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From the President's Desk

Farm, Feed & Flourish

The year 2015 marks the Silver Jubilee of the National Agricultural Science Academy and I take this opportunity to convey my hearty congratulations to the esteemed Fellowship and stakeholders. The NAAS organized the 12th Agricultural Science Congress with the theme of "Sustainable Livelihood Security for Smallholder Farmers" at National Dairy Research Institute (NDRI), Karnal during February 3-6, 2015, and came as a follow up of the year 2014, declared as the 'International Year of Family Farming' by the United Nations. The event was an unprecedented gathering of the Fellowship as well as the Agri-fraternity in the cause of Smallholder farmers.

The number of operational farm holdings in India stood at 138 million in 2010-11, with an average size of operational holding declining to 1.16 ha. Small and marginal holdings taken together constitute 84.97% of the total holdings forming over 44% of the total operated area. To add to these are a large number of landless farmers who own livestock. The estimates indicate that small and marginal farmers may account for more than 91 per cent of farm holdings by 2030. In order to ensure livelihood security of the marginal and small farmers, it is necessary to focus on the technological needs and infrastructure, including diversifying avenues for gainful employment in the non-farm sector, for their development.

Productivity enhancement, post-harvest management and value addition are critical for ensuring sustainability and increasing farm income and profitability. Hon'ble Prime Minister of India, at the 86th ICAR Foundation Day, called upon agricultural scientists to work towards a two-fold objective of enabling the Indian farmer to: (a) feed India and the world; *(rashtra aur vishva ka pet bhare)* and (b) earn a good income in the process *(kisan ki jeb bhare)*.He gave two mantras: *"Kam zameen, kam samay, zyaada upaj"* – Less land, less time, more crop: "per drop, more crop".

The current levels of use efficiency of resources such as water, energy, fertilizers, pesticides, feeds and fodders, is rather low that results in

increased cost of production, as also in severe environmental consequences. There is enormous scope to improve the productivity and efficiency of farming through technological interventions. Ensuring timely availability of adequate supplies of quality inputs at affordable prices to farmers is necessary for achieving higher agricultural productivity and production. Further, livelihood security of small holder farmers is also at a higher risk to climate change or natural disasters. The resilience of small farmers' agriculture production and productivity have to be improved by cost-effective and location specific technological interventions.

Timeliness, precision and resource conservation in farm operations are of utmost importance to realise the potential yields of the technologies. For such farmers, farm equipments which are low-cost, light-weight, multi-purpose, gender-friendly reducing drudgery are needed. Therefore, mechanization of small farms is the need of the hour as it can also mitigate labour scarcity during peak season. Indian agriculture is becoming increasingly energy-intensive and hence is the need for introducing energy-efficient farm machinery and irrigation systems, areas that are also relevant to the *'Make in India'* initiative of the Government. In order to meet the growing demand for energy in agriculture, use of non-conventional and renewable sources of energy would be imperative.

It is estimated that present levels of post-production losses are about 2.8-10% in durables, 6.8-12.5% in semi-perishables and 5.8-18% in perishable products. About 50% of these losses could be prevented using appropriate post-harvest approaches. Post-harvest quality losses due to poor infrastructure and lack of storage and transportation are major causes of poor economic return to the farmers. The family farmers can be trained to undertake post harvest processing and packaging of farm produce, preferably on a farm or near the production site. For instance, traditional drying practices can be replaced with solar drying. New transport methods should be evolved for more remunerative marketing of farmers produce. Such technologies would promote entrepreneurship in rural areas by strengthening the forward linkage in agriculture, thus creating economic opportunities, especially for the rural youth and women thus enabling to move towards Agriprenuership.

The family farming households require timely advice based on meteorological, marketing and management information for land-use decisions and investments to improve resource use efficiency that can go a long way in reducing cost of cultivation and environmental pollution. Timely availability of quality inputs, particularly the seed and planting material, fertilizer, or the feed and fodder in case of livestock, has to be ensured. Diversification holds promise for small holders by shifting agriculture towards high value crops and intensive cultivation. The success would depend largely on improving the marketing efficiency by attracting investment. Creating markets, especially in rural and peri-urban areas, transport and cold chain for agriculture produce, organised retails should be promoted to link small holders to the market. The family farming demands that besides economics, continuous up gradation of knowledge levels, entrepreneurship and benefits to the environment are duly considered. The need is to make agriculture more exciting and rewarding for family farms so that self employed workers in agriculture are not pushed to move out to non agriculture activities under distress. The approach, hence for Family Farms is 'Farm, Feed & Flourish'.

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XII Agricultural Science Congress on "Sustainable Livelihood Security for Smallholder Farmers"

XII Agricultural Science Congress (XII ASC-2015) under the aegis of NAAS in collaboration with Indian Council of Agricultural Research (ICAR) was organised at National Dairy Research Institute, Karnal, Haryana during February 3-6, 2015. The theme of the XII ASC was "Sustainable Livelihood Security for Smallholder Farmers", with an objective of promoting a vibrant platform for discussing and exchanging views on contemporary topics in Indian Agriculture like the Crop and Vegetable Production, Animal Production Systems,

Fisheries Technologies and related Social Science issues. The Congress was attended by over 1700 participants representing the Faculty & Students from 42 SAUs and 9 Traditional Universities, 32 ICAR Institutes, 600 Farmers, KVKs, ZPDs, NGOs, the World Bank, banking institutions and policy makers from State and Central departments. The international representation included ILRI, CIMMYT, Michigan State University (USA), IFPRI, BISA, Polish Academy of Sciences.

The Congress was inaugurated on February 3rd, 2015 by the Chief Guest Hon'ble Governor of Punjab and Haryana, Prof. Kaptan Singh Solanki. Mr. Kevin Gallaghar, FAO representative in India. Dr. David Bergvinson, Director General, ICRISAT, Hyderabad, Dr. Jimmy Smith, Director General, International Livestock Research Institute, Nairobi, Kenya; Dr. J. Voegele, Senior Director, World Bank, Washington, USA, Dr. Sanjaya Rajaram; World Food Prize winner and Former Director, CIMMYT Global wheat programme; Dr. R.S. Paroda, Past President NAAS, Dr. R.B. Singh, Immediate Past President, NAAS, were Guests of honour. Dr. S. Ayyappan, President NAAS, Secretary DARE & Director General, ICAR, presided over the inaugural function. Dr. A.K. Srivastava, Convener of

Congress, Director & Vice-Chancellor, NDRI extended a hearty and floral welcome to the chief guest, all dignitaries, distinguished participants and delegates, and gave an overview of the XII ASC.

