Strengthening National Seed Research, Production and Distribution System

Proceedings of 12th National Seed Congress

December 11-13, 2023

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani - 431 402

Venue : Taj Vivanta, Ch. Sambhajinagar (MS)

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सत्यमेव जयते

INTERNATIONAL YEAR OF MILLETS 2023

Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani

Venue : Taj Vivanta, Ch. Sambhajinagar (MS)

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Under the guidance of

Dr. Indra Mani
Vice-Chancellor, VNMKV, Parbhani

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Year of Publication
2024

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Printed at
Omkar Graphics, Parbhani

FOREWORD

Prof. (Dr.) Indra Mani
Vice Chancellor,
VNMKV, Parbhani

It is a matter of great pleasure that Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani organized 12th National Seed Congress-2023 in collaboration with Indian Society of Seed Technology, New Delhi and National Seed Research and Training Centre, Varanasi (UP) under the aegis of Dept. of Agriculture and Farmers Welfare, Ministry of Agriculture, GoI, New Delhi during December 11-13, 2023 at Hotel Taj Vivanta, Ch. Sambhajinagar (Aurangabad, Maharashtra). The theme of the congress was 'Innovations and Challenges in Quality Seed Availability under Changing Climate'. Gracious presence of all eminent personalities of seed sector, esteemed scientists, researchers, policymakers, and industry leaders stands as a testament to the critical role that seeds play in our global food security and agricultural sustainability.

The 12th National Seed Congress-2023 featured six technical sessions and three panel discussions. The congress highlighted the intricate challenges and vast opportunities within seed science and technology. To optimize crop improvement, seed technologists must be integral to breeding programs, while breeders should gain comprehensive exposure to seed sector operations. This interdisciplinary collaboration should be institutionalized.

Strengthening partnerships among farmers, FPOs, NGOs, industry, and public and private seed sector organizations, with SAUs and ISST as central hubs is crucial for effective seed systems to reach end-users. Despite India's significant seed industry growth, its global seed trade share remains minimal. Expanding seed exports is imperative. A dedicated panel discussion with farmers and FPOs explored their contributions, challenges, and aspirations.

In the present scenario of climate change, there is need to develop biofortified varieties of food crops. VNMKV, Parbhani is credited with the development of two bio-fortified varieties of pearl millet out of four varieties released at National level. Similarly, VNMKV also release first bio-fortified variety of sorghum. Thus, VNMKV succeed in nutritional security and bringing sustainability in rainfed farming. Looking to the scarcity of labours particularly at the time of sowing, application of insecticides & pesticides and at the time of harvesting, VNMKV developed varieties and cultivation practices pliable to mechanical harvesting. For major crops of the region, seed to seed mechanisation has been in the practice in the University.

FOREWORD

The proceedings you hold in your hands encapsulate the breadth and depth of knowledge exchanged at the congress. They serve as a valuable resource for researchers, policymakers, farmers, and all those committed to advancing seed innovation.

National Seed congress-2023 was inaugurated by Dr. Mangala Rai, Former Secretary, DARE & DG, ICAR, New Delhi as Chief Guest and Plenary session was graced by Padmabhushan Dr. R. S. Paroda, Former Secretary DARE & DG, ICAR, New Delhi as a Chief Guest. August gathering on the occasion of Seed congress was witnessed by legendary personalities from seed sector including Dr. P. K. Singh, Commissioner (Agriculture) GOI and doyens of seed sector, Dr. H. S. Gupta, Dr. S.A. Patil, Dr. C. D. Mayee, Mr. Ajai Rana Chairman, FSII, New Delhi, Shri. Raju Barwale and others.

I commend the organizers, speakers, and participants for their contributions to this momentous event. By working together, we can harness the power of seeds to build a more resilient, equitable, and food-secure world. I encourage to explore the contents of this volume and to engage in further discussions on the critical issues raised. I am sure that the implementation of the recommendations of NSC-2023 will definitely strengthen the National seed research, production, distribution system and export.

