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Editors

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From the President's Desk

IYoM2023: Mainstreaming Millets for Better Nutrition Outcomes



Millets are the traditional food crops, particularly in the dry land regions of the world. It is cultivated in more than 130 countries and consumed by more than 590 million people. India grows millets - both major and small. Major millet crops include jowar or sorghum (*Sorghum bicolor*), bajra or pearl

millet (*Pennisetum typhoides*), mandua/ragi or finger millet (*Eleusine coracana*). The small millets comprise of kangni or foxtail millet (*Setaria italica*), kutki or sama or little millet (*Panicum miliare*), kodo millet (*Paspalum scrobiculatum*), jhangora or sawan or barnyard millet (*Echinochloa frumentacea*), cheena or proso millet (*Panicum miliaceum*), and korale or brown top millet (*Brachiaria ramosum*). Other minor millets grown elsewhere in the world are Teff [*Eragrostis tef* (Zucc.) Trotter] and Fonio (*Digitaria exilis* Staph and *Digitaria iburua*) and Job's tears (*Coix lacryma-jobi*). Besides providing food and fodder to the dry land agricultural communities, millets offer several health benefits. Given the richness of millets in fibre, micronutrients, protein, key vitamins etc., this group of crops is now appropriately named by the government of India as "Nutri-Cereals".

Proactive Role of the Government to Mainstream Millets

The Ministry of Agriculture, Government of India has acted proactively in recent years to initiate actions for mainstreaming millets. Earlier, millets were promoted under the programme called "Initiative for Nutritional Security through Intensive Millets Promotion" (INSIMP) during 2011-12 to 2013-14. Based on the recommendations of a committee under the Chairmanship of Prof. Ramesh Chand, Member, NITI Aayog, constituted for deliberating on the "Introduction of Millets under PDS to provide Nutritional Support", the government took major decisions: i) Three major millets namely, Jowar, Bajra and Ragi are to be promoted through PDS across the country to improve nutritional outcomes; ii) Instead of calling them coarse grains, millets should be positioned as Nutri-Cereals; iii) The millets are to be popularized amongst masses through sustained and effective



campaign; and iv) Research has to be intensified to develop high yielding varieties and also varieties with longer shelf life. As a consequence, a Sub-Mission on National Food Security Mission – Nutri Cereals is being implemented from the year 2018-19 in 212 districts of 14 states with operational flexibility to the North Eastern States, Himachal Pradesh and UT of Jammu & Kashmir and Ladakh. ICAR intensified efforts to develop new high yielding varieties and hybrids in the millet crops. The highlight of these efforts is the development and release of 13 varieties (nine in pearl millet, three in finger millet and one in little millet) biofortified for micronutrients particularly zinc and iron during the past 4-5 years. Besides, 2018 was declared as National Year for Millets to promote millets for nutrition security. More importantly, on the proposal of the Indian government, which was supported by 72 countries, the United Nations General Assembly (UNGA) declared 2023 as International Year of Millets (IYoM) in March 2021.

India's Preparedness for IYoM2023

Government of India has planned to initiate a series of events to observe the IYoM2023 including the global launch at New Delhi. Further, six task forces have been formed on various aspects of millets to obtain informed inputs from experts across the country to suggest and recommend various activities. The committees have submitted the recommendations, which are under considerations by the respective departments for implementation. The Government has also evolved 'Seven Sutras' (themes) in the run-up to the IYoM, which will be rolled out by the concerned Ministry/Department: i) Enhancement of production/productivity (Department of Agriculture & Farmers' Welfare/Department of Agriculture Research Education), ii) Nutrition & health benefits (Ministry of Health/Food Safety and Standards Authority of India), iii) Value addition, processing & recipe development (Ministries of Food Processing Industries & Tourism), iv) Entrepreneurship/Startups/Collective development (Ministries of Commerce and DA&FW), v) Awareness creation including branding, labelling & promotion (All Ministries), vi) International outreach (Ministries of Commerce & External Affairs) and vii) Policy interventions for mainstreaming (Dept of Food & Public Distribution and DA&FW). Millets have been already included under the POSHAN Mission Abhiyan of the GoI. Over 500 StartUps are working in millet value chain while the ICAR-Indian Institute on Millet Research (IIMR) has incubated 250 Startups under RKVY-RAFTAAR. ICAR-IIMR has planned to organize millet fairs and demonstrations through crop cafeteria by All India Coordinated Research Projects centres across the country. Additionally, ICAR- Indian Institute of Millets Research is working with the State Millet Missions (Odisha, Karnataka, Tamil Nadu, Telangana, Chhattisgarh etc.) to revive millets on farms

and plates with simultaneous focus on production, processing, consumption, marketing, and Inclusion of millets in Government schemes alongside incentivizing millet cultivation and mainstreaming in public funded programs. Training and capacity building of SHGs (Self help groups) and FPOs (Farmer producer organisations) in millet processing and value addition through the AICRP centres and KVKs across the country has also been planned.

Suggested Actions during 2023 and Beyond

1. Promote consumption

The demand for millets for household consumption has declined due to a lack of awareness about their health benefits on one hand, and easy access to fine cereals (wheat and rice) on the other hand. Up to 1965-70 millets accounted for 20% of total food grain basket that has declined to only 6% now, being dominated by rice and wheat. According to one study, the per capita consumption of millets in rural area decreased from 3.2kg during 1977 to 0.53kg in 2011 i.e., 83% drop, and in urban clusters it has decreased from 1.15kg to 0.27kg during the same period i.e., 77% drop. However, in 2022, millet consumption in India was estimated to be 17.75 MMT, as against 16.05 MMT in 2012, showing a decadal of 1% CAGR. The consumption of sorghum in the overall basket of millets showed a decadal decline while consumption of other millets increased; reflecting growing awareness of the latter's health benefits. In 2022, around 0.45 MMT of sorghum was utilised as feed while 4.00 MMT was utilised as Food, Seed and Industry (FSI). Around 1.60 MMT of other millets were utilised as feed while 11.70 MMT were utilised as FSI.