Dr S. Ayyappan, President NAAS extended a warm welcome to the Chief Guest, guests of honour, eminent scientists, delegates, farmers and students. Dr Ayyappan, in his inaugural address, highlighted the achievements of agriculture sector and also outlined the second generation challenges facing the sector. He stressed that for more sustainable growth, the problems of small farmers need to be addressed and they are required to be educated in science. He stressed that "robust agriculture can make strong India" and also gave the slogan of "Smart farming for small farmers" and called upon scientists to understand and work on the issues of small farmers. Dr Kevin Gallaghar mentioned that India is a great source of science and stressed that bringing good science to small farmers will be beneficial to all. Dr David Bergivisan DG, ICRISAT, Hyderabad stressed the need of demand-driven innovation to solve the problems of small farmers. Dr. Jimmy Smith, Director General, International Livestock Research Institute, Nairobi, Kenya remarked that the power of science should be used to address the issues of farmers and also we should be ready to face the challenge of climate change. Dr J. Voegele Senior Director, World Bank, Washington, USA, stressed the need of second green revolution in the country to meet the demand of a growing population. Prof. A.K. Srivastava, Director, NDRI remarked that small farmers face problems not only in production but also in marketing their produce, and require enabling policies to ensure their risk cover to climate change impacts. Dr Sanjay Rajaram, stated that India has the best brains in agriculture science that led to significant growth of the sector and ushered green, white and blue revolution, but cautioned that future challenge in the sector will be more complex that would imperatively require an integrated and holistic

approach. Dr R.B. Singh, Chancellor CAU, remarked that India will have to eliminate hunger by taking science to people to pursue sustainable development in a partnership mode. He also made a reference to Gokul Mission and Kam-denu concept. Dr R.S. Paroda, Past President, NAAS, advocated renewal of efforts towards ever green revolution and stressed that today farmer's priority is need for knowledge, building his capacity to absorb and implement the technology including gender empowerment. He stressed upon the scientific community to develop climate mitigation technology in major crops and farming systems. He suggested that environmentally sustainable GM technology should be accepted.

While inaugurating the XII ASC, Prof. Kaptan Singh Solanki, Hon'ble Governor of Haryana, lauded the organizers for organizing such an important conference and said that we all have gathered here for the National Cause as farmers are the pillars of agriculture. He emphasized that the problems faced by the small farmers are unique and the scientific community should take lead in educating the farmers with new technologies for optimum utilization of resources available with such farmers. He stressed that creating a second green revolution is imperative to ensure the food and nutritional security of our country. The challenge for Indian agriculture is to increase production, while minimizing environmental impact. On this occasion, Hon'ble Governor also presented the Academy Awards, certificates to New Institutional Members of NAAS and released Compendium of Congress, a C.D. of NAAS and other publications. He declared the congress open and wished all delegates intellectually beneficial discussion and implementable output from the congress. The inaugural session ended with a formal vote of thanks proposed by Dr M.P. Yadav, Secretary, NAAS.

In the afternoon, Dr Sanjaya Rajaram, Padma Awardee and World Food Prize holder, Director Resource International, delivered a plenary lecture on "Emerging Technology options for ensuring food, nutrition and energy security". He highlighted the global perspective, developments and challenges of agriculture sector also presented the progress that India has been able to achieve to feed its huge population through the implementation of green revolution technologies. He observed that to meet the challenges of 2050 India will have to take appropriate steps to freeze agriculture footprints, grow more on existing farmlands. To achieve this he suggested that next generation thrusts should be GM technology, Hybrid technology, innovations in farming, health of soils, harvest pulse, large-scale mechanisation for small farmers. He also suggested that India should enhance entrepreneurship, agri-business, make consumption rural and farmer centric, also involve private sector in farm education.

On 4 February, 2015 three plenary lectures were presented by Dr Juergen Voegele, Senior Director World Bank, Washington, DC, USA; Dr R.S. Paroda, Former Secretary DARE, & D.G., ICAR; Dr Jimmy Smith, DG, ILRI, Nairobi, Kenya. They spoke on agriculture research for development agenda for sustainable livelihoods of smallholder farmers. These talks were much thought provoking and generated lots of interactions among all participants. Dr S. Ayyappan, Chairman of session and President NAAS, thanked all the three learned speakers for sharing their views and thoughts, which will help the organizers in developing appropriate recommendations / action plan for agriculture research in the country.

The scientific programme was covered under 12 Technical Sessions, 8 Plenary Lectures, 2 Round Table Meetings on Plant & Animal Science issues, poster session, the Inter-Zone Elocution Contest by students, the young scientist presentations by researchers of below 35 years, a specially organized Farmers Session and a ASC India Expo. The scientific programme was deliberated by more than 50 eminent invited and plenary speakers.

The issue of Group dynamics of smallholder farmers being key to their sustainability was deliberated in detail. Major recommendations emerging from these deliberations were that the cooperatives and SHGs need to secure forward linkages to cover marketing risk faced by the member farmers, capacity building of small farmers to enable establishing the producer companies, the NARS institutions should collaborate with development agencies in the private and public sector in up-scaling and replication of existing success stories of group dynamics in various parts of the country. The leadership role should be provided by the Small farmers Agribusiness Consortia Platform recently launched by ICAR.

"How to retain and attract youth in agriculture" was deliberated as one of the core theme areas during the congress. This can be achieved by adopting innovative educational approaches that include consortium approaches to share the costs such as technology mediated educational approaches or open educational resources like Massive Open Online Courses (MOOCs). In order to overcome the manpower shortage in extension and to professionalize extension delivery, central sector scheme of Agri-Clinics and Agri-Business The centres need to be created with the ultimate objective of producing self-employed Agripreneurs.

Along with other issues the effect of climate change was deliberated by several speakers. It was recommended that the concept of Climate Smart Villages must include several risk management interventions and provide an opportunity for building effective resilience strategies.

One of the technical sessions was especially dedicated for intensification of livestock as a means of sustainable livelihood security of small holder farmers. It was recommended that more emphasis is needed for improving indigenous livestock available with small and landless farmers by using available technologies and skill development of livestock owners specially women. Available biomass in the form of uncounted feed resources like horticulture, industrial waste etc. should be judiciously utilized with their value addition. Proper training and skill development of milk producers for the formulation of a balanced ration by using locally available ingredients is needed at large scale. Backyard poultry farming requires a proper intensification for generating sustainable livelihood of smallholders. Landless holders keeping only livestock should be included in defining 'farmers' so that they may get advantages of government aided policies for the farmers.

The Valedictory Session held on 6 February, 2015 was chaired by Hon'ble Chief Minister of Haryana Shri Manohar Lal Khattar, who stressed that small farmers cannot sustain long on the wheat and rice cultivation cycle, and they should go for community and cooperative farming to reduce the input costs. He also stressed to link the livestock production system with other crops with appropriate policy incentives. On this occasion, Hon'ble Chief Minister of Haryana presented awards to the winners of Best Poster Presentation and young researchers.

Dr. S. Ayyappan, in his concluding remarks expressed immense satisfaction over the way XII ASC was planned and executed, and attended by a record number of participants. He said that a "Farmer to Consumer" approach is required to be put in place to avoid middle men. Small farmers are to be trained to familiarize them with technology in production planning, consumer access and financial management. He further said that agro-climatic zone wise policies are to be developed to protect the interests of smallholders and enhance their ability to adapt to climate change. Prof. A.K. Srivastava, Director, NDRI in his concluding remarks lauded the efforts of the small farmers in making the nation secure on food front. Dr. M.P. Yadav, Secretary, NAAS proposed the vote of thanks on the occasion.

