. He wished the Academy all success in playing the pivotal role for the cause of agriculture in general and agricultural sciences in particular.



excellence in science without wavering. He wished the Academy all success in playing the pivotal role for the cause of agriculture in general and agricultural sciences in particular.

10. Regional Chapters

The Academy has five Regional Chapters as follows. The Regional Chapters make suggestions with regard to policies and problems concerning their areas of operation.

The Conveners of these Chapters are:

Southern Chapter (*Hyderabad*)

Dr. B. Venkateswarlu

Northern Chapter (*Lucknow*)
Eastern Chapter (*Patna*)
Western Chapter (*Mumbai*)
North Eastern Chapter (*Imphal*)

Dr. P.S. Pathak
Dr. B.P. Bhatt
Dr. W.S. Lakra
Dr. S.N. Puri

Activities of the Regional Chapters

A National Seminar on **‘Fly Ash-based Amendments for Amelioration of Degraded Soils to Increase Crop Production in the Gangetic Plains’** was organized during May 7-8, 2011 at Lucknow by the Northern Regional Chapter of the Academy in association with National Institute of Ecology, CSSRI, RRS, Lucknow and Centre for Fly Ash Research & Management (C-FARM) by Dr. P.S. Pathak, Convener of the Chapter. It was inaugurated by Prof. R. B. Singh, President of the Academy and was presided over by Dr. Vimal Kumar, Scientist G and Head, Fly Ash Utilization Programme (FAUP), DST, New Delhi. It was attended by local NAAS Fellows and about 80 delegates from the different parts of the country.

Dr. Vimal Kumar traced the problem of the disposal and productive use of fly ash, a product from the thermal power plants. He made a strong case for its use in agriculture. In his inaugural speech, Prof. R.B. Singh said that the Indo-Gangetic Plains are facing the problem of accelerated soil and water degradation.



He remarked that if the Ganges is kept healthy, the whole Plains will be healthy. He said that the present use of fly ash in India, despite high potential, is very low and advocated focused research and extension backup for improving its use. Comprehensive participatory research is needed to work out its economic and social impact as done in case of gypsum replacement on usar soils. Agricultural universities are also required to provide research recommendations in tangible fashion so that the beneficial impact of fly ash use is realized. He said that detailed discussions in the seminar should help in deciding the profitable doses of fly ash for improving land productivity.

In the six technical sessions, 17 papers were presented and discussed. Based on presentations, the following recommendations were drawn:

- A dynamic data-base on physico-chemical characteristics of fly ash produced by different thermal power stations across the country may be maintained.
- A comprehensive bibliography listing the research application of fly ash in agriculture may be compiled.
- Pilot scale operational research in partnership-mode involving researchers,

farmers, development departments and thermal power generating units is required to demonstrate the use of fly ash for improving land productivity.



- Research is required particularly in sodic soils for developing algorithms on the spatio-temporal dimensions of fly ash dose and the frequency of its application under different edaphic and climatic conditions.
 - Use of fly ash in reclaimed sodic soils to improve the soil and crop productivity should be promoted.
 - Value addition to fly ash through microbial inoculation, vermi-composting etc. for better soil health should be streamlined.
 - Use of fly ash for decontamination and detoxification of soils deserves promotion.
 - Environmental issues related to fly ash production, collection, transportation and application need detailed life cycle analysis.
 - Fly ash use-based eco-technology should be developed for improved crop production.
 - Policy support for the transport of fly ash from thermal power plants to the distant agricultural sites needs to be evolved as it involves large quantity application.
 - ICAR may initiate an All India network research project to determine the recommended doses of fly ash for different soil types in different agro-eco regions of the country.
 - NTPC and other related industries may fund such research initiatives.
- ♦ The Southern Chapter of the Academy along with Hyderabad Chapter of the Indian Society of Soil Science jointly organized “**World Soil Day**” on 5th December, 2011 to focus on the importance of soil health for food security of the country. The programme was organized at Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad and a Special Lecture in memory of the late Padma Shri Dr. I.V. Subba Rao, former Vice-Chancellor, ANGRAU and Former General President of Indian Science Congress. Land degradation has important implications for climate change mitigation and adaptation, as the loss of biomass and the soil organic carbon into the atmosphere as CO₂ and affects the quality of soil and its ability to hold water and nutrients. India, amongst world climate change affected countries, urgently needs to evolve strategies for sustainable management and conservation of