Consumption of millets needs to be increased further through a series of systematic actions: i) Taking millets closer to people through various awareness programs with the help of different media including promotion by Indian Railway, civil aviation, sports, anganwadi centres, etc. on the lines of milk and egg for wider reach, ii) The school children are to be adequately informed about the nutritional benefits of millets; all schools should mandatorily include awareness classes for "Nutrition Literacy" inviting and involving experts regularly to interact with the students, iii) Millets and value added millet products are to be included in the Integrated Child Development Services (ICDS) and Mid-Day Meal Scheme (MDM) to nudge children towards consumption of millets, as schools are not only a place where children build long lasting habits but they also act as key influencer in shaping food preferences in their family, iv) Small and Medium Enterprises/StartUps are to be incentivised through government policies and schemes to push the millet products in local markets, v) Industry and business giants need to be encouraged to include millets in their product portfolio and make



those available at affordable prices for the masses as part of their “Corporate Social Responsibility”, vi) Novel value-added products with improved shelf life needs to be developed, attractively packaged, appropriately branded and taken to the market, vii) Industrial uses of millets including the development of plant-based proteins, dairy and meat analogues need to be explored and capitalised for higher consumption and viii) Low-cost product development needs to be undertaken by the research institutions as well as by industry, ix) The recipes, traditional and newly developed, are to be published in all languages and distributed free in mass awareness programmes, and x) Sensory evaluation of all ready-to-eat and processed products have to be strictly carried out keeping in mind the most-liked taste for wider acceptance.

2. Enhance export

Malnutrition is a global phenomenon. Millets need to be mainstreamed globally so that these are chosen to constitute an essential part of the diet system. Hence, millet export needs to be enhanced for better nutrition outcomes and economy. India plays a vital role in the global millets trade. In the year 2021, India exported millets worth USD 65.10 M (1.66% of global trade). In volume terms, India exported 1.68 lakh MT (0.45% of global trade). The country witnessed exports rising from USD 55.22 M in 2011 to USD 65.1 M in 2021, registering a CAGR of 1.66%. India is the 5th largest exporter of Millets. India’s millet export accounts for about \$ 31 M (226.41 Crores) with more than 50% of the exports coming from Gujarat. States like Karnataka, Odisha etc., which are traditionally growing and consuming millets, have high potential as they can be pushed for export markets from current domestic consumption. World export of millets has increased to USD 402.7 million in 2020. Major exporters of millets are USA, Russia, Ukraine and India. The global millet market is projected to register a CAGR of 4.8% during the forecast period 2022-2027. Due to COVID-19, the millet market witnessed a disruption in the supply chain, labor shortage, shutting of small processing units, etc. due to the imposition of repeated lockdowns. Despite all these negative factors, there was a significant increase in retail sales. Opting for healthy meals to boost immunity, people shifted from junk foods to nutrient-rich super foods like millets and their derivatives.

Consumer demand for millets is expected to increase during the forecast period (2022-27) and India must capitalise on this positive change. Following set of actions is suggested: i) Analysis of export competitiveness of millets, demand-supply gaps and price volatility; segmenting the markets for building product portfolio along with appropriate marketing and branding strategies are required to foster export growth, ii) Identification and grouping of the millet growers and linking them with processors and traders

will help establish sustainable supply chain for exports, iii) Building a robust system for convergence of start-up and the industry ecosystems where start-ups can process the products for big private FMCG players on contract manufacturing will result in efficient use of capacity; the big players can concentrate on penetrating the export markets for the nutrient-rich products, iv) Designing and development of packaging standards and materials for export; definition of grades and standards, for enabling certification to address issues related to export quality, and v) Training, capacity building for entrepreneurship development and linking them with export markets for increasing the number of food processors and exporters, and vi) Bringing millet specific export policies such as allocating the separate HS codes for all millet products.

3. Increase area and improve productivity

Increased demand through enhanced domestic consumption and export has to be coupled with higher level of production. India is the largest producer of millets in the world with about 20 per cent of global share in production. Millets are cultivated in an area of 12.45 million hectares, producing 15.53 million tonnes with a yield of 1247 kg/ha. Sorghum is the fourth most important food grain in India after rice, wheat, and maize in terms of area (3.84 Mha) and production (4.31 MMT). Bajra (7.05 mha) is contributing more than 50 per cent of the country’s area under millets with nearly equal percentage of production. India is the highest producer of kodo millet (100%), little millet (100%), barnyard millet (99.9%), finger millet (53.3%), and pearl millet (44.5). While Rajasthan has the highest area under millets cultivation (29.05%), the highest yields were recorded in Andhra Pradesh (2626.58 kg/ha). The rain-fed ecology of Rajasthan (A1 zone receiving <400 mm rainfall), where mostly bajra is being cultivated, does not allow realization of full potential of the varieties/hybrids.

The main concern is the decline in area under millets. In 1950s, the total millet area was 35.41 Mha, which

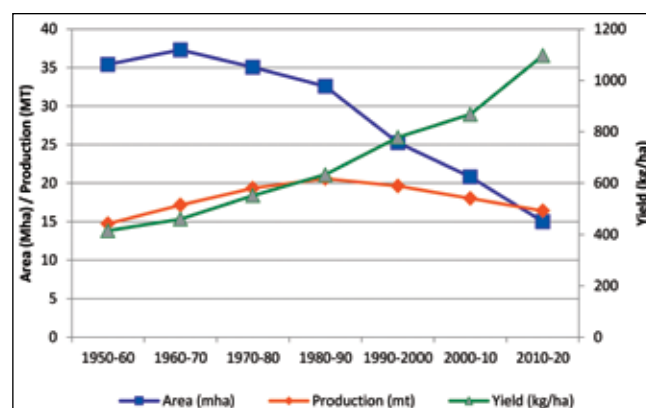


Fig 1. Area, production and yield of millets in India since 1950s



significantly decreased to 15.01 Mha during 2010-20 (Fig. 1). The production has increased marginally from 14.75 MT to 16.42 MT primarily due to the increase in yield (415 kg/ha in 1950-60 to 1097 kg/ha in 2010-20) during this period of about 70 years. In particular, the area under sorghum has been continuously declining, with the current area being 5.1 Mha as compared to 18.0 Mha in 1960s. As a consequence, sorghum production declined by more than 50% during 2015-20 in comparison to mid 1960s, in absence of significant improvement in productivity, particularly in *kharif* sorghum. Similarly, the finger millet cultivation also came down by more than 50% from mid 1960s. With regard to small millets, the area decline has been to the tune of 90%. In case of pearl millet, despite 30% decrease in area, production was more than doubled due to increase in productivity (NAAS Policy Paper No. 114).