(Indra Mani)

MESSAGE

Dr. H.S. Gupta
President
ISST, New Delhi

Seeds, as we all know, are the silent heroes of agriculture. They hold the potential for bountiful harvests, thriving farms and ultimately, a food-secure nation. Looking back, we can be proud of the incredible strides India has made in agriculture. We are now the second-largest producer of food grains in the world, a testament to the hard work of our farmers, scientists, the unwavering support of our government and the invaluable contributions of the seed sector.

I believe that the National Seed Congress organized by Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani in collaboration with Indian Society of Seed Technology, New Delhi and National Seed Research and Training Centre, Varanasi (UP) under the aegis of Department of Agriculture and Farmers Welfare, Ministry of Agriculture, Govt. of India, New Delhi had given an opportunity for all stakeholders to reciprocate ideas in order to highlight the critical role of new plant varieties and high-quality seed in the provision of dynamic and sustainable agriculture.

This book of proceedings is a treasure trove of information on cutting-edge advancements in seed breeding and production, like climate-resilient crop varieties and stress-tolerant seeds, emerging technologies that are revolutionizing seed quality control, thought-provoking perspectives from leading researchers, policymakers, and farmers, offering a holistic view of the complex issues surrounding seed availability.

I congratulate the organizers for successful conduct of National Seed Congress 2023. I hope the deliberations and recommendations will be useful for planning and supply of good quality seed too farming community.

(H.S. Gupta)

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ABOUT THE NATIONAL SEED CONGRESS

About the National Seed Congress

Quality seed is crucial for achieving enhancement of yield, production and sustained growth in agriculture and food security. From a meagre 50.5 million tonnes during 1950-51 to nearly 330 million tonnes of food grain production during 2022-23, the journey of Indian agriculture had been remarkable, crossing several milestones. It could be made possible due to use of quality seed of improved varieties, advanced package of practices, adroitness and diligence of Indian farmers, and supporting policies. For an agrarian economy like India, food security is highly dependent on seed security as evidenced from a steady increment in food grain production vis-à-vis growth in quality seed production. The response of all other inputs depends on quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15 - 20%, depending upon the crop and growing conditions, which can be raised further with efficient management of other inputs.

Over the years, seed quality specifications comparable to international standards have been evolved and are adopted by the Indian Seed Programme by both the public and private sectors. The country has a rigorous mechanism for seed quality control through voluntary seed certification and compulsory labeling, which is monitored by the provincial level Seed Law Enforcement Agencies. However, the problem of spurious and under-performing seed remains a serious problem. For seed technology research, there is a national level institute Indian Institute of Seed Science, also housing the All India Coordinated Project on Seed (NSP) under the Indian Council of Agricultural Research, as well as state level research set up in the State Agricultural Universities. Thus, the Indian Seed Programme, occupies a central place in Indian agriculture, and is well poised for continued growth in the years to come. National Seeds Corporation (NSC), which is the largest single seed organization in the country with a wide product range of crops and varieties pioneered the growth and development of a sound seed industry in India. NSC, States Seeds Corporations, Cooperatives, private seed industry and other seed producing agencies viz., FPO/FPCs are continuously expanding their activities, especially in terms of product range, volume and value of seed handled, and number of customers served. Over the past four decades, these seed producing agencies have built a sizeable core of competent seed producers and seed dealers in various parts of the country with necessary competence in handling and managing various segments of seed supply system .

The National Agricultural Research System (NARS) under the aegis of ICAR has developed more than 5,700 varieties of different field and horticultural crops since 1969.

From 2014 till January 2023, a total of 1,575 varieties of 70 field crops have been developed, which include 770 varieties of cereals, 235 of oilseeds, 236 of pulses, 170 of fiber crops, 104 of forage crops, 52 of sugarcane and 8 of other crops. In addition, 288 varieties of horticultural crops have also been released and notified.