soil resources. About 120 agricultural scientists from various research institutes like CRIDA, ANGRAU, NRSC, DRR, DOR, ICRISAT, and Fellows of National Academy of Agricultural Sciences in the southern region attended the World Soil Day. The memorial lecture “Soil Science Research under Changing Climate Scenario” was delivered by Dr. B. Venkateswarlu, Director, Central Research Institute for Dryland Agriculture, and the programme was chaired by Dr. M. V. Santaram, Eminent Soil Scientist and former Dean, ANGRAU. Scientists discussed various issues on soil health sustainability and improvement, impacts of changing climate on food security of India, drought, floods, and abnormal weather aberrations, Green House Gas (GHG) emissions and soil carbon sequestration. Dr. Ch. Srinivasa Rao, Principal Scientist, CRIDA and Fellow of NAAS and Dr. G. Jayasree, Senior Scientist, ANGRAU facilitated the programme

♦ Stakeholders meeting organized at ICAR-RCER on 03/03/2012

A meeting entitled ‘Strategies for Agricultural Development in Eastern Region - Stakeholders’ Meeting’ was jointly organized by ICAR Research Complex for Eastern Region, Patna and National Academy of Agricultural Sciences, New Delhi on March 3, 2012 at ICAR-RCER, Patna.

The Stakeholders Meeting was inaugurated by Dr. A. K. Singh, Deputy Director General (NRM), ICAR, New Delhi. Some of the dignitaries present in this occasion were Dr. R. P. Singh, Chairman, QRT, Dr. Gopalji Trivedi, Ex-Vice Chancellor, RAU, Pusa, Dr. P. N. Jha, Ex-Vice Chancellor, RAU, Pusa. Besides, about 100 farmers, NGOs and representatives from Department of Agriculture of states of eastern region actively participated in the meeting.



11. Awards

11.1 Academy Awards

The Academy has instituted the following awards to recognize scientists for excellence in research in Agricultural and Allied Sciences. The nominations for the following Academy's Awards for the biennium 2011-2012 have been invited:

- i. Memorial Awards

- ii. Recognition Awards
- iii. Young Scientists Awards
- iv. Endowment Awards (Sh. L.C. Sikka Endowment Award)

The Judging Committees of the Academy will consider all the valid nominations in September 2012, and awards will be presented at XI Agricultural Science Congress scheduled to be held at Orissa University of Agriculture and Technology, Bhubaneswar, in January 2013.

11.2 Padma Awards to Fellow

The President and Fellows of the Academy congratulated Dr K.L. Chadha and Dr V.P. Singh for having been conferred with the prestigious Padma Shri award in 2012. It is a matter of great pride and honour for the Academy.

Dr. K.L. Chadha

Dr. K.L. Chadha, an eminent horticulturist of the country has contributed significantly for achieving enhanced food, nutrition and income security. The success of the national horticultural programmes led by him has been recognised worldwide.

Dr. V.P. Singh

Dr. V.P. Singh played a pivotal role in bringing basmati revolution in the country by developing Pusa Basmati-1 and Pusa Basmati 1121 which became major foreign exchange earner through export and brought prosperity to Basmati rice growers.

12. Publications

List of publications brought out during 2011-12 is as follows.

- i. Presidential Address on “*The Hungry Child Cannot Wait*” delivered by Prof. R.B. Singh at Foundation Day
- ii. *Towards Evergreen Revolution - The Road Map*
- iii. Policy Paper 50 : *Carrying Capacity of Indian Agriculture*
- iv. Policy Paper 51 : *Drought Preparedness and Mitigation*
- v. Policy Paper 52 : *Bio-safety Assurance for GM Foods in India*
- vi. NAAS-News (four issues)
- vii. Agricultural News (six issues)

13. Programmes Planned For 2012

- *Scientific Management of Crop Residues in the Context of Conservation Agriculture*;
Lead Person: **Dr. Himanshu Pathak**

- *Agricultural Education - Shaping India's Future*; Lead Persons: **Prof. M.S. Swaminathan and Dr. S.M. Virmani**
- *Mastitis Management in Dairy Animals*; Lead Person: **Dr. A.K. Srivastava**
- *Livelihood Security of Marginal and Sub-marginal Farmers*; Lead Person: **Dr. S.P. Ghosh**
- *Genetic Improvement of Cereal Crops through Nif Genes and C4 Pathway*; Lead Person: **Dr. S.K. Datta**
- *Peri-Urban Agriculture (including Horticulture, Floriculture, Livestock, Fisheries and Fodder)*; Lead Person: **Dr. H.P. Singh**
- *Water Use Potential of Flood-affected and Drought-prone Areas of Eastern India*; Lead Person: **Dr. B.P. Bhatt**
- *Climate Resilient Agriculture*; Lead Person: **Dr. A.K. Singh**

14. Finance, Budget And Audit

The main source of funds for the Academy is the grant received from the Indian Council of Agricultural Research (ICAR). During the year 2011-12, ICAR released Rs. 150 lakh.