In view of the above situation, it calls for urgent attention of all concerned to arrest decline in the area, rather to increase the area under millets and improve productivity in order to increase the production. The following measures are suggested: i) Development of better cultivars using modern tools of breeding, genomics and biotechnology to break yield ceiling, impart higher level of stress tolerance and climate resilience, improved heterosis levels, diverse health benefits and better shelf life; strengthening seed chain for those cultivars for rapid reach in target areas, ii) Productivity enhancement through new methods such as system of millet Intensification, iii) Expansion of millet cultivation to better endowed areas, iv) Promotion of farm gate processing and value addition through millet based FPOs and SHGs, v) Declaring MSP for small millets and devising policies for procurement of millets, vi) Developing low cost and efficient machinery for primary and secondary processing, vii) Standardization of polishing in millets to contain the indiscriminate polishing resulting in loss of nutrition, and viii) There has to be an investment of about Rs.

500 crores in next five years for comprehensively addressing R&D needs in millets.

4. Leverage the international year of millets

The IYoM2023 offers a huge opportunity for the country to make rapid strides in mainstreaming millets with regard to production, consumption and export. Convergence of various institutions and departments such as NITI Aayog, APEDA, MHRD, MOFPI, MSME, DHR, DSIR, DARE, DAFW etc., and other public institutions, private sector, NGOs, farmer groups, chefs, dieticians, doctors, nutritionists, start-ups, etc., is essential during 2023 and beyond. This would help development of new programs/schemes, formulation and implementation of supportive policies, creation of mass awareness, and increase in production, domestic consumption and export. The Department of Agriculture and Farmers' Welfare in association with DARE and NITI Aayog has to intensify its efforts to catalyse the change in the millet sector. Besides, global platforms such as South-South Triangular Cooperation (SSTC) to be leveraged for awareness creation, knowledge sharing, capacity building, technological support, incubation, etc. for replicating the successful models of India towards strengthening global value chains on millets. Research is required to build evidences to unequivocally establish the health benefits of millets and to discover new molecules of relevance for the nutraceutical industry. Social media needs to be proactively utilized for promoting millets for better nutrition outcomes.

The International Year of Millets 2023 is a great opportunity for India to bring back the glory of millets, and through concerted efforts of the academia, industry and the government, make millets the future super foods.

Trilochan Mohapatra
President



*On behalf of the Academy and my own behalf, Greetings
and Best Wishes to the Fellowship for a Very Happy, Safe
and Healthy 2023.*

(Trilochan Mohapatra)
President



129th EC Meeting

The 129th EC meeting held on December 16, 2022 and was chaired by Dr. Trilochan Mohapatra, President of the Academy. After brief welcome by the President all the listed agenda were discussed in details and necessary approval accorded. The EC approved final report of the Ranking of Professional Societies for submission to the ICAR. The EC deliberated and approved changes in the Guidelines for Fellowships and Awards of the Academy. Some of the important decisions included ratification of the election of office bearers/EC members/Fellowship/Associates from January 2023 and approval of the recommendation of the Programme Committee and various Judging Committees of various Academy Awards.

The EC felicitated the outgoing office bearers, which included Dr T. Mohapatra, President, Dr Panjab Singh, immediate Past-President; Dr P.K. Joshi, Secretary, and Dr P.S. Birthal, Editor; and Executive Council (2022) members Dr Jitendra S. Chauhan, Dr Wazir Singh Lakra, Dr Cherukumalli Srinivasa Rao, and Dr Rangaraju Visvanathan.

Elected new Office Bearers and Members of the Executive Council from January 1, 2023

President	: Dr. Himanshu Pathak
Secretary	: Dr. W.S. Lakra
Editor	: Dr. V.K. Baranwal
Members (4)	: Dr. Anjani Kumar : Dr. Ramabhau Tumadu Patil : Prof. Agepati S. Raghavendra : Dr. E.V.S. Prakasa Rao

The EC also ratified the election of the following scientists to the Academy Fellowship 2023

Section I: Crop Sciences

Dr. Parbodh Chander Sharma
Dr. Pankaj Kaushal
Dr. Harsh Kumar Dikshit
Dr. Manish Kumar Pandey
Dr. Ramesh Pal Singh Verma
Dr. Kapuganti Jagadis Gupta

Section II: Horticultural Sciences

Dr. Ram Kumar Sharma
Dr. Vinay Bhardwaj
Dr. Ajmer Singh Dhatt

Section III: Animal Sciences

Dr. Thapasimuthu Vijayamma Anilkumar
Dr. Sachinandan De

Dr. (Ms.) Anju Manuja
Dr. Ashok Kumar Tiwari

Section IV: Fisheries Sciences

Prof. (Ms.) Robinson Jeya Shakila
Dr. Narottam Prasad Sahu

Section V: Natural Resources Management Sciences

Dr. Hanuman Sahay Jat
Dr. Debashis Chakraborty
Dr. Ram Swaroop Meena
Dr. Gangalakunta P. Obi Reddy
Dr. Parveen Kumar

Section VI: Plant Protection Sciences

Dr. (Ms.) Radha Prasanna
Dr. Kalyan K. Mondal
Dr. (Ms.) Anupama Singh
Prof. Narayanasamy Mathivanan

Section VII: Agricultural Engineering & Tech.