As per the Federation of the Seed Industry of India (FSII) the Indian seed industry is estimated to be worth Rs 22,000 crores and is constantly growing. Currently, the seed export from India is less than Rs 1,000 crores per annum, whereas the annual global seed market is worth US$ 44.4 billion. India with its well developed seed industry, technical expertise, and agro-climatic advantage, has the potential to capture at least a 10 per cent share of the global market by 2028, and be a global hub as per the FSII estimates.

The share of the public sector in seed production in the country reduced from 42.72 per cent in 2017-18 to 35.54 per cent in 2020-21, while the share of the private sector grew from 57.28 per cent to 64.46 per cent during the same period, highlighting the rising role of private companies in India's seed sector. There has also been a growing partnership between the public research institutions and the private seed industry. Many of the varieties released by the public sector are being marketed by a number of private seed companies under non-exclusive licensing agreements, which helped their fast spread and adoption.

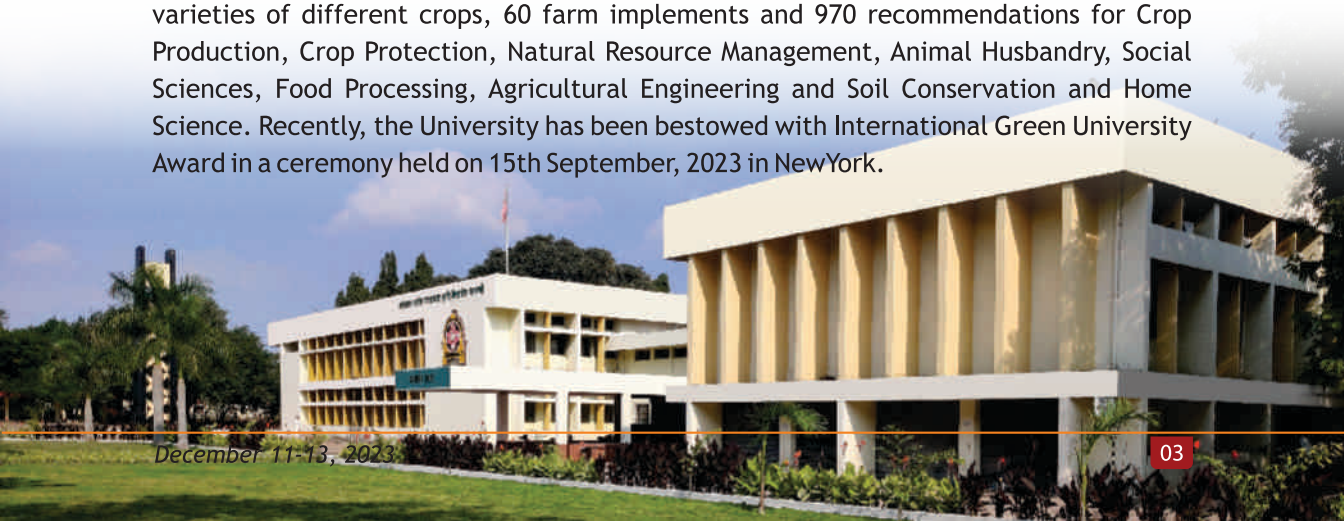
A number of applied seed quality enhancement technologies are available today, both for conventional and conservation agriculture systems. However, necessary testing protocols and regulatory modifications are needed to bring these main stream. In view of these developments, innovations and challenges in the seed sector, this 12th National Seed Congress will provide an effective platform for all the stakeholders pertaining to Indian seed sector to further improve the timely supply high quality seeds of improved varieties' at reasonable price to all farmers across the nation, including the difficult to reach areas.

About the Host University

Marathwada Krishi Vidyapeeth, Parbhani was established on May 18th, 1972 by the State of Maharashtra to fulfil the regional aspirations of agrarian growth. It was entrusted with the responsibilities to provide education in Agriculture and allied field, undertake research and facilitate technology transfer across the eight districts in Marathwada region.