The Accounts of the Academy are audited by Chartered Accountants appointed with the approval of the General Body. Utilization Certificates up to the year 2011-12 have been submitted to the ICAR.

A brief Audited Statement of Accounts and Auditor's Report for 2011-12 is annexed with the report (Annexure I & II).

Acknowledgment

The Academy acknowledges with grateful thanks the support received from the Indian Council of Agricultural Research for its generous and continuing support for its programmes, and for extending generous financial support since its inception. This has greatly helped the Academy to: (a) organize a number of congresses, workshops, seminars etc on major policy issues; (b) award medals to distinguished scientists and young scientists in recognition of their contributions; (c) set-up office of the Academy with necessary infrastructural facilities, and (d) construct a permanent building for the Academy.

The Academy also places on record the cooperation and support in terms of logistics and grants received from other organizations.



Ashok Aggarwal & Co.
Chartered Accountants

Chamber No. 207-211, R.K. House,
WP-504, Shiv Market,
Ashok Vihar, Delhi-110052
Tel. : 27224924, 47068900,
Telefax : 27466167,
E-mail : info@caashokaggarwal.com

AUDITOR'S REPORT

The Members,
National Academy of Agricultural Sciences,
NASC Complex, DPS Marg, Pusa
New Delhi

We have audited the attached Balance Sheet of **NATIONAL ACADEMY OF AGRICULTURAL SCIENCES, NEW DELHI** as on 31st March, 2012 and the annexed Income and Expenditure Account for the year ended on that date. These financial statements are the responsibility of the management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with the auditing standards generally accepted in India. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatements. Our audit includes examining, on a test basis, evidence supporting the financial transactions and disclosures in the financial statements. Our audit also included assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

We further report that:

1. We have obtained all the information and explanations which to the best of our knowledge and belief were necessary for the purposes of our audit.
2. In our opinion, proper books of account, as required by law have been kept by the Academy, so far as it appears from our examination of those books.
3. The Balance Sheet and the Income and Expenditure Account dealt with by this report are in agreement with the books of account of the Academy.
4. In our opinion, the Balance Sheet and the Income and Expenditure Account dealt with by this report, comply with the Accounting Standards, to the extent applicable.
5. In our opinion and to the best of our information and according to the explanations given to us, the said Statements of Accounts read together with notes thereon and document annexed thereto give a true and fair view:
 - (i) In the case of Balance Sheet, State of Affairs of the Academy as at 31st March 2012,
 - (ii) In the case of Income and Expenditure Account, of the excess of Income over Expenditure of the Academy for the period ended on that date.

For Ashok Aggarwal & Co.
Chartered Accountants
Regn. No. 005422N


Sachin Aggarwal
Partner
M. NO:-500156



Place : New Delhi
Date : May 2, 2012

**NATIONAL ACADEMY OF AGRICULTURAL SCIENCES
BALANCE SHEET AS ON 31.03.2012**

Liabilities	Amount (Rs.)	Assets	Amount (Rs.)
CAPITAL FUND			
Opening Balance	10,68,71,079.29	Opening Balance	3,70,79,260.72
Add: Transferred from Accumulated Fund	98,15,218.20	Addition during the year	16,50,633.00
Add: Excess of Income over Expenditure during the year	39,94,370.77	Sale during the year	(52,000.00)
Less: Funds transferred to Specific Reserve Fund	89,58,098.09	Depreciation w/off	(39,56,055.06)
		Deposits in Approved Securities	12,17,32,586.04
SPECIFIC RESERVE FUND			
Opening Balance	4,85,38,507.52	CURRENT ASSETS	
Add: Addition during the year	89,58,098.09	Bank Balances	15,67,449.18
Less: Utilized during the year	98,15,218.20	Cash Balances	251.00
		ADVANCES	
		Tax Deducted at Source	13,81,832.70
TOTAL	15,94,03,957.58	TOTAL	15,94,03,957.58