Dr. Sudhir Pratap Singh
Dr. N. Vigneshwaran

Section VIII: Social Sciences

Dr. Abhishek Rathore
Dr. Rajarshi Roy Burman
Dr. R. Sendhil

Foreign Fellows

Dr. William Dollente Dar
Prof. Kazuyuki Inubushi

Pravasi Fellows

Dr. Ajay Kohli
Prof. Karimbhai M. Maredia
Dr. Rai Singh Kookana

NAAS Associates Selected for 2023 under Different Sections

Dr. R.K. Ellur, Crop Sciences
Dr. A. Bohra, Crop Sciences
Dr. (Ms.) P. Raigond, Horticultural Sciences
Dr. G.B. Sreekanth, Fisheries Sciences
Dr. Subhash Babu, Natural Resources Management Sciences
Dr. D. Chatterjee, Natural Resources Management Sciences
Dr. Amalendu Ghosh, Plant Protection Sciences
Dr. D. Pramesh, Plant Protection Sciences
Dr. K. Anjineyulu, Agricultural Engineering & Technology
Dr. Eldho Varghese, Social Sciences



NAAS Young Scientist Awards 2023

Plant Improvement	Dr. Rajkumar Uttamrao Zunjare, Scientist, Division of Genetics, ICAR-IARI, New Delhi
Plant Protection	Dr. (Ms.) Namisha Sharma, Research Associate-III, National Institute of Plant Genome Research, New Delhi
Soil, Water & Environmental Sciences	Dr. Bappa Das, Scientist (Sr. Scale), ICAR-CCARI, Goa
Animal Sciences	Dr. G.B. Sreekanth, Scientist (Sr. Scale), ICAR-CCARI, Goa
Agricultural Engineering & Technology	Dr. Manoj Kumar, Scientist, ICAR-CIRCT, Mumbai
Social Sciences	Dr. (Ms.) Ratna Prabha, Scientist, Division of Agricultural Bioinformatics, ICAR-IASRI, New Delhi

Academy Awards for the Biennium 2021-2022

Name of Award	Name of Awardee
Memorial/Lecture Award	
Dr B.P. Pal Award for Excellence in Agricultural Sciences	Dr. Mangala Rai, Former Secretary, DARE & DG, ICAR and Former President, NAAS
Dr K. Ramaiah Award	Dr. Devendra Kumar Yadava, ADG (Seed), Indian Council of Agricultural Research, New Delhi
Dr K.C. Mehta Award	Dr. Mujeebur Rahman Khan, Professor, Department of Plant Protection, Faculty of Agricultural Sciences, Aligarh Muslim University, Aligarh
Dr M.S. Randhawa Award	Dr. Puranjan Das, Former Deputy Director General (Agricultural Extension), Indian Council of Agricultural Research, New Delhi
Dr N.S. Randhawa Award	Dr. Paramjit Singh Minhas, Former Director, ICAR-National Institute of Abiotic Stress Management, Karnal
Dr P. Bhattacharya Award	Dr. Joykrushna Jena, Deputy Director General (Fisheries Science), Indian Council of Agricultural Research, New Delhi
Dr A.B. Joshi Memorial Lecture Award	Dr. Panjab Singh, Former Secretary, DARE & DG, ICAR
Endowment Award	
Dr L.C. Sikka Endowment Award	Dr. Sharat Kumar Pradhan, Assistant Director General (F & FC), Indian Council of Agricultural Research, New Delhi
Dr (Ms) Prem Dureja Endowment Award	Dr. (Ms) Kambham Madhavi Reddy, Principal Scientist, ICAR-Indian Institute of Horticultural Research, Bengaluru
Dr N.G.P. Rao Endowment Award	Dr. Anilabha Das Munshi, Principal Scientist, ICAR-Indian Agricultural Research Institute, New Delhi
Recognition Award	
Plant Improvement	Dr. Sujay Rakshit, Director, ICAR-Indian Institute of Agricultural Biotechnology, Ranchi
Plant Protection	Dr. Sivakumar Uthandi, Professor, Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore
Soil, Water & Environmental Sciences	Dr. Vinod Kumar Singh, Director, ICAR-Central Research Institute for Dryland Agriculture, Hyderabad
Animal Sciences	Dr. Rajan Sharma, Principal Scientist, Dairy Chemistry Division, ICAR-National Dairy Research Institute, Karnal
Agricultural Engineering & Technology	Dr. C. Anandharamakrishnan, Director, National Institute of Food Technology, Entrepreneurship and Management (NIFTEM), Thanjavur
Social Sciences	Dr. Ranjay Kumar Singh, Principal Scientist (Agricultural Extension) ICAR-Central Soil Salinity Research Institute, Karnal



NAAS Programs

BRAINSTORMING SESSIONS

Seaweed Farming and Utilization [Convener: Dr J.K. Jena, Deputy Director General (Fisheries Science), ICAR; Co-convener; Dr A. Gopalakrishnan, Director, ICAR-Central Marine Fisheries Research Institute, Kochi]

The National Academy of Agricultural Sciences (NAAS) organized a Brainstorming Session on “Seaweed Farming and Utilization” on 16th November 2022. In his opening address, Dr Trilochan Mohapatra, President emphasized the need for introduction of alternate seaweed species, especially high-yielding indigenous ones in the farming practices, and round the year round availability of quality planting material. He also stressed on the importance of novel compounds, nutraceuticals, and plant growth-promoting substances derived from seaweeds; and developing guidelines for promotion of seaweed-based biostimulants. Dr J.K. Jena introduced the topic emphasizing the need to promote an interface between research and seaweed industry; and the guidelines for introduction and evaluation of exotic aquatic plants. Pointing out the importance of seaweed farming in PMMSY, Dr J. Balaji, Joint Secretary, Department of Fisheries, Government of India stressed on the need for an alternative to *Kappaphycus* species for diversification in seed weed farming. Pilot-scale seaweed farming may be initiated in coastal areas identified by ICAR-CMFRI in consultation with state administration.

Key recommendations are given below:

- Establish seaweed seedbanks and supply chains for round-the-year production and supply of quality planting material of all commercially important seaweed species. Micro-propagation for large-scale production of planting material be up-scaled and pilot-scale seaweed farming be taken up in potential areas.
- Alternative high-yielding native and exotic species of seaweed should be evaluated for farming as to reduce dependence on single species *Kappaphycus alvarezii*.
- Strain improvement of selected indigenous and commercially important seaweed species.
- Mechanism for regular purchase of surplus seaweed materials by the Government at remunerative prices.
- Introduce insurance for seaweed farming.
- Test efficacy of seaweeds as fodder supplements to reduce methane emission from livestock.
- Promote offshore farming and IMTA with native seaweed species.
- Expedite FSSAI standards for seaweed products/ recipes (including dried products) for human consumption and guidelines for imports, and evaluation of exotic seaweed species.
- Promote seaweed products in domestic and international markets.