90th and 91st Executive Council Meeting

The 90th meeting of the Executive Council was held on 29.11.2014 in the NAAS Secretariat. Following are the notable decisions:

The EC approved 15 new programme initiatives of the Academy along with respective conveners. Various recommendations of programme committee were accorded approval. The EC also lent its approval to the election of new 9 office bearers, members of the Executive Council and Fellowship for 2015. Detailed discussions were held on the proposed events to be organized during the Silver Jubilee Celebrations of the Academy and were approved. The EC also approved the logo for the Silver Jubilee Year (2015).

The 91st meeting was held at NDRI, Karnal on 3.2.2015. Following are the notable decisions;

The minutes of the 90th meeting were confirmed after approving the inclusion of "Crop protection" as a discipline for Penal discussion of NAAS Associates during Silver Jubilee celebrations. As a part of Silver Jubilee Celebrations the "Youth Convention" has been rescheduled to June 2, 2015 at IARI. For inter-academy interaction during the silver jubilee year the inclusion of Academy of Biological Sciences and the Academy of Forestry Science was approved. The EC approved the revised checklist for the Nominee, Proposer and Seconder to NAAS Fellowship to be implemented from 1.1.2015. The guidelines for Foreign and Pravasi Fellows were approved for operational consideration from 1.1.2015. Issue of redefining regions under NAAS regional chapters was discussed and approved. The EC reviewed the action taken by programme conveners of new initiatives planned by the academy. The Foundation Day, AGM and Silver Jubilee Programmes were discussed and approved by the EC. The Theme and Venue of XIII Agricultural Congress - 2017 was discussed and EC decided that Programme Committee to submit details in the next meeting. The guidelines and prizes for winners of the Student Elocution Competition were deliberated and approved by the EC.

Programmes Held

New Year Get-together

Academy organised a get together of Delhi based Fellows at NAAS premises on 1st January, 2015 at 3.00 p.m. with Dr. R.S. Paroda, Past President, as the Chief Guest. Dr. M.P. Yadav, Secretary, NAAS,extended a hearty welcome to all the distinguished fellowship and introduced the newly elected office bearers, Fellows and Associates present on this occasion.

Dr. S. Ayyappan, President of the Academy also welcomed the fellowship and Dr. R.S. Paroda Past President and Chief Guest. Dr. Ayyappan highlighted the achievements of the academy and new initiatives taken during 2014. He also briefed the house about

the activities planned during the Silver Jubilee year celebrations and 12th Agricultural Science Congress to be held at NDRI, Karnal from February 3-6, 2015 on the theme 'Sustainable Livelihood Security for Smallholder Farmers'.

On this occasion Academy's publications, including five policy papers, NAAS Yearbook 2015, NAAS News; October – December 2014 and NAAS Planner 2015 were released by the Chief Guest, Dr. R.S. Paroda. He stressed the need for foresight, effective communication and policy advocacy as current priority needs and emphasized on the adoption of more aggressive approach by the Fellowship of the Academy on very important issues concerning the agricultural research and development in the country to meet the future challenges.

Several fellows expressed their views in the open discussion session and gave valuable inputs on issues regarding policy papers, best practices in education, dissemination of knowledge, attracting private sector in agriculture and considering fellowship as a think tank on research for consideration.

The program ended with a vote of thanks proposed by Dr. K.V. Prabhu, to the chief guest, President, distinguished fellowship, members of the executive council and members of staff of academy secretariat.

Activities of Regional Chapters

Karnal

A Special Lecture was organised by NAAS, Karnal Chapter at NDRI, Karnal on 27th December 2014. Faculty, Research Associates, Research Fellows and students attended this lecture. Dr. Subeer Majumdar Scientist, National Institute of Immunology, New Delhi

delivered a talk on **"Progress on Transgenic Animal Production in India"**. He highlighted in detail the importance of transgenic animals in Indian agriculture with specific reference to production of therapeutic proteins in milk and production of transgenic animals with higher growth rate. He informed that his group has developed an easy method for sperm mediated transgenic animal production technology in mice. This technology has high potential in farm animals, particularly cattle and buffaloes. He also informed that his group has been following innovative technology to produce transgenic buffalo in collaboration with BAIF, Development Research Foundation, Pune. He expressed confidence that his group in collaboration with the animal scientists in India shall be able to produce transgenic animals in near future.

Mumbai

The NAAS Silver Jubilee Rally on 'Fisheries and its Importance' was organized at CIFE, Mumbai, on 29th November, 2014. The main objective of this rally was to create general awareness among the public and especially fisher folks about the fisheries education, research and its importance. It was addressed and flagged off by Dr. W.S. Lakra, Director and Vice-Chancellor of CIFE, Mumbai in the presence of Shri Pradeep Tapke, a prominent fisher community leader of Versova. Total 250 people, including students and staff members of CIFE participated in the rally, which covered major streets of Vesrsova. Pamphlets containing information about fisheries education, extension and its importance were distributed during the rally.

Bhubaneswar

The NAAS Bhubaneswar Chapter organised an interaction meet with school students during Agriculture Education Day on 14th November, 2014 at CRRI, Cuttack. A total of 200 students of class VIII to XII

standard from 18 Schools and Junior Colleges around the city along with their teachers participated. The day-long celebrations including Debate competition on "Can Modern Science Contribute to Climate-Resilient Agriculture?"; Quiz competition on "General Agriculture"; and Group Song competition, apart from the Exhibition project competition, which showcased the innovative ideas of the students in the form of models, charts, graphs and live materials.

The Chapter organised another interaction meet on 16th November, 2014 with Prof. M.S. Swaminathan, Former-President, NAAS at CRRI, Cuttack. Professor Swaminathan emphasized on the role of public research institutes in agricultural development of the country and suggested that the climate and natural resource degradation issues must be addressed vigorously. He drew the attention of the scientists to the plights of small and marginal farmers. Describing the food security scenario of India, he advised that scientists should conduct research to increase the productivity of rice by 50% of available land, and estimated 30% less water than today, by conserving water use, and efficient use of chemical fertilizer and labour.

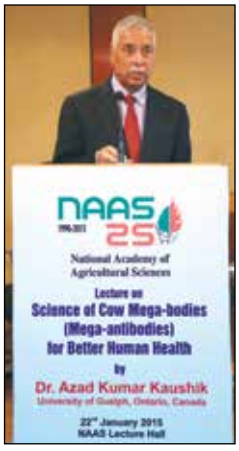
Lucknow

NAAS Lucknow chapter organised a discussion on "Reducing the cost of cane cultivation *vis a vis* sugar production: A growing concern of Indian Sugar Industry" on December 29, 2014, at IISR, Lucknow. Dr. P.S. Pathak, Convener, welcomed the participants and highlighted the importance of the subject. Dr. R.K.