As per our report of even date attached

Ashok Aggarwal & Co.
Chartered Accountants

- **Sd** -

Sachin Aggarwal

Partner

M.NO. - 500156

Place : New Delhi

Dated : May 2, 2012

National Academy of Agricultural Sciences

- **Sd** -

Treasurer

- **Sd** -

Secretary

NATIONAL ACADEMY OF AGRICULTURAL SCIENCES
INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31st MARCH, 2012

Expenditure	Amount (Rs.)	Income	Amount (Rs.)
To Expenditure/contribution on Project Programmes	1,37,35,293.34	By Grant in Aid from ICAR	1,50,00,000.00
To Depreciation	39,56,055.06	By Interest on Investments (including 4th WCCA)	30,94,605.17
To Excess of Income over Expenditure transferred	39,94,370.77	By Contribution from Publications, Subscriptions and other receipts	32,43,414.00
		By Amount transferred from Sir Dorabji TATA Trust Fund	
		- NAAS TATA Young Scientist Award Project	3,00,000.00
		- NAAS TATA Bihar Project	47,700.00
Total	2,16,85,719.17	Total	2,16,85,719.17

As per our report of even date attached

Ashok Aggarwal & Co.
Chartered Accountants

National Academy of Agricultural Sciences

- Sd -

Sachin Aggarwal
Partner
M.NO. - 500156
Place : New Delhi
Dated : May 2, 2012

- Sd -

Treasurer

- Sd -
Secretary

Minutes of the Brainstorming Session on Agricultural Education - Shaping India's Future

A Brainstorming Session on Agricultural Education in India as curtain raiser to the forthcoming XI Agricultural Science Congress on Agricultural Education. This Brainstorming was organized by the Academy on 23rd December 2011. It was a structured meeting and well attended by eminent scientists and educationists in agriculture. Prof. Anwar Alam, Secretary, NAAS welcoming the participants, provided background information and flagged major issues concerning agricultural education in India particularly deterioration in quality of education, SAUs having paucity of funds, employability issues, trends towards specialised universities, autonomy-deficit of the SAUs, 'son-of-the-soil' syndrome creeping in, weak public-private partnership (PPP), weak intra and inter-institutional linkages within the country and abroad, etc.

Prof. R.B. Singh, President, NAAS in his welcome address further focused on major land marks in development of agricultural education in India. He recalled that both British and U.S. Models of agricultural education were considered in Independent India. Finally American Land Grant College model based on Indo-US Joint Mission on Agriculture was adopted. Government of India decided to establish State Agricultural Universities (SAUs) fashioned on American Land Grant College concept in every major State of the country as single campus universities with triple functions of teaching, research and extension education.

He called upon deliberations on the following:

- a. Harmonization of agricultural education
- b. SAUs suffering for want of funds from State Governments
- c. Faculty strength at SAUs must be restored to 1985 level and the vacant posts filled on priority
- d. The VCs of SAU have desired separate budget line in State Budget, and one time catch-up grant of Rs. 100 crore to all SAUs, prioritizing those suffering most.
- e. There is need for more para-agriculture personnel, diploma holders in agriculture and allied fields
- f. Livelihood security through agriculture

He also made a reference to a meeting at Academy with DG and DDGs for scaling up the cooperation. Education is fundamental to development. We need to enthuse young generation towards agriculture, he asserted.

The brainstorming session was organised at the initiative of Dr. S.M. Virmani who is concerned with the falling educational standards in SAUs. He recalled his visit to archives of Royal Society, London and noticing an observation of Queen Victoria

1776 that social development of Britain and that of Europe could only be science-led. Queen invited all the philosophers for a brief meeting. All including Sir Isaac Newton participated. India could take such an initiative almost 200 years later in the form of Green Revolution, Dr. Virmani said. The First Joint American Team wanted SAU on IARI model but SAUs went their own way. Degrees and knowledge base are not closely related; creative research and teaching are diminishing, challenges of agricultural innovation are not being met. Discoveries have not been translated into modern day agriculture. There is a strong asymmetry in outputs and mandate. Investments in human resource (HR) development are essential. Educational system introduced in 1950s (or 1960s) has served the country very well. Revolutionary system introduced has contributed immensely innovative leading to the development of and agro-eco sensitive technologies in the world.

Dr. Virmani observed that, there is overcrowding of agricultural universities and colleges, too rapid development to have good faculty and facilities. The agricultural education that was revolutionary in 1950s is becoming 'dysfunctional'. How to check overcrowding? We need to recalibrate our response at all levels including teachers, students, research, regulatory mechanisms.