- Develop cultural practices for at least 2-3 commercial brown seaweed species for algin.
- Regular release of seaweed annual calendar and distribution pattern of seaweeds in coastal regions, and periodic estimation of potential yield to facilitate wild collection in a sustainable manner.
- To organize “National Seaweed Day” to promote seaweed consumption.

Livestock Service Delivery System in India (Convener: Dr M.L. Madan; Co-conveners: Dr Abhijit Mitra and Dr P.S. Birthal)

A BSS on “**Livestock Services Delivery System**” was held on December 5, 2022 to examine current status of livestock service delivery system in India and to explore innovative models for providing service support to livestock producers.

The key recommendations emerging from the deliberations are:

- Public extension system is more efficient in improving livestock productivity, but its outreach is limited despite the country having more than 80000 veterinarians in the public sector. Thus, there is a need to redefine the role of existing veterinarians for engaging them in delivery of livestock services to farmers.



- There is a need for regular interface between public and private service providers so as to improve capacities of the latter in diagnosis and prescriptions.
- Promote digitization in dairying from genetics to end-consumption for improving efficiency of milk value chains.

Milk vs. Plant-Based Dairy Analogues (Convener: Dr Anil K. Srivastava, Vice Chancellor, DUVASU, Mathura)

Milk is a super food, fulfilling requirement of all the nutrients including vitamins, minerals and bioactive

molecules. The role of milk in improving human nutrition, immunity, body growth and mineral sufficiency has made it the best alternative over other foods, and, therefore nutritionists, pharmacologists, and clinicians consider it as a complete food. However, in the recent past, a new range of products called ‘plant-based milk analogues’ has been introduced in the global market, which has created confusion among consumers and may cause harm to human health if not based on sufficient scientific evidences. Although, the market for plant-based milk analogue has been growing fast in the USA, its growth in India is meagre. However, the plant-based food industry can complement the dairy industry in ensuring food security. With this background, a brain storming session on ‘**Milk vs. Plant-Based Dairy Analogues**’ was held on December 10, 2022 at DUVASU, Mathura under the convenership of Dr Anil K. Singh, Vice President, NAAS. Major recommendations are given below:

- Plant-based milk analogues cannot be an alternative to milk.
- Plant-based milk is a misnomer. Use of the term ‘milk analogue or beverage’ is more appropriate.
- A large-scale campaign may be conducted to create awareness among people regarding anti-nutritional elements in some of the plant-based beverages.
- Myths related to consumption of milk and milk products should be addressed through awareness campaigns.
- Plant-based analogues should be used with utmost care as a complement to milk but not as a substitute of milk.
- Milk for all or Milk for life or Milk for every house or any other suitable national slogan can be designed to create awareness among consumers.
- For ensuing nutritional security, the plant-based beverages may be used along with milk but with a line of demarcation between milk and plant-based analogues.





Other Activities

A Special Meeting of Local Office Bearers with Delhi School Children

On the occasion of Children's Day, the NAAS Office-bearers including Dr T. Mohapatra, President; Dr Anil K. Singh, Vice President; Dr P.K. Joshi, Secretary, Dr Malavika Dadlani, Editor, and Dr Sanjeev Saxena, Executive Director visited Sarvodaya Kanya Vidyalaya, IARI Campus, New Delhi, on 14 November, 2022, and interacted with more than 500 girl students along with the School

Principal and teachers. The interaction focused on Nutrition Awareness and importance of balanced and nutritional food in our health and wellbeing. Dr Malavika Dadlani introduced the topic, and Dr Trilochan Mohapatra in his address highlighted nutritional benefits of indigenous cereals, vegetables, and fruits and informed the children about the benefits of biofortified crops. He also deliberated on the importance of scientific research in nutrition and health, and apprised the children about the advances in nutri-genomics,



The Academy organised an Academia-Industry Meet on December 23, 2022

NAAS organized an Academia-Industry Meet to discuss various topical issues with regard to policy development in agriculture and allied sectors. The meeting was held on December 23, 2022, under the Chairmanship of Dr T. Mohapatra, President,

NAAS. The participants represented various sectors from the industry and deliberated issues related to seed, agro-chemicals and crop protection, fertilisers, Indian poultry, and livestock sector including cattle feed and fodder seeds, with a view to ensure sustainable growth of agriculture and enhance profit of farmers.





Activities of the Regional Chapters

Barapani Chapter

Potential of GI Crops

The Regional Chapter, Barapani, in collaboration with ICAR Research Complex for NEH Region, Meghalaya, organized a strategy workshop in hybrid mode on “Harnessing the Potential of Geographical Indication Tagged Crops in North-East India – Research Needs, Outreach Approaches and Policy Perspectives” on 3rd October 2022 at Umiam, Meghalaya. Dr. Trilochan Mohapatra, President (NAAS) and former Secretary, DARE & DG, ICAR delivered the inaugural address and enumerated the importance of GI crops in the North East. The technical sessions deliberated on the multifaceted aspects for promotion of GI crops with special reference to the research, extension and policy requirements.

Nutritional Awareness of School Children

Nutrition awareness program for school children was organized at College of Agriculture, CAU, Kyrdemkulai, Meghalaya on 7 December, 2022. Around 100 students alongwith their teachers from Kendriya Vidyalaya, Christ Sr. Secondary School, St. Francis Sr. Secondary School, in Ri Bhoi, Meghalaya and from SOS Village participated. Children were apprised of the importance of nutritious food for a healthy life, nutrition garden for family’s well-being, organic-based integrated farming system and natural farming system models, and importance of various components (dairy, poultry, apiary, indigenous fruit plants, vegetables, fishery etc.) in a healthy diet. Experts delivered lectures on Nutrition and Health. Children interacted actively with experts.



Bengaluru Chapter

On the occasion of Children’s Day, the Regional Chapter, Bengaluru organized an awareness campaign on 14 November 2022 for school children highlighting the importance of nutrition for health and wellbeing. The programme was organised at three government primary and middle schools located in Bengaluru Rural district. Dr Raghavendra Bhatta, Dr Arindam Dhali and Dr K



Participation of students in oratory competition

Giridhar visited the villages, and packets of multigrain powder and laddu were distributed to the students.