Singh, Ex. Vice-president NAAS highlighted the issues of closure of sugar mills in U.P., reduction of the area of cultivation in eastern U.P., shortage of labour and thus a change of the cropping system, poor varietal replacement and poor seed availability. He stressed the need for critical analysis to address the issue of cost of cultivation so that the interest of farmers is sustained. Dr. Solomon, Director of IISR gave the keynote address covering all the issues of cultivation and management. At the end of deliberations, some important recommendations emerged which are: **Seed**: The seed production programme needs to be properly organized, ensuring availability of new varieties; **Cultural practices and management**: Bud chip technology should be popularized. Use of biofertilizer consortia is ensured to help in the proper nutrient mobilization. The management should be amenable to combine harvesting in order to save the labour. The system of partial mechanization also needs to be followed and popularized.; Promotion of micro-irrigation through the drip system, subsidy on the use of drip irrigation should be provided to all.; Sugar mills as **Corporate Social Responsibility** to produce biofertilizers on a large scale.; **Post harvest management**: Cane supply system should be modified to suit the adoption of the harvesting system from present Parchi to cluster system. If all the above recommendations are tried, the cost can be cut down by 20-25%.

Special Lecture

A special Lecture organized by the National Academy of Agricultural Sciences (NAAS) on "***Science of Cow Mega-bodies (Mega-antibodies) for Better Human Health***" on 22nd January 2015 at the NAAS Lecture Hall in NASC Complex, was delivered by Dr. Azad Kumar Kaushik, University of Guelph, Ontario, Canada. The session was chaired by Prof. R.B. Singh. Prof. M.P. Yadav, Secretary, NAAS welcomed the participants



and introduced the speaker. Dr. Kaushik emphasized the novelty of the antibodies of cow (cattle) among all the other animal species studied, as the cattle antibodies are longest, i.e. having up to 65 amino acids as compared to the usual 22-25 amino acids. Cows produce the largest sized antibodies of the whole of the animal kingdom. These antibodies are distinct and poised to be more effective at attacking diverse species of bacteria and viruses. Dr. Kaushik opined that by giving more emphasis on production traits in the selection of livestock we have lost many good genes, particularly those responsible for health. His researches indicate that these so called mega antibodies of cattle would be ideal next-generation therapeutics and have the potential for forming the basis of new vaccines, diagnostics, medicines and immune-modulator agents to treat and prevent human diseases.

Silver Jubilee National Symposia

1. "Mechanization of Small Farms: Review and Road map for 25 years" at CIAE, Bhopal

Silver Jubilee Symposium on *"Mechanization of Small Farms: Review and Road map for 25 years"* was held on July 18, 2014 at CIAE in collaboration with the Directorate of Agricultural Engineering, Madhya Pradesh. On this occasion an exhibition on modern agricultural machinery was also held for the benefit of 400 farmers and the delegates participating from all over the state. Dr. Anwar Alam, Ex-Secretary, NAAS was the Convener of the Symposium. The symposium and the exhibition were inaugurated by Shri Gouri Shanker Bisen, Hon'ble Minister of Farmers Welfare and Agriculture Development, Govt. of Madhya Pradesh. He in his inaugural address lauded the efforts made by the scientists, government officials of line departments and farmers in the phenomenal progress of agriculture in the state of Madhya Pradesh. In order to increase farm mechanization, the state government has abolished VAT on agricultural machinery and efforts are made to abolish 2% entry tax on farm machinery. The state government is promoting entrepreneurship of custom-hiring of farm machinery in a big way so that the benefits of improved technology and mechanization are made available to smallfarmers who are unable to afford expensive machinery for performing their farm operations in time and more efficiently.

Indian agriculture is dominated by small and marginal farms; constituting 85% of the total farm holdings, therefore, the emphasis on small farm mechanization was highly relevant. The symposium was planned to present the road map for mechanization of small farms with the existing status of machinery availability and to project actions to be initiated for continued growth in mechanization leading to sustainable growth in Indian agriculture.

The symposium suggested very relevant fifteen recommendations on small farm mechanization in the field of research, technology development and policy support.

2. "Nutritionally Sensitive and Environmentally Sustainable Agriculture for India's Food and Nutrition Security:" Challenges and Opportunities at NAARM, Hyderabad

A Silver Jubilee Symposium on "Nutritionally sensitive and Environmentally Sustainable Agriculture for India's Food and Nutrition Security: Challenges and Opportunities" was held on August 23, 2014 at NAARM. Hyderabad. Dr. Mahtab S. Bamji was the convener, and Dr. Ch Srinivas and Dr. SL Goswami were the Co-conveners. Dr. S. Ayyappan, Secretary, DARE & Director General, ICAR & President, NAAS, presided over the inaugural function and highlighted the problems faced by the farming community and the opportunities for the scientific community to address those issues to keep up the momentum in agricultural performance. He exhorted the scientific community to work towards achieving "The Tricolor Revolution" as envisaged by the Hon'ble Prime Minister of India. There were three technical sessions and papers were presented by eminent scientists. Based on discussions, nine major recommendations emerged that could be translated into appropriate action points by the stakeholders.

3. "Indian Fisheries and Aquaculture" at Central Institute of Fisheries Education, Mumbai

A two day NAAS Silver Jubilee National Symposium on 'Indian Fisheries and Aquaculture: 25 Years of Achievements and Way Forward' was organized during 21-22 October, 2014 with Dr. W.S. Lakra as Convener. The symposium was inaugurated by Dr. Sanjeev Kumar Balyan, Union Minister of State for Agriculture & Food Processing Industries. In the inaugural address, Dr. Balyan urged the scientists and students of the fisheries sector to critically evaluate the strength and weakness of the sector and focus on improving the rural livelihood through better technologies and innovations. He also

underscored the importance of the sector in meeting the nutritional security of the country and highlighted the need for a 'Blue Revolution'. Dr. Balyan also suggested that institutions such as NABARD should encourage entrepreneurship and support small farmers through affordable financial assistance. The Minister inaugurated the Aquarium and other facilities at CIFE on this occasion.

Dr. S. Ayyappan, Secretary, DARE & Director General, ICAR & President, NAAS, presided over the inaugural function. He highlighted the progress and achievements of fisheries and aquaculture sector and emphasized on the efforts required in the future to sustain the growth. He also underlined some of the challenges such as climate change which have been impacting the sector significantly. He urged the students to be ready for future challenges as they will be steering the sector for the next 25-30 years. Dr. W.S. Lakra, Director, CIFE and the Convener of the symposium welcomed the dignitaries and presented an overview of the achievements of fishery sector during the last 25 years. Guests of Honour Dr. Dr. E.G. Silas, Former VC, Kerala Agricultural University, Ms. Leena Nair, Chairperson, MPEDA and Dr. Harsh Kumar Bhanwala, Chairman, NABARD, expressed their views on the increased potential of fisheries in the country. **The symposium came up with important recommendations on** Freshwater and Brackish-water Aquaculture, Fisheries Education Marine and Island Fisheries, Genetic Resources and their conservation, Inland Fisheries and Coldwater Fisheries, Harvest and Post-harvest technologies.