Dr. I.P. Abrol speaking on NRM-centred Agriculture observed that India's agricultural system has done well in the past but there is need for change to respond to the following emerging challenges:

1. Issues and challenges of global nature such as trade and markets, climate change, knowledge access and management, and quality assurance and certification.
2. Issues and challenges at national level
 - Need for continued substantial changes in food production
 - Processing and consumption
 - Storage and buffer stocking
 - Livelihood assuring acceptable standards of living
 - Quality related challenges of land and water resources
 - Agriculture and NRM demanding location specific solutions
 - Integration of indigenous knowledge with modern knowledge
3. Agricultural education
 - Broader framework and a differentiated approach to education

Dr. D. Rama Rao, NAARM made a presentation on man power assessment and human resource need in agriculture and allied sciences. According to his study, annual outturn of UGs and PGs including Ph.D. at present is 24000 and by the year 2020, the demand in different disciplines is likely to rise to as under:

Crop Science

25,284

Horticulture	8,618
Veterinary	7,672
Fisheries	2,614
Dairy	3,315
Agri-Biotech	1,039
Agri-Engineering	3,256
Forestry	1,832
Total	53,630

Employment profile of the graduates is changing; more finding employment in private sector, i.e. non-governmental jobs approximately to the extent of 70%. In all disciplines expansion is possible to the extent of 30 – 40%, except possibly in Agricultural-Engineering and Agri-Biotech. However, the private sector is looking for intermediate to UG i.e 10+2 or diploma holders, para-professionals. He highlighted the following issues relating to agricultural education.

1. Manpower ratios - large demand for para-professionals, for every graduate, three para-professionals are in demand.
2. There is need for 50% more graduates but quality is of general concern.
3. Many non-government jobs need a degree in agriculture/horticulture etc but not many specializations.
4. Every sector wants management skills, and soft skills are in great demand.
5. Of the emerging sciences, Food Tech, Biotech and Agribusiness Management are in demand, which are at present produced more in traditional universities.
6. Private sector in education requires broad-based faculty. As a result, agricultural graduates are not willing to join.
7. Broad based inter-institutional degree programmes are in demand. More Central agricultural universities are needed
8. A legal regulatory body is needed to make agricultural education professional.

Dr. Gajendra Singh advocated strong basic sciences components for attaining excellence in agricultural education. Compartmentalization of education is non productive and weakens inter-disciplinarity. Our curricula are densely packed and inflexible. In US, only 50% is compulsory, 25% electives and remaining are secondary electives. We need climate modelling experts.

Dr. Arvind Kumar, DDG (Edn) presented ICAR perspective on agricultural education and human resource development and the role of private sector. He informed that Education Division ICAR had organized day long brain storming on agricultural education under the chairmanship of Dr. Panjab Singh. He briefed the current profile of the agricultural education with a mention about number of SAUs and colleges etc. Demand-

supply equation is not favourable. Employment of agricultural graduates is very good, so much so that there are few takers of Ph.D. programmes particularly in veterinary sciences stream. About 36% are girl students. Library grant and CeRA have enabled timely availability of learning resources. More constituent colleges and CAUs need to be established in agriculture.

Separate budget for agricultural universities in principle has been accepted at Planning Commission level. Linkages and partnership across the globe, and visiting faculty from other parts of the world are being contemplated during XII Plan. Success stories in agriculture are envisaged to be included in course curricula. PG research programmes are being strengthened, aimed at talent aspiring with higher goals. There is a demand for a centre of excellence in each university with scientific staff recruited at ICAR/ASRB level.

Among the students, skill development is targeted with a set of skills such as analytical skills, networking skill, leadership skill, risk bearing skill, communication skill, project management skill, problem solving skill, team building skill, handling and delivery skill, facilitation skills etc. He advocated inculcation of 10Cs amongst students such as character, confidence, capacity, credibility, cooperation, competence, commitment, connectivity, capacity and conclusiveness.

For strengthening education, a number of measures such as faculty development, student development, institution development, reforms in governance, curriculum and instructional material development, curriculum and instruction delivery, examination reforms, performance-linked support, facilities for engineering education, learning resources, inter-institutional and faculty linkages, and education quality, monitoring and assurance etc. are being envisaged.

He was of the view that narrow discipline-oriented universities is not conducive to holistic development. On the other hand central universities with less regional interference are desirable. Financial allocation for agricultural education should be more than doubled. Both Council and Academy must have say in the matter.