Coimbatore Chapter

Nutrition Literacy Awareness Campaign

The Coimbatore Chapter organized a campaign on nutrition literacy for children of a middle school in Veerakeralam village, Coimbatore on 14th November 2022. Dr D. Puthira Pratap delivered a talk on ‘Balanced Nutrition’. Dr R. Viswanathan addressed the students and elaborated on the importance of nutri-cereals in daily diet, and adverse impact of junk foods. An oratory competition was conducted. The school Head Master and teachers also addressed the students and thanked NAAS and ICAR-SBI for organizing the awareness campaign.

Interactive Meeting on Quality Assurance in Agriculture Education through Accreditation

A one-day interactive meeting on “Quality Assurance in Agriculture Education through Accreditation” was organized at TNAU, Coimbatore on 5th December 2022. Dr R. Viswanathan delivered a talk on NAAS activities, and Dr V. Balasubramani delivered the inaugural address. Dr P. Ramasundaram, National Coordinator (IDP) and Nodal Officer (NAHEP), ICAR, New Delhi talked about quality assurance in agriculture education, and Dr. C.K. Narayana, Principal Scientist, ICAR-IIHR,



Dr. C.K. Narayana delivering the theme address



Bengaluru and Regional Coordinator, ICAR Accreditation delivered a talk on roadmap of ICAR accreditation.

A panel discussion on accreditation process was also held under the chairmanship of Dr M. Raveendran, Director of Research, TNAU, Coimbatore. The plenary session was chaired by Dr V. Geethalakshmi, Vice-Chancellor, TNAU. Dr G. Hemaprabha FNAAS, Director, ICAR-SBI, Coimbatore delivered a special address.

Cuttack Chapter

An awareness program on crop diversification was organised for tribal women on 28th November, 2022 in Tangi, Cuttack with special emphasis on nutrigarden. Dr A.K. Nayak, Director, ICAR-NRRI Cuttack briefed women farmers regarding the importance of backyard kitchen for fulfilling their nutritional requirements.



Women farmers during the interaction session

Women farmers interacted with scientists regarding the problems they face in agricultural activities and other related queries.

Hyderabad Chapter

Sensitization Programme on Nutrition Literacy among Rural Children

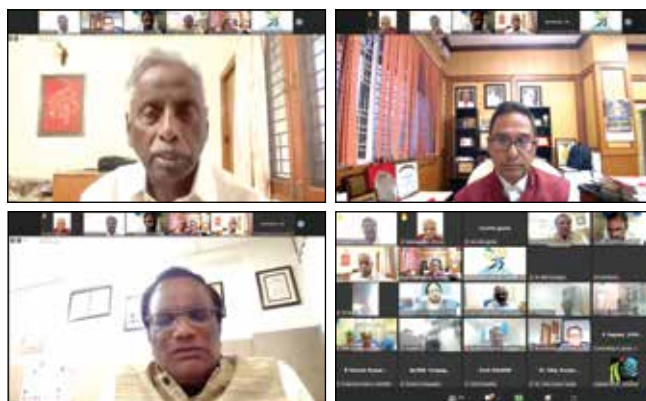
The Hyderabad Chapter in collaboration with ICAR-NAARM organised a sensitization programme on “**Nutrition Literacy among Rural Children**” on the Children’s Day at Zilla Parishad Girls High School, Shamshabad, Rangareddy district, Telangana. Around 500 girl students and teachers participated in the programme. Literature on nutrition and millets were distributed among students. Dr Ch Srinivasa Rao,



Convenor & Director, ICAR-NAARM highlighted the critical role of nutrition in child growth and development. He also mentioned that, malnutrition, especially anaemia, continues to be rampant among girls due to dietary deficiencies. He urged the students to include millets and millet-based products in their daily dietary requirement so as to gain more nutrition and to stay healthy.

World Fisheries Day

The Hyderabad Chapter organised an online lecture on “**Sustainable Fishery for Food and Nutritional Security in India**” by Dr M. Vijay Gupta, World Food Prize laureate on 21st November, 2022 on the occasion of World Fisheries Day. He briefed about the role of fish in food, nutrition and trade. He outlined various



challenges for meeting the demand for aquaculture and ways to address them. Around 200 participants from SAUs and ICAR institutes attended the programme.

World Soil Day

The Hyderabad Chapter in collaboration with ICAR-NAARM organized an online lecture on “**Soil Management for Climate Change Mitigation**” by Dr Anil Kumar Singh, Vice President, NAAS on 5th December 2022 on the occasion of World Soil Day. He narrated on the importance of soil resources in supporting Sustainable Development Goals (SDGs). The





technologies for climate change mitigation and impact of these mitigation technologies were also highlighted.

Dr B Venkateswarlu, former Vice Chancellor, VNMKV, Parbhani highlighted the need to work on the adaptation of soil in terms of drought management.

Publications

NAAS Policy Paper 87 on “Abiotic Stress, Droughts, Floods, Cyclones and Hailstorms Management” translated in Telugu was released in the 129th EC Meeting on December 16, 2022.



A leaflet on “Millets for Food and Nutrition Security”, in Telugu was prepared in collaboration with ICAR-IIMR for distribution among rural school students. It was released in the 129th EC Meeting on December 16, 2022.

Karnal Chapter

A Brainstorming Session on “Eco-regional Diversification in Crop and Livestock Production for Profitability and Sustainability” was organized on November 14, 2022 in virtual mode. Dr Trilochan Mohapatra, President, NAAS chaired the session. Panelists included Dr Gurbachan Singh, former Chairman, ASRB; Dr Ajay Gehlot, former Vice-Chancellor, RAJUVS; Dr J.C. Dagar, former ADG, ICAR; Dr Samar Singh, Vice Chancellor, Horticulture University, Uchani; Dr J.S. Sandhu, former Vice Chancellor, SKNAU, Jobner; Dr S N Saxena, Director, ICAR-National Research Centre on Seed Spices, Ajmer; Dr Pratap S. Birthal, Director, ICAR - NIAP, New Delhi, and Dr V. S. Rathore, Principal Scientist, Regional Research Station, ICAR-Central Arid Zone, Bikaner.