4. "Enhancing and sustaining Agricultural productivity for Food and Nutrition Security" at M.S. Swaminathan Research Foundation, Chennai

In commemoration of the Silver Jubilee Year of the National Academy of Agricultural Sciences, a symposium on "Enhancing and sustaining Agricultural productivity for Food and Nutrition Security" was organised at the M.S. Swaminathan Research Foundation (MSSRF), Chennai on 22nd November 2014. More than 200 delegates representing academia, students, mass media and farmers representatives participated in the event. This symposium convened by Dr Ajay Parida, Executive Director, MSSRF,was inaugurated by Prof. M. S. Swaminathan, Founder President, NAAS and Founder, MSSRF.

The deliberation highlighted the role of scientific advances in the field of genetics and plant breeding, agronomy, disease and pest management, participatory technology development and taking these advances to the farmer's field as the key factor in achieving food and nutrition security of the country. While impressive advances have been made in agriculture, but emerging challenges faced by the farming communities in relation to declining agriculture growth, expanding biotic and abiotic stresses, unfavorable climatic conditions, in appropriate market opportunities, calls for concerted and priority attention and action from both scientific community and policy makers for enhancing and sustaining agriculture productivity in the future. The symposium identified eight priority actions that need to be taken up for ensuring that agriculture growth remains central to the development trajectory of the country.

Brainstorming Sessions

1. Reservoir Fisheries Development in India: Management and Policy Options (*Convener: Dr. W.S. Lakra*)

A Brainstorming session on 'Reservoir Fisheries Development in India: Policy and Management Options' was organized by the National Academy of Agricultural Sciences at NASC Complex, New Delhi on 19th September 2014. The session was chaired by Dr. S. Ayyappan, President NAAS and DG, ICAR and convened by Dr. W.S. Lakra, Director, CIFE. Several distinguished experts in the field participated in the deliberations. Several issues concerning fishery development in reservoirs were discussed in detail.

Dr. Ayyappan in his remarks emphasized to explore the possibility of branding reservoir fish as organic since it was raised in natural ecology and is preferred by consumers. He expressed that for new reservoirs the fisheries development plan should be incorporated from

the planning stage itself. He impressed on the experts to discuss all the critical issues confronting the reservoir fisheries development in a fresh perspective. Dr. Lakra, Convener of the program made a lead presentation outlining the priority concerns of bridging the existing gap between actual fish productivity and potential in a sustainable manner to improve the livelihoods of reservoir fishers. He emphasized that policy and governance issues need to be addressed to tackle the complex issues

of conflicting inter-sector water demands, ownership of water bodies, and ecosystem conservation.

Recommendations

- Through major stock enhancement initiative of NFDB it has been noted that reservoir productivity in small and large reservoirs has increased in many States. As a follow-up it is recommended that a major mission mode program be taken up to develop a holistic database on reservoir fisheries at the national level and re-examine the ongoing reservoir development schemes.
- Some encouraging results have been reported by a few states on NFDB funded cage culture activity in reservoirs. However, the inadequacy in our knowledge in cage culture in the reservoir was strongly highlighted. It was felt that more clarity is required in terms of choice of candidate species, proper cage installation area, low cost durable cage designs, feeds / alternatives, economic viability, profitability, policy support, fishery governance, large scale adoption and operational guidelines and environmental impacts.
- While non-adoption of scientific management practices has been understood and accepted as one major reason for low reservoir productivity. It is recommended that each state should have its protocol of BMP,s for each category of reservoirs based on their eco-region and ecologies and the level of technology adoption. Some success stories from different states can serve as models.
- It was strongly felt that a dialogue among Departments of Fisheries, Agriculture, Water Resources, Planning, Environment and Forests was necessary to reconcile the competing demands for water to ensure sustainable ecosystem services including fishery. Fishing regulations should vest with State Fisheries Dept. while ownership rights continue to lie with respective parent Depts.
- The Model Bill on Inland Fisheries and Aquaculture circulated by DAHDF to State DoFs may provide the basis on which more, enabling State specific policies can be framed to provide pragmatic blue prints for reservoir fisheries development in each state.
- A need was felt to strengthen state line departments with professionals to implement reservoir fishery development schemes.
- Fisheries cooperatives need serious reforms to make them professional, transparent, financially sound while encouraging SHGs in reservoir fisheries development.
- Role of exotic fish species in reservoir productivity improvement is both negative and positive. It was felt necessary to initiate short-term and long term impact studies on specific reservoirs so that outputs could be inputs for policy initiatives.
- While social equity among fishers operating on the reservoir is very important but, we need to generate significant surpluses in production that can only be possible through private investment and entrepreneurship that will ensure profitability of enterprise. Because in a large number of cases reservoir fishery development by government through corporations, cooperatives, panchayats have not triggered large scale fish production in reservoirs.
- To harness the un-tapped potential of selected reservoirs we should seriously consider the private investment and entrepreneurship. These units/ models may turn out to be Reservoir Fishery production Hubs n case of freshwater aquaculture.

2. Rating of Agricultural Universities and Institutions (*Convener: Prof. R.B. Singh*)

A Brainstorming session on 'Rating of Agricultural Universities and Institutions was organised 'by the National Academy of Agricultural Sciences at NAAS on 4th December, 2014. It was convened by Prof. R.B. Singh, Immediate Past President, NAAS and attended by various Vice Chancellors and Directors/Deans of various institutions. Dr S. Ayyappan, President, NAAS chaired the session and gave a brief account about the need and the genesis of the BSS, particularly in context of the concern expressed by Hon'ble President and Prime Minister of India, that none of our universities and institutions find a place in the top 200 universities globally as per the ranking by various agencies abroad. He informed that Govt. of India has constituted a Committee to advise on the ranking of the Indian universities. Presently, India has 70 Agricultural Universities inclusive of Veterinary, Animal Sciences, Fisheries and Horticulture, thus constituting about 10% of the total of around 700 universities in India. Dr. Ayyappan emphasized the need to have a database of agricultural universities and institutions in the country. After a lot of discussion by eminent scientists, there was a consensus for a requirement for ranking of our agricultural universities/institutions which need to be taken up on priority. A small committee of 4-5 expert members be formed by the Academy. The first mandate of this committee should be to finalize the indicators

of benchmarking suitable for agricultural universities/ institutions. The committee should submit its report as early as possible for taking the matter further.

3. Good Aquaculture Practice Certification in India (*Convener: Dr. Iddya Karunasagar*)

India is the second largest producer of aquaculture products after China and has diverse aquaculture systems ranging from fresh water carp, catfish and tilapia to brackish water shrimp and marine fish. There are serious concerns that there is an unregulated use of antimicrobials in aquaculture to combat disease problems and this has led to several rejections of aquaculture products in international markets due to residues of antimicrobial agents. Adopting "Good Aquaculture Practices" would be the best way to avoid disease problems and also to address the environmental and sustainability concerns regarding aquaculture.