Prof. R.B. Singh drew attention to four points from the presentation:

1. Comprehensive Base Paper be prepared.
2. Selected eminent agricultural educationist be invited
3. Employability of agricultural graduates & post-graduates be duly addressed
4. Issues relating to education and HRD be in depth examined and remedial measures evolved

Dr. Panjab Singh said that as XII Plan formulation is on, this is right time to intervene. India has one of the largest education system in the world. However, 35% of its population below 15 years of age faces numerous challenges. In spite of promises of successive governments to spend 6% of GDP on education it has hovered around only 4%. Every year, India produces 2.5 million graduates, which is next only to USA and China. However, in terms of quality it is falling much below the developed world.

Higher education in India is basically supported by State funding which is usually 70-90% only mostly for teaching but little for research which is essential for high education. Private educational institutions have existed from the very beginning even in colonial period but mostly philanthropic. Profit-oriented universities and colleges have sprung up in the recent past.

Knowledge through higher education produces professionals who impact on macro-economics. As knowledge becomes more important to the global economy, so does higher education. Enrolment in higher education (tertiary education) is 72% in USA, in east-European countries such as Slovenia and Russia it is 60-64%, 15% South Africa and only 10% in India. He suggested that education sector should take up the following steps

1. Increase enrolment and graduation rates
2. Encourage women in postgraduate studies, S&T including agriculture
3. Promote gender equity
4. Reduce high dropout rates
5. Staff recruitment with wider vision
6. Increase funding for academic and infrastructure improvement
7. Reversing the brain drain from universities.

By 2020, 37% of Indian population will be in the age group of 15-29% and another 29% in the age group of 30-49 years of age i.e. one-third below 30 years and 2/3rd below 50 years of age, a national asset that should be wisely developed and mobilised for socio-economic development of the country, he informed.

Indian agriculture being a part of the global agricultural system must keep accelerated pace, for attaining global leadership. Agricultural education system has to have a paradigm shift in its program portfolio, Dr. Singh said. We have made progress but it is too slow. We need to realize dream of our former President Dr. A.P. J. Abdul Kalam of “Ring Road” approach - connecting production, processing, marketing and living centres and PURA (provision of urban amenities in rural areas) as an option.

Dr. D.P. Ray made a number of suggestions. Career Advance Scheme should curb inbreeding and promote only well deserving candidates. Innovative teaching should be duly rewarded. To attract quality PG and Ph.D. students there should be more scholarships. There should be faculty at every level. Experiential learning programme should be strengthened and make graduates skilled in operation and management of agricultural technologies. Niche Areas of Excellence should be operative in all SAUs. RAWE, In-Plant-Training and Internships be made more effective.

Dr. Kirti Singh observed that this exercise is being taken after a long time. How do we expect SAUs to achieve excellence when State Governments do not stop direct interference weakening their autonomy? Selection of the VCs is getting diluted. He observed that often gold medalists have been poor teachers but good researchers. Some

private colleges used to be better than constituent colleges of SAUs. However, now their financial condition is poor, 50% of positions vacant and staffs don't get salary for months. He favoured setting up a library at NAAS, and retired scientists should donate their books. Peer review of the SAUs should continue, he suggested.

Dr. S.L. Mehta said that 1960-80 was Phase I of SAUs when all State Governments fully supported them. Establishment of the PG School at IARI was a major development. During 1980-2000 more SAUs came up. AHRD supported by the World Bank brought in a number of reforms which led to reversing the decline in quality of Agricultural Education. Today we have 64 universities and in next 10 years we will have 80 agricultural universities. SAUs initially started as multi-faculty single campus universities and have now given way to single faculty multi-campus universities. These new universities have been created without commensurate financial, faculty and infrastructure support. There is extensive inbreeding in SAU's. Recruitment of faculty needs to undergo major reform to bring in quality and national character. Another casualty is the neglect of basic science. Earlier entrance to UG was at High School level where additional courses in basic sciences and languages were considered essential and imparted. Now entrance is at 10+2 level, supposed to have good background accordingly SAUs jettisoned basic science and humanities education. But often at 10+2 level the new entrants are not well-groomed in basic science and languages.

Skilled human resource is propeller of development in agriculture. SAUs and even ICAR DUs have very low faculty/scientific strength. Over the years there has been serious erosion in faculty number and quality in IARI even, the so called Mecca of Agriculture. Quality of Ph.D. research is at the lowest ebb, hardly any international impact factor journals are being published from majority of the theses. Earlier in SAUs, teaching was a pride activity, now it is looked down upon. We should have strong system of Accreditation. Fourth Deans' Committee did recommend major reforms but many are yet to be implemented. ICAR has introduced Experiential Learning at UG level based on IV Dean Committee recommendations but most faculty have not understood properly the mechanism for its operationalization. Experiential Learning Instruction manuals for five disciplines have already been developed and this would make great difference in the skill and entrepreneurship of UG students. Minimum norm of published papers before award of Ph.D. needs to be prescribed, at least one. Academy should come up with model personnel policies.