Lucknow Chapter

An interactive meet on “Forage Based Agro-Ecosystems Functioning and Resilience - Farmers & Students Perspectives” was organized on December 5, 2022 at ICAR-Indian Grassland and Fodder Research



An interactive meet with farmers and students

Institute, Jhansi (U.P.). Farmers from three villages of Jhansi district, and college students participated in the program. At the outset, Dr S.K. Pandey, Convener of the Lucknow Chapter briefed about the role and activities of the Chapter. Dr A.K. Roy and Dr Sunil Kumar delivered lectures on “Conserving Forage Genetic Resources and Grassland Biodiversity”, and ‘Round-the-Year Fodder Production in Semi-arid Agro-ecosystem”, respectively. Experts including Dr S.K. Pandey, Dr O.P. Chaturvedi, Dr A.R. Sharma, and Dr S. K. Chaturvedi also presented their views on forage based agro-ecosystems for environmental sustainability. Dr Amaresh Chandra, Director, ICAR-IGFRI emphasized on sustainable forage production while conserving natural resources. Experts also interacted with farmers and students on their queries. The following action points emerged:

- A strategy for round-the-year fodder production in semi-arid situation needs to be worked out for sustainable livestock production.
- Soil and water conservation measures and crop residue management to be given priority.
- Adoption of agroforestry for climate moderation and fulfilling the food-fodder-fuel-timber requirement.
- Convergence of government plans and schemes for technology up scaling.
- Formation of FPOs, start-ups and entrepreneurship models to attract rural unemployed youths.
- Crop diversification through pulses and oilseeds in the Bundelkhand region.

Ludhiana Chapter

Several awareness programs were organised on food and nutraceuticals, use of plant tissue culture, molecular biology and phytochemical analysis for the development of fortified food for the UG and PG students and faculty members of Rungta College of Science and Technology, Bhilai, Chhattisgarh; Kanya Maha Vidyalaya, Jalandhar, Punjab; and SCVB Govt. College, Palampur, Himachal Pradesh.



Demonstrations on upscaling of food and nutraceuticals at Pilot Facility, CSIR IHBT



Lectures to PG students

Specific lectures on “Nutritional and Nutraceutical Formulations” were organized for graduate students during the month of November, 2022.

Varanasi Chapter

Special Lecture

A special lecture by Dr S. M. Singh, Science and Engineering Research Board, New Delhi on “**Possibilities of Funding Opportunity from the SERB**” was organized by Varanasi chapter on **07th October, 2022**, at ICAR-Indian Institute of Vegetable Research, Varanasi. Dr. Singh briefly presented on the research grant schemes, fellowship, etc. He emphasized on formulation of multi-institutional and multi-disciplinary projects. Dr T.K. Behera, Director of the Institute briefed about the achievements of the institute and their impacts. Dr. Sudhakar Pandey, Convener, NAAS-Varanasi Chapter briefed about the research activities and achievements of IIVR and explained career opportunity in agriculture. Dr D.R. Bhardwaj delivered a talk on the importance of vegetables for health and prosperity.



Nutrition Literacy Program

On the occasion of the Children’s Day, an awareness program was organised on the “**Importance of Nutritious Food and Cleanliness in Daily Life**” for school children on 14th November, 2022, in which 425 students of three government schools participated. Essay writing & quiz competition on “Importance of Nutritious Food and Cleanliness in Daily Life” and a special lecture on nutrition and health were also held. The chief guest of the programme was Padma Shri Chandershekhar Singh, and Dr. Tusar Kanti Behera, Director, ICAR-Indian Institute of Vegetable Research, Varanasi was the Guest of Honour. Shri Chandershekhar Singh, Padma Shri Awardee in his address emphasised the importance of nutrition and cleanliness for good health. Dr T.K. Behera highlighted the role of nutrition for physical and mental health.



Science Awareness Programme and Exposure Visit for College Students

The Varanasi Chapter organized an exposure visit and science awareness programme for the intermediate





students of agricultural sciences and teachers of Government Inter College, Jakhini, Varanasi on 1st December, 2022. They were taken to the research farm, technology park, waste management facility, seed production and seed processing unit of ICAR-IIVR.



Forthcoming Programs

1. Brainstorming Session on Export Potential of Agricultural Commodities and Challenges (Dr Naveen P. Singh)
2. Expert Consultation on COP 28: Preparedness for Indian Agriculture (Dr P.K. Aggarwal)
3. Brainstorming Session on Revisiting Soil Health Mission (Dr B.S. Dwivedi)
4. Brainstorming Session on Water Auditing in Indian Agriculture (Dr K. Palanisamy)
5. Brainstorming Session on Enhancing Investment in Research for Indian Agriculture (Dr P.S. Birthal)
6. Brainstorming Session on Honey Bees: Harbinger for Sweet Revolution
7. Brainstorming Session on Multiple Uses of Solar Energy in Agriculture (Dr N.S.L. Srivastava)
8. Brainstorming Session on Greening of Livestock and Poultry Sector (Dr B.M. Naveena)
9. Brainstorming Session on Food Safety Strategies for Indian Fishery Sector (Dr Jeyashekarani)
10. Brainstorming Session on Prospectus of dsRNA based Biopesticides for Crop Protection in Indian Agriculture (Dr B. Mandal)
11. Expert Consultation on Ethics and Current State of Research Publications (Inter-Academy) (Dr G. Taru Sharma)

Obituaries



Dr Bansh Narain Singh

(15.07.1942 – 26.11.2022)

Dr Bansh Narain Singh, an eminent fish nutritionist was born in Varanasi on 15 July 1942. He was educated at U.P. College, and BHU, Varanasi. He did his Post-Doctoral Research at Bristol University, U.K. He held various positions in the ICAR including Head, Division of Fish Physiology, CIFA; Asstt. Director General (Inland Fisheries), Acting Dy. Director General (Fisheries), and ICAR Emeritus Scientist, NBFGR, Lucknow. He was a Visiting Scientist at Auburn University, USA in 1984.