Against this background, the brainstorming session on "**Good Aquaculture Practice Certification in India"** was organized on December, 29-30, 2014 at NAAS, New Delhi. Dr. S. Ayyappan, President, NAAS and Dr. R.B. Singh, Immediate Past President, NAAS addressed the Session. Dr. Iddya Karunasagar, Senior International Consultant, FAO was the Convener of the Session, which was attended by 22 participants

from various organizations such as Bureau of Indian Standards, Quality Council of India, National Accreditation Board for Certification Bodies, Coastal Aquaculture Authority of India (CAA), National Fisheries Development Board (NFDB), Marine Products Export Development Authority (MPEDA), Central Institute of Brackish Water Aquaculture, Central Institute of Freshwater Aquaculture, Central Marine Fisheries Research Institute, State Agriculture Universities and private certified auditors for aquaculture farms. The following are the major conclusions and action points:

- There is a need to have national Aquaculture Certification Standards for India.
- National Good Aquaculture Practice (GAqP) GAqP certification will cover the process of production of fish/shrimp by Aquaculture.
- National GAqP will be a voluntary standard. Initially, the Standard will cover two systems- fresh water aquaculture and brackish-water aquaculture.
- National GAqP certification standard will be developed by the Bureau of Indian Standards (BIS) with technical inputs from concerned stakeholders and R&D organizations. BIS would come up with a draft standard for public comment by the end of 2015.
- Certification Scheme and other requirements for certification like accreditation will be developed by the Quality Council of India (QCI). This work can start immediately after draft standard is available from BIS.
- QCI and NFDB or CAA or MPEDA can jointly own the Certification scheme. The Scheme owners will also own the logo. The certification could be valid for a period to be specified in the scheme (eg one year or two years).
- The Certification Standard may be developed at two levels. Level 1 will be the basic scheme, including criteria for food safety, animal health and welfare. Level 2 will be the complete scheme involving environmental and socioeconomic criteria apart from those in level 1.
- Efforts need to be made to liaise with international benchmarking agencies such as Global Food Safety Initiative (GFSI) and Global Seafood Sustainability Initiative (GSSI).
- All attempts need to be made to reduce the cost of certification.
- There would be a number of constraints for implementation of certification schemes. Unless farms are registered, they cannot be certified. For freshwater aquaculture an authority similar to CAA need to be set-up.
- There is a need for bringing the sale and prescription of veterinary drugs for aquaculture under a national regulation.
- Scientific data on the pharmacokinetics of drugs for which Codex maximum residue limits (MRL) exist is lacking with respect of fish cultured in India. Such data would be essential for prescribing withdrawal times.
- To be eligible for certification, farms would need to use authorized inputs. These include feed supplements, probiotics and products for water treatment.
- The quality of water either surface or underground used in aquaculture farms will be critical to meeting their certification requirements.
- The impact of pesticide and chemical used in agriculture on fish farms and fish safety needs to be assessed.

Michigan State University (M.S.U.), U.S.A. delegation interaction with NAAS / NARES

A delegation of alumni of Michigan State University (M.S.U.), U.S.A. headed by Dr. Karim Maredia, Director South Asia International Program of M.S.U. visited the Academy on February 16, 2015. The meeting was chaired by Prof. R.B. Singh, immediate past president of the academy. It was attended by 30 participants from USA and India. Prof. M.P. Yadav, Secretary, NAAS, extended a very warm welcome to all the participants.

Prof. R.B. Singh briefed the participants about the purpose of the meeting to explore the possible areas of common interest for collaboration between M.S.U., NAAS, and National Agricultural Research and Education System (NARES), particularly ICAR institutes and Agricultural universities. He highlighted the issues of attracting and retaining youth in agriculture, linking school and college education with higher agricultural education, and impact of climate change on agriculture. He also informed that Michigan State University has taken initiative to institute lecture series in the name of Dr. V. Kurian, an alumni of M.S.U. Prof. R.B. Singh also suggested exploring the possibility of trilateral collaboration between Michigan State University, India and African countries. He also conveyed the message of good wishes from Dr. S. Ayyappan, President of the academy.

Dr. Karim in his remarks mentioned that the delegation was thankful to the authorities in Government of India for arranging their visit to different scientific organisation / institutions. They were indeed happy to attend this interactive meeting under the auspices of NAAS. He highlighted the activities of M.S.U. in US and their collaboration/activities in other countries. He informed the house that many Indian scientists in the past and at present as well, have worked / working with M.S.U. The delegation during this visit was looking forward to identify some areas of mutual interest to initiate collaboration. During this interactive meeting many points were raised by the M.S.U. delegation to which the Indian participants responded by highlighting the strategy adopted by institutions / universities to tackle those issues. Similarly, many Indian participants sought clarifications on some specific issues from the M.S.U. delegation. Other issues discussed included post-harvest management and value addition of agriculture produce, particularly the perishable commodities like milk, fish and fruits; progress and scope of processing of milk and fish in India. Dr. Karim explained that M.S.U. has strength in areas of natural resource conservation, sustainable agriculture (inclusive organic agriculture), plant biotechnology, plant breeding, food processing, value addition and food safety; linking agriculture with health and nutrition, impact assessment of agriculture for the society.

Dr. R.P. Singh, Executive Secretary IAUA desired that a write-up from M.S.U. listing the areas for collaboration between Michigan State University and NAAS, ICAR and NARES will be useful in finding out the partner universities in India in the specified areas. About the Indian vision for trilateral collaboration between India, African countries and M.S.U., Dr. R.B. Singh informed that the Indian Government is already having several bilateral collaborations with African countries and special funds have been provided for the purpose. This effort could be supplemented from U.S. aid for agriculture development for African countries that may partly be channeled through trilateral model where the experiences of Indian scientists in agriculture in general and Livestock, Horticulture, Fisheries and Poultry in particular will be very useful as the climate analogues of India and African countries often match each other.

To a query from M.S.U. delegation, Dr. Vass informed about the efforts in hand in India for undertaking the reactive nitrogen assessment of agriculture and other sectors of economy including aquatic ecosystems and fisheries.

Prof. M.P. Yadav briefed about the strength and achievements of livestock sector in India along with possible areas for collaboration. The meeting ended with a vote of thanks by Dr. K.V. Prabhu, Jt Director IARI and Secretary, NAAS.

Adulteration of Milk and Milk Products

G.R. Patil* and S.A. Hussain**
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Milk and milk products being in high demand are often adulterated intentionally or unintentionally by some unscrupulous people involved in the dairy value chain. The adulterant may be any material which could be employed for making the food unsafe or sub-standard or misbranded or containing the extraneous matter. Generally any food product is considered adulterated if: a substance is added which depreciates or

injuriously affects it; cheaper or inferior substances are substituted wholly or in part; any valuable or necessary constituent has been wholly or in part abstracted; it is an imitation; it is coloured or otherwise treated, to improve its appearance or if it contains any added substance injurious to health; for whatever reasons its quality is below the standard (www.fssai.gov.in). List of adulterants generally encountered in milk and milk products is presented in Table 1.