Dr. H.S. Gaur representing Dr. H.S. Gupta and Dr. M.P. Yadav gave a structured presentation on Entrepreneurial and Agribusiness Skill Development in Agricultural Graduates in the Country. He told that entrepreneurs have to be innovative, creative and hardworking; have high achievement motivation; goal setting behavior; moderate risk taking; undaunted perseverance; time conscious about seasonality and deadlines. An entrepreneur is required to convert knowledge in to business to have, problem solving and market awareness aptitude. Earlier we worked for more food and now more jobs need to be created.

Dr. C. Devakumar suggested that background papers be well prepared and presented so that they find place in Academy's archives which can be accessed in future. He wanted kinds of graduates and post-graduates that we need should be well defined. Standards setting for higher education is in the Union List. DARE may become more pro-active in setting and regulating quality and standards in agricultural education. India's national education system ought to set standard for global education. Education should enlighten mind and soul of the students. SAUs need to develop excellent human quality and sense of global citizenship. We can have All India Teaching Service, he postulated. Re-employment up to 65 years of age should be possible. Competencies need to be developed. Prof. R.B. Singh quoted Sarvapalli Radhakrishnan saying 'nation can be as tall as tallest of its teachers and students'. He requested Dr. Devakumar to prepare a base paper on 'Think globally and act locally' for agricultural education.

Prof. Anupam Varma observed that we are too rigid about discipline. Situation is emerging that no agricultural graduate can do PG or Ph.D. in Horticulture if he does not have B.Sc. (Hort). There is dearth of faculty to teach chosen topics. We need to replicate IARI, five more IARIs be created in agriculture. He was of the view that NAARM's effort towards training young entrants could be reviewed so that young scientists are motivated to pursue original research.

Dr. K. Pradhan told that Academy has done exercise in the past on what ails agricultural education. Production, diversification in production and products from produce have been addressed primarily catering to human needs. With growing demand of animal products we have to also cater to foodgrains and forages need of livestock, poultry, cattle, pigs, fish etc. B.V.Sc. graduates address primarily to treatment, little to animal production. There is great need for para-vets, para-agriculturists diploma holders or certificate courses, he observed. It will help in putting agricultural sciences in rural life. He also commented that ad-hoc schemes from AP Cess Fund that ICAR used to operate were of great help in PG research. It has been stopped but similar scheme is urgently needed.

Dr. P.S. Pathak suggested to review the Agri-clinic Agri-business scheme. He observed that knowledge should lead to skills, and skills into entrepreneurship in which experiential learning is are very important.

Dr. Nihal Singh, Professor, Veterinary Physiology in Australia, former student of Mathura Veterinary College, observed that similar transformation has gone in Australia too from compartmentalization to one block of disciplines, like School of Biological Science including all related departments breaking their barriers. Facilities are centralized, technicians are there providing common facilities. Similar to Centres of Excellence in India, Australia has CRCs (Cooperative Research Centres). After 2012 they will have TAFE (Technology and Further Education) Scheme where entrant goes through a technology (skill oriented) programme and if one choices can carry his credits he has earned to another university. He suggested, let there be schools, not divisions.

Dr. H.K. Jain addressed to the necessary reforms measures. SAUs have made significant contributions in the development of Basmati rice, hybrid cotton, castor etc.

that earn huge foreign exchange, SAUs have played role in food and nutritional security. We are second largest producer of sugar and milk. It is however, admitted that academic standard has declined. He elaborated related critical points:

1. *Academic Excellence* : Improve excellence of our teachers. Every teacher should go to USA, Australia, Canada or Netherlands for a one year course work and research. The US Land Grant College pattern is the best educational system in the world. India is the only country that has adopted it with some degree of success. Funds would not be a problem, World Bank could be a good source of funding. Teachers should go with well defined project, audit courses and also sit in examination, try for a degree, do thesis, publish papers and present them in India. We should have a National Institute for Agricultural Education (NIAE). NAARM was created for a different purpose, primarily to train young scientists. Best academic brains available in the NARS should be placed in the proposed National Institute of Agricultural education. National Professors Scheme could be attached to NIAE. SAUs should also admit pure science graduates for PG/Ph.D. programmes.
2. *Discipline* : It is expected of a university teacher that he goes to library and reads latest research papers in his discipline. The teachers could be requested to hand-over to students a one page summary of their lecture along with at least two recent references. This task should be handled by Deans and Directors for which they should be empowered and provided fund. They should get feedback from students, through Deans of the Colleges.
3. *Central Agricultural Universities*: We have to have SAUs, State Governments look to them for their technological needs. Academic part of SAUs be strengthened. For academic excellence, more CAUs should be created in agriculture.
4. *Element of External Examination* : Usually guides manage to send thesis to their friends. Only Dean should suggest the name of thesis examiners. There should be strong element of external examination in qualifying examinations.
5. *Course Contents* : Dean's Committee does good job, making at least 50% courses essential/compulsory and allowing flexibility for local needs. However, subjects of Mathematics, Statistics, Biophysics, Biochemistry etc. should be studied by all students.