It was rechristened as Vasantrao Naik Marathwada Krishi Vidyapeeth to honour the contributions of former Chief Minister Late Shri Vasantrao Naikji, who was the longest serving Chief Minister and father of Green Revolution in the state of Maharashtra. The agricultural research at Parbhani has glorious history of more than 105 years. Cotton Research Station, Maheboob Baugh Farm is one of the oldest research station established

during pre independence era (1918) especially for genetic improvement of desi cotton. As a result of strenuous work carried out by VNMKV, Parbhani, desi cotton varieties having longest staple length (30 - 31 mm), fibre strength (27 - 28 g/tex) and fine micronaire (4.3 - 4.7 µ/inch) have been released recently (PA 812, PA 810, PA 785, PA 740, etc.), with excellent fibre properties reported for first time at International level. Similarly, a great accomplishment has also been achieved in American Cotton, as the first Bt cotton hybrid from public sector has been released in Maharashtra by Joint venture of VNMKV, Parbhani - MSSC Ltd., Akola i.e. NHH 44 (BG II) during 2018 followed by release of three straight varieties viz., NH 1901 Bt, NH 1902 Bt and NH 1904 Bt during 2023. The Agriculture Research Station, Badnapur is famous for development and release of Sterility Mosaic and wilt resistant Pegion pea varieties viz., BSMR 736, BDN 2, BDN 711 and BDN 13-41 which are the most popular varieties not only in Marathwada but in other parts of country. Apart from collection of wild species of Green gram and wilt screening nursery are unique in the country. Marathwada is recognised as 'Bowl of Pulses' in the country because of significant increase of area under these high yielding varieties released by VNMKV, Parbhani. Similarly, the University has distinction in development of first variety suitable for Mechanical harvesting (MAUS 162), Climate smart variety (MAUS 612) and tolerant for stem fly (MAUS 158). These varieties are presently cultivated on more than 10 lakh hectare area in the state of Maharashtra. AHB 1200 and AHB 1269, the two biofortified hybrids of Pearl millet enriched in Fe and Zn are also released by university. First biofortified variety of Sorghum (Parbhani Shakti) is also released by this university. Looking to the outstanding accomplishments of university, All India Coordinated Research Projects on Oilseeds, Pearl Millet and Safflower have been awarded 'Best Research Centre' by the ICAR. Apart from achievements under 'Crop Improvement', university take major lead in increasing area under Breeder seed production. During 2022-2023, more than 1500 acres additional uncultivated area has been brought under cultivation. This will help to double seed production during 2023-2024 (15,000 qtls). University had taken major jump in 'Application and Adoption of Drone Technology' for the benefit of cultivators of Marathwada. Since establishment, the University released more than 150 varieties of different crops, 60 farm implements and 970 recommendations for Crop Production, Crop Protection, Natural Resource Management, Animal Husbandry, Social Sciences, Food Processing, Agricultural Engineering and Soil Conservation and Home Science. Recently, the University has been bestowed with International Green University Award in a ceremony held on 15th September, 2023 in NewYork.



About ISST

The Indian Society of Seed Technology (ISST) was formed, with the primary objective to serve as a forum for the Seed Scientists and Technologists of the country to share their experiences and disseminate the knowledge relating to seed production, certification, testing, processing, storage and marketing. The Society was registered with the Registrar of Societies Delhi vide Registration No. 4888 on 14 April 1971, and formally inaugurated on 21st April, 1971 by late Shri Fakhruddin Ali Ahmed, the then Union Minister of Agriculture, Govt. of India. The Society was has been serving both the NARES and the industry for over the last 50 years as a forum for the all seed professionals of the country by facilitating them to share their experiences, disseminate knowledge &upgrade the technology related to all aspects of seed . The Society has grown over the years to the strength of more than 1000 members from ICAR institutes, State Agricultural Universities, Public and Private Sectors, and other organizations.. Over seventy five seed technologists from overseas are also members of the Society. The office of the Society, located in the Division of Seed Science & Technology, IARI, is managed by the elected body - the Executive Council. The ISST publishes two issues annually of its journal 'SEED RESEARCH', the only in field of seed science and technology from India besides four issues of Seed Tech News in a year. This Society has so far organized one International and fifteen National Seminars and Conferences on various aspects of seed science and technology.