Despite food legislation, cases of milk adulteration have remained uncontrolled. In India a lot of producers and traders connected with dairy value chain are involved is such malpractices it is compounded by ignorance of consumers, inadequacy of fully trained manpower to test the adulteration making it extremely difficult to control the adulteration. Besides milk, the menace of adulteration is rampant in almost all dairy products. Adulteration is also widely rampant in ice cream, butter and ghee, these products are in great demand by a wide section of consumers. Indigenous milk products such as khoa, paneer and milk based sweets too are adulterated and their demand surges during festive seasons.

A national survey on milk adulteration was conducted in 2011 by the food safety and standards authority of India (FSSAI) to ascertain the quality of milk and identify different types of adulteration in the liquid milk throughout the country involving 28 states and 5 union territories. Only 31.5% of the total samples collected were conforming to the FSSR (2011) standards and the remaining 68.5% were non-conforming to the standards. The percentage of non-conforming samples was higher in urban areas (68.9%) as compared to the rural areas (31%). The non-conforming milk samples included both the packed and loosely sold. The 96% of milk samples collected from Bihar, Chhattisgarh, Daman and Diu, Jharkhand, Orissa, West Bengal, Mizoram, Manipur and Meghalaya were non-conforming to the standards. More than 80% of the samples collected from the states, Gujarat, Sikkim, Uttrakhand, Uttar Pradesh, Nagaland, Jammu & Kashmir and Punjab were non-conforming, indicating the severity of adulteration in the country. However, all the samples in Goa and Puducherry conformed to the standards. The survey concluded that water is the most common adulterant added to milk. The survey reported that detergents, neutralizers, glucose, urea, salt and some preservatives are deliberately added to milk. According to an Indian council of medical research (ICMR) detergents in milk causes food poisoning and may lead to gastrointestinal complications. The immediate effect of drinking milk adulterated with urea, caustic soda and formalin is gastrointestinal disorder but the long term effects are reported to be far more serious (http://www.fssai.gov.in).

The quality of milk suffers both due to adulteration and entry of contaminants in milk supply. Although there is zero tolerance for the presence of adulterants in milk, maximum residue limit has been prescribed for various contaminants in milk. As milk is a perishable commodity, demand for rapid analytical methods for ascertaining the quality of milk has been increasing. Although considerable progress has been made in the instrument based methods, field type methods are more in demand as these methods can be used by anyone involved in the supply chain. Further, among the instrument based methods the trend is to simplify the extraction protocol thus minimizing the sample extraction time and use of hazardous solvents.

Significant research work has been carried out to develop the test procedures for detection of adulteration in milk and milk products. Apart from the time consuming laboratory tests, several ready to use

Table 1. List of adulterants in milk and milk products.

Products	Adulteration/Common adulterants
Milk	water, removal of fat, addition of skim milk, reconstituted milk, skim milk powder, thickening agents such as starch, arrowroot, flour, cane sugar, glucose, urea, fertilizers pesticides, common salt, chlorine and pesticide residues, antibiotics and other drugs, preservatives, neutralizers, kerosene oil, petroleum products, heavy metals, etc.
Cream	Other fats, thickening agents.
Butter	Hydrogenated fats, thickening agents, animal fat, margarine, pea nut butter.
Ghee	Vegetable oils, fats, animal fats, thickening agents, pesticides.
Condensed milk	Preservatives, colour, skim milk, homogenized foreign fats
Ice cream	Prohibited colour, artificial sweeteners, prohibited flavours, foreign fats.
Milk powder	Starch, dextrins.
Khoa, rabari and other concentrated indigenous milk products	Starch, arrowroot, blotting paper, artificial sweeteners, colouring matters
Milk based sweets	Starch, colouring matter, artificial sweeteners
Cheese	Starch, prohibited colouring matters, hydrogenated fats, aflatoxins.

(Source: Gupta and Gupta, 2013)

kits have been developed to make the procedure of detection adulteration easier, faster and more accurate. A number of test kits for detecting various adulterants viz urea, neutralizers, sucrose, glucose, pesticides antibiotics, preservatives, detergents, aflatoxins have been developed at National Dairy Research Institute, Karnal; Central food technological Research Institute, Mysore; PCDF, Lucknow and elsewhere. Recently, newer concepts such as dry chemistry based strip tests, lateral flow assay, molecular imprint technology, aptamer based detection methods, etc. have been introduced.

Dry reagent based strip tests are an attractive alternative to conventional wet chemical methods, having the advantage of long stability and chemicals are less likely to be wasted. It also results in lower costs, ease in handling, less analysis time and enables quick decisions without the support of a conventional laboratory. In the dry chemistry strip based methods, paper strips are impregnated with dry reagents to which the milk sample is added. The dry chemistry technology is widely applied in clinical and food analysis by using classical organic reagents, enzymes and antibodies. Dry reagent test strips have suitability to be used as an emergency test and does not require skilled personnel as the results can be interpreted from the colour change with a naked eye. Thus the development of such test strips can be a beneficial and best way to check the adulteration of milk at the reception docks in dairy plants, at farm level and in households.

Recently, five different strips have been developed by NDRI for the detection of neutralizers, urea, glucose, hydrogen peroxide and maltodextrin in milk. These strips have been developed by passive immobilization of either dyes alone or in combination with various enzymes and other chemicals on the paper strips. These strips are required to come in contact with milk during their working; the surface of the strips has been made more hydrophilic by co-immobilization of a suitable hydrocolloid along with dye, enzymes and other chemicals. Further, the presence of hydrocolloid seems to provide stability to the enzymes during the storage of strips. The developed strips for detection of neutralizers and urea in milk involve dipping the strip in milk samples followed by visualization of the colour of the strip. The colour of the strip changes to deep red in milk containing neutralizers (immediately) and urea (after 2 min) while in pure milk samples, the strip retained its original yellow colour. For detection of glucose hydrogen peroxide and maltodextrin in milk, the test involves putting a drop of milk on the strip followed by visualization of change in colour of the strip. The colour changes to deep pink immediately, in case of adulterated milk containing hydrogen peroxide, while response time is 2-3 min in case of milk containing glucose. In the case of negative samples, only light pink colour appears. The change in colour to greenish brown, in the case of samples is positive for maltodextrin. The sensitivity of these strips has been ascertained and is 0.04% for neutralizer, 0.06% for added urea, 0.03% for glucose, 0.02% for hydrogen peroxide and 0.05% for maltodextrin. The tests are rapid and results are available within 5 min (Sharma *et al*., 2014).

Rapid, reliable, sensitive and cost effective methods for detection of contaminants are also important. Recently, an aptamer based method has been developed at NDRI for detection of aflatoxin M1 and B1. Also, biosensors have been developed at NDRI Karnal for rapid detection of antibiotic residues and aflatoxin M1 in milk (Kumar *et al*., 2014).