Minutes of the Second meeting about the organization of XI Agricultural Science Congress to be organized at OUAT, Bhubaneswar

Taking advantage of special EC Meeting organized for the release of NAAS *Journal of Agricultural Research*, this meeting was organized to initiate organization of the XI ASC on 7-9 February 2013. The meeting held in 31st January 2012 was attended by the members of Executive Council, Dr. D.P. Ray, VC, OUAT and Convener of XI ASC and Dr. K Pradhan, Co-Convener.

Dr. Lalji Singh in his remarks observed that every department restricts itself to its defined boundaries. Earlier, science drove technology and now it is technology that is driving science. He opined that agriculture in an institution like BHU should be an integral part of the university with its constituents actively participating and contributing in it. Centralized facilities which could be world class should be created and shared by all. He also drew attention to the emerging challenges like climate change, avian diseases. He advocated for inter-departmental participation in lead research. We need to create a new generation of scientists. India has the largest biodiversity and forests should not be destroyed. Second Green Revolution should be addressed to increase productivity, he advised. Instead of creating more CAUs, invest more in existing ones, he observed. Since, majority of our farmers are small and marginal, small farm technologies need to be developed.

Dr. H.S. Gupta, Director IARI stated that quality of agricultural education has been declining in the recent past. Education is key to our success in agriculture. The report of Dr. D. Rama Rao, NAARM, Hyderabad on human resource requirement is timely. More SAUs are needed but not specialized ones. In order to serve the farmers, we need to have integrated education and research in agriculture. Infrastructure of the SAUs that contributed to Green Revolution is in poor condition. We need to invest and make them once again world class. Appropriate mechanisms need to be evolved so that SAUs also produce para-professionals to meet the needs of the farmers and private sector. Entrepreneurial component is lacking in our graduates. IARI is developing a course on entrepreneurial skills and IPR. It will address entrepreneurial development, agri-business ethics in science and IPR. Total attitude has to change. Students should be oriented to serve the farmers.

Dr S.L. Mehta said that major issue is reorienting and restructuring of agricultural education. faculty strength of IARI is at 50% level of 1985. University governance is at its lowest ebb; powers are centralized at VC level. The ICAR Model Act is being flouted. We need to revisit Land Grant College Concept. Autonomy of SAUs is compromised. Teacher is the first pillar of teaching. The fragmentation of SAUs has marginalised the inter-faculty research. He said, "I am a strong advocate of CAU; it will eliminate

ills of SAUs". In every SAU, few faculty should be centrally funded. Ph.D. should be offered after at least one research paper in a journal with atleast 4.0 NAAS rating. Prof. R.B. Singh added that Prof S.L. Mehta should prepare a paper on Governance of Agricultural Education. We need to revisit Land Grant College as implemented in India, recruitment policy, system of monitoring and evaluation, harmonization of excellence, standard, codification etc. He may associate Dr. Arvind Kumar and Dr. Devakumar in this exercise.

Dr. B.S. Pathak told that initially land grant college was a role model which has disappeared, SAUs have become general universities. There has been tendency to convert an agriculture college into SAU making them glorified college. We are overloading our students. With limitation of land, water, and energy, management of natural resources to the best advantage of farming is essential. State governments should take due responsibility in respect of the SAUs. When he was Dean, salary component used to be 50% now it is over 85%. Joint-university programmes as in the past need to be revived. Over the years, we have lost perception about good and poor students. Poor workers are coming in the way of excellence. Individual excels but system collapses, we should check it, Dr. Lalji Singh added. He further informed that Government wants to bring foreign universities. If we do not invest, we will be doomed producing mediocre grade human resource. The President suggested that Dr. Rama Rao and Dr Devakumar may study human resource requirement and human resource development, agricultural education for development and social equity.