Themes of 12th National Seed Congress, 2023

1. Innovations in Seed Research for Climate-Resilience
2. Seed Quality Assurance : Challenges and Solutions
3. Advancements in Seed Biotechnology for Enhanced Adaptability and Yields
4. Emerging Trends in Seed Processing and Storage
5. Protection of Varieties for Augmenting Seed Supplies and Export
6. Challenges and Opportunities in Quality Seedlings and Seed Availability of Spices, Horticultural and Plantation Crops.

Panel Discussions

1. Strengthening the Seed Systems for Distribution and Access of Millets for Health, Food Security and Farmers Prosperity
2. Gene technologies: Potential and Challenges
3. Seed Industry and Farmers' Organizations: Contributions, Constraints and Expectations

Venue : Taj Vivanta, Aurangabad

PROGRAMME SCHEDULE

Day 1 : Monday, 11.12.2023	
08.00- 09.00	Registration
09.00- 11.15	Inaugural Session
11.30-13.30	Technical Session I
	Poster presentations (Theme - I)
14.30 - 16.30	Technical Session II
	Poster presentations (Theme - II)
16.45 -18.45	Panel Discussion I
	Poster presentation (Theme Miscellaneous Sr. No. 1-50)

Day 2 : Tuesday, 12.12.2023	
09.00 - 11.00	Technical Session III
	Poster presentations (Theme - III)
11.15-13.30	Technical Session IV
	Poster presentations (Theme - IV)
14.30 - 15.30	Ch. Amir Singh Memorial Lifetime achievement award of ISST
15.30-17.30	Panel Discussion II
	Poster presentations (Theme Miscellaneous Sr. No. 51-100)
18.30-20.00	General Body Meeting of ISST
	Poster presentations (Theme Miscellaneous Sr. No. 101 onwards)

Day 3 : Wednesday 13.12.2023	
09.00-10.30	Technical Session V
	Poster presentations (Theme - V)
10.30- 12.30	Panel Discussion III
12.30-14.00	Technical Session VI
	Poster presentations (Theme - VI)
14.30-16.30	Plenary-cum-Prize distribution session

SUMMARY AND RECOMMENDATIONS

SUMMARY AND RECOMMENDATIONS

Quality seed occupies a central place in farming. Indian seed programme have been evolved in seed quality specification comparable to International standards and the same have been adopted in public and private sectors. India has a rigorous mechanism for seed quality control through voluntary seed certification and compulsory labelling.

Jalna city near Historical city Ch. Sambhajinagar (Aurangabad) is generally called as "Seed hub" due to presence of huge number of seed companies. More than two hundred seed companies are located in Jalna cluster dealing with vegetable and field crops. Looking to the importance of seed sector, Department of Agriculture and Farmers welfare, New Delhi and Ministry of Agriculture gave responsibility to VNMKV, Parbhani for hosting 12th National Seed Congress-2023in collaboration with Indian Society for Seed Science and Technology (ISST), New Delhi and National Seed Research Training Centre, Varanasi.

12th National Seed Congress got huge response from Scientists' of different states, representatives from Seed Industries, FPOs and Farmers. Inaugural and plenary session was chaired by legendary personalities of seed sector Dr. Mangala Rai, Former Secretary, DARE & DG, ICAR, New Delhi and Dr. R. S. Paroda, Former Secretary DARE & DG, ICAR, New Delhi, respectively. Total six different sessions were organized on most burning and critical topics like innovation in seed research for climate resilience, seed quality assurance: challenges and solutions, advancement in seed bio technology for enhanced adaptability and yields, emerging trends in seed processing and seed storage research, protection of varieties for augmenting seed supplies and export and challenges and opportunities in quality seedlings and seed availability of spices, horticulture and plantation crops. Apart from these, three panel discussions were organised specially on gene technologies, strengthening seed systems and seed industry and farmers organizations.