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Fellows' Views

2015 marks the beginning of the UN Decade of Sustainable Development. To achieve the goals of this decade, we have to pay concurrent attention to the ecological, social and economic dimensions of sustainable development. In the social dimension, attention to the problems of women is particularly important. If our Academy participates effectively in promoting environmentally, socially and economically

sustainable development, we will also help our country to meet the zero hunger challenge by 2025. I wish the Academy great success in ending hunger and malnutrition in our country.

Prof. M.S. Swaminathan
Chairman
MS Swaminathan Research Foundation

The National Academy of Agricultural Sciences (NAAS) is an apex scientific forum playing an important role for policy advocacy and creating awareness on emerging issues in the areas of agricultural research, education and extension. Since 2015 has been declared by the United Nations as the International Year of Soil, NAAS should take lead in organizing brain storming sessions/ workshops to highlight the issues of malnourishment and nutritional security, in the context of declining soil health and prepare a Road Map to implement the recommendations emerged from such workshops. It also needs to be emphasized that India needs to pursue farming systems approach to address the problems of smallholder farmers for long-term sustainability of agriculture. It is also extremely important that farmers in India should have in- depth knowledge of advanced and innovative technologies for enhancing production and productivity rather than depending on subsidy. The success stories of progressive farmers should be replicated and showcased in order to benefit other farmers. The major challenges relating to the involvement of the youth in agriculture and empowerment of women also need to be addressed on priority.

A strong need is being felt to have in place highly qualified and experienced research and development managers in agriculture. In order to address effectively national food and nutritional security, there is an urgent need to enhance current investment in agriculture by almost three-fold. Climate change and its impact on agricultural production and productivity is another area of concern which needs to be addressed on priority for needed resilience in agriculture. Prioritization of research in agriculture should be done in view of scarce available resources. We now need to be proactive in our approach for planning R&D programmes and creating enabling policies in order to move forward the agenda for agricultural research for development (AR4D) in our country. It is envisaged that NAAS will give priority attention to address some of these emerging issues.

Dr. R.S. Paroda
Chairman, TAAS

Awards and Honours

Dr Ashok Gulati an esteemed Fellow of NAAS, has been conferred with the prestigious Padma Shri award on 26th January, 2015 by the Honourable President of India. It is a matter of great pride and honour for the Academy.

Dr. Ashok Gulati is currently Chair Professor, Indian Council for Research on International Economic Relations, New Delhi. Dr Ashok Gulati served as Chairman, Commission for Agriculture Costs and Prices, Ministry of Agriculture, GOI, New Delhi (2011-2014). He also served as Director, Markets, Trade and Institution Division, IFFRI, Washington (2001-2006) and Director Asia, IFFRI, New Delhi (2006-2011). He has also been a member of the Economic Advisory Council of the Prime Minister of India; a member of the State Planning Board of Karnataka; a member of the Economic Advisory Council of the Chief Minister of Andhra Pradesh; a member of the Board of Directors of ICICI Banking Corporation; and many other such positions. His special areas of research include analysis and policy advice on issues related to agricultural markets and the development of value chains; agriculture, trade liberalization and negotiations in WTO with a focus on the likely implications on developing country interests.

Science and Technology Spectrum

NDRI scientists clone endangered wild buffalo of Chhattisgarh

Scientists of the ICAR-National Dairy Research Institute (NDRI) in Karnal have achieved a milestone in the field of cloning through hand-guided cloning technique. They successfully produced a female clone (named Deepasha) of endangered wild buffalo of Chhattisgarh on 12th December 2014. “It is the clone of the lone wild buffalo (named Asha) in the country. This is the State animal of Chhattisgarh which is also known as ‘ban bhainsa’. Asha is at the Udanti Wildlife Sanctuary in Chhattisgarh”. The scientists of the NDRI have proved that besides multiplication of superior germplasm, the conservation of endangered species through cloning has a great potential.”

Udanti Wildlife Sanctuary in Chhattisgarh is left with a lone female wild buffalo named Asha, which had delivered male calves during several natural-matings. The team of the scientists involved in the production of this cloned calf, include Dr. S.K. Singla, Dr. M.S. Chauhan, Dr R.S. Manik, Dr P. Palta, Dr S.S. Lathwal, Anuj Raja and Amol Sahare. Besides multiplication of superior germplasm through cloning, conservation of endangered species through cloning has great potential. As our domestic buffalo has evolved from wild-buffalo, we may need to extract few traits of biological and/or economic importance from these wild animals in future. Wild buffalo looks similar to bison in appearance, but is a different species. It is very active in nature and considered more resistant to natural adversities.

Obituary

Dr. S.P. Singh
Aug. 1941 - Dec. 2014

Dr. S.P. Singh was born in Faridkot in Punjab on 11th August, 1941. He obtained his M.Sc. degree from the Punjab Agricultural University, Ludhiana, in 1963 and Ph.D. from the Kuba Agricultural Institute, Krasnodar, Russia, in 1973. Dr Singh held several important positions and served as Project Directorate of Biological Control (ICAR), Bangalore (1994–2002) before superannuation. He also served as a Project Coordinator-IPM, Asian and Pacific Coconut Community, Jakarta (Indonesia) (2004–2007). His focus of research remained on Biological Control and Pest Management throughout career. His outstanding contributions in the field enabled him to obtain various awards like Hexamar Agricultural Research and Development Foundation Award (1994–1995). He conceived and established the first ever Project Directorate of Biological Control in India in 1993 and it was under his leadership that PDBC won the ICAR Best Institution Award in 1998.

Dr. S.P. Singh was recognized as Fellow, Member, Member Secretary and Chairman of several national/ international scientific committees. Some important recognition includes Fellow, National Academy of Agricultural Sciences, India; Plant Protection Association of India; Indian Society for the Advancement of Insect Science; and Horticultural Society of India.

Dr. Singh has been a leading figure in prestigious scientific societies, and served as President of the Society for Biocontrol Advancement. He served as a member of the editorial boards of a number of national and international scientific journals. He published more than 400.

Dr. Singh passed away on 1st December, 2014 after a brief illness at Chandigarh. In his passing away country has lost an eminent agricultural scientist who has made immense contribution in pest management. The Fellowship mourns the sad demise of one of distinguished fellows and pays its homage to the departed soul.

Compiled by Editors NAAS

Announcement

Silver Jubilee Foundation Day Programme, 2-5 June 2015 at New Delhi

2 June 2015 : Youth Convention – Elocution Competition and Essay Competition for PG students of SAUs/ CAUs/ ICAR Deemed Universities

3 June 2015 : Silver Jubilee Panel Discussion
Inter-Academy Meeting
Silver Jubilee Lectures by Eminent Agricultural Scientists

4 June 2015 : Panel Discussion on views of Young Scientists (NAAS Associates)
Scientific Presentation by Newly Elected Fellows

5 June 2015 : AGM
Presentation of Silver Jubilee Awards and Felicitation Function
Foundation Day Lecture

Editors: Dr. (Ms.) Prem Dureja & Dr. K.K. Vass

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