For his significant contributions to the field of aquaculture, Dr Singh was awarded V.G. Jhingan Gold Medal (1999-2000). In his demise, the scientific community lost a brilliant scientist and a wonderful human being. The Fellowship of the Academy prays for peace to the departed soul and solace to the bereaved family.



Dr Yoginder K. Alagh

(14.02.1939 – 06.12.2022)

The Fellows of the National Academy of Agricultural Sciences are deeply aggrieved on the sad demise of Dr Yoginder K. Alagh, a renowned economist and Fellow of the Academy.

Professor Alagh left an indelible impression on the society in various important positions as Minister of Power and for Planning & Programme Implementation with additional charge of the Ministry of Science & Technology; Member, Planning Commission; Chairman, Bureau of Industrial Costs and Prices, Ministry of Industry and Secretary to the Government of India.

An academican and visionary *par excellence*, he made immense contributions as Vice- Chancellor, Jawaharlal Nehru University; Senior Fellow, World Institute of Development Economic Research, United Nations University, Helsinki; Coordinator, South Asia Technology Network of the Commission of European Communities, Brussels; Special Adviser to



the Secretary General of the UN (Rio) Conference on Environment and Development; Senior Adviser Consultant to FAO, UNFPA, ILO, ESCAP, World Bank and UNDP; Chairman, Scientific Steering Committee of the International Social Science Programme, UNESCO; Member of the International Board of Governors of CIGI, Canada and Chairman of the South Asian Network for Development and Environmental Economics. His work in the field of quantitative modelling and policy analysis shall remain invaluable to researchers for generations.

Professor Alagh was awarded several fellowships and awards, including VKRV Rao Award 1981; Life Time

Achievement Award, Indian Society of Agricultural Marketing. As President of Indian Society of Agricultural Economics, Indian Society of Labour Economics and Indian Econometric Society, he, most ably, guided their activities.

The scientific community has lost an outstanding academicians, policy maker, and a great human being. The Fellowship of the Academy prays to the Almighty to give peace to the departed soul, and solace and strength to the bereaved family to bear this great loss.



Dr Devaki Nandan Kamra

(08.11.1954 – 03.12.2022)

The Fellows of the National Academy of Agricultural Sciences deeply condole the sad demise of Dr Devaki Nandan Kamra, Fellow of the Academy and an outstanding scientist. In his illustrious career, he made immense contributions in the field of rumen microbiology and biotechnology for eco-friendly livestock production.

Dr Kamra left a lasting impression among agricultural scientists in his various exemplary roles as Principal Scientist; Director, Centre of Advanced Faculty Training in Animal Nutrition; Joint Director (Research), and ICAR National Professor, Centre of Advanced Studies in Animal Nutrition, Indian Veterinary Research Institute, Izatnagar.

In recognition to his contributions, Dr Kamra was awarded several fellowships and awards, including Rafi Ahmed Kidwai Award, 2005-06; Bharat Ratna Dr. C. Subramaniam Award for Outstanding Teacher of ICAR, 2011; Best Teacher Award, IVRI, 1996-97; Award of Merit, IVRI, 2001; Award of Honour, IVRI, 2011; Life Time Achievement Award of CLFMA, India, 2013. German Academic Exchange Service, DAAD Fellowship, 1983-85, etc. He was President, Animal Nutrition Association; General Secretary, Animal Nutrition Association, 1996-98 & 2008-10; and Member, International Editorial Advisory Board, Journal of Applied Animal Research.

The scientific community has lost a brilliant scientist, teacher, and wonderful human being. The Fellowship of the Academy prays to the Almighty to give peace to the departed soul, and solace and strength to the bereaved family to bear this great loss.

Announcement

The **XVI Agricultural Science Congress** will be organised in Kochi with ICAR-CMFRI as the host institute. The theme of the Congress shall

be **‘Transformation of Agri-Food Systems for Achieving Sustainable Development Goals’**. The Congress will be held during 10-13 October, 2023.

The NAAS, New Delhi has been organizing the Agricultural Science Congress in a biennial cycle since 1992 and for the XVI Agricultural Science Congress, the President NAAS and the Organizing Committee, through this announcement, is requesting all stakeholders to join this mega event at Kochi, Kerala. Your participation is important in identifying approaches and strategies, including policy options, in Transformation of Agri-Food Systems for Achieving Sustainable Development Goals. Please visit the website www.16asc2023.in for details and updates.



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XVI AGRICULTURAL SCIENCE CONGRESS & ASC EXPO



Transformation of Agri-Food Systems for Achieving Sustainable Development Goals

10-13 October 2023 | Kochi, Kerala, India

Events

- Plenary, Special and Invited Lectures by Eminent Scientists to discuss the most recent trends, innovations and concerns as well as challenges and solutions
- Technical Sessions on Thematic Areas
- Symposia and Panel Discussions
- Poster Presentations
- Interaction with Farmers and Industry
- Student Activities
- Agri Expo
- NAAS Business Meeting



Poster Presentation

The extended summaries for the poster presentation will be reviewed before acceptance. Each poster session will have a Convener who will present a summary of the concerned session which will aid in the formulation of substantial recommendations. Selected abstracts in all the thematic areas will be included in the Book of Abstracts, and the concerned author will present the poster.

Themes

No.	Theme Area
1.	Ensuring Food & Nutritional Security: Production, Consumption and Value Addition
2.	Climate Action for Sustainable Agri-food Systems
3.	Frontier Science and Emerging Genetic Technologies: Genome Breeding, Gene Editing
4.	Livestock-based Transformation of Food Systems
5.	Horticulture-based Transformation of Food Systems
6.	Aquaculture-based Transformation of Food Systems
7.	Nature-based Solutions for Sustainable Agri-food Systems
8.	Next Generation Technologies: Digital Agriculture, Precision Farming and AI-based systems
9.	Policies and Institutions for Transforming Agri-food Systems
10.	International Partnership for Research, Education and Development

Important Dates

Start of registrations	: 01 January 2023
Start of receipt of abstracts	: 01 February 2023
Last date for submission of abstracts	: 30 June 2023
Acceptance of abstracts	: 31 July 2023
Regular registration closing date	: 31 August 2023

Website: www.16asc2023.in

Editors: Dr. P.S. Birthal and Dr. Malavika Dadlani

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