More than 350 participants attended the 12th National Seed Congress and made it great success. Great personalities of seed sector, eminent scientists

from different ICAR institutes, SAUs and private seed sector delivered lectures on various topics mandated aims at strengthening the seed sector in the country. A number of applied seed quality enhancement technologies are available today, both for conventional and conservation agriculture system. However, necessary testing protocols and regulatory modifications are needed to bring these in main stream. There is an urgent need to critically examine/ review the various rules/ regulations/ polices governing the seed sector. Strengthening partnerships among farmers, FPOs, NGOs, industry, and public and private seed sector organizations, with SAUs and ISST as central hubs is crucial for effective seed systems to reach end-users. Parbhani model of land development and seed to seed mechanization should be followed for enhancing quality seed production to match the request of breeder seed at National level. There is an urgent need to develop trust and bonding between public and private sector giving importance to FPOs seed production, approval and implementation of National seed policy.

The following specific recommendations were emerged from the National Seed congress.

1. Policy environment suitable for the seed system growth and development in the country should be created by revisiting the necessary regulations and making them easy and stakeholder-friendly. *[Action: Seed Division, MoA & FW, GoI and ICAR]*
2. Despite significant growth and development of the Indian seed industry or sector, its share in the global seed trade is negligible. Scope for improving seed export from India is immense. This is an area for urgent attention. *[Action: Seed Division, MoA & FW].*
3. Strengthen the partnership of various stakeholders, including farmers, FPOs, NGOs, industry, and other public and private seed sector organizations, with ISST as the pivotal point for the success of seed systems and reaching the end users. *[Action: ISST, All Stakeholders]*
4. Policies and procedures relating to public research or ICAR-SAU Breeder Seed indenting, availability, supply, pricing, terms of compliance by the indentor or user etc. need review by interaction between the ICAR-SAUs and the Seed Sector [both public and private] so as to remove the hurdles and facilitate smooth functioning of the system. *[Action : ICAR-SAUs/Seed Division, MoA & FW/ NSAI/FSII/NSC/SSCs].*

5. With reference to Seed License, the concept or principle of 'One Nation -One License' should be favourably considered and requisite guidelines issued. Also, the license should cover the entire gamut of seed business activities so as to enable the Licensee handle all seed related activities over and above 'mere selling '. This will facilitate the seed sector to make available quality seed across the country, in time. *[Action : Seed Division, MoA & FW].*
6. The requirements or conditions or procedures prescribed by the States for issuing seed license vary between States and are cumbersome, time consuming and counter-productive. Also, separate license for each State is required; and often it is only for 'seed sales'; and in some, it is only for notified varieties. Some States enact seed related Laws or Acts over and above the central Seeds Act Rules. The seed sector is affected by these situations; and hence need to be resolved soon. *[Action: Seed Division, MoA & FW,GoI].*
7. The Revised Seed Bill, drafted first in 2004 [38 years after the passage of Seeds Act, 1966] and given final shape in 2014 is still awaiting passage by the Parliament. This should be expedited without any more delay. So also, the 35 year old New Policy on Seed Development [1988] and the 22 year old National Seed Policy [2002] should be revisited and revised taking care of the seed sector's concerns now and the advances in Seed Science & Technology. *[Action: Seed Division, MoA & FW, GoI]*
8. Public-Private - Partnership [PPP] should be encouraged in various areas and activities involved in Crop Improvement and Seed Improvement with emphasis on mutual trust or confidence, integrity, honesty and transparency. Basic essential principles or norms including benefit sharing, royalty terms, IP Protection, safeguards against infringements etc. need to be defined for MoUs governing PPPs to serve as a Model in the interest of broad uniformity amog such alliances in the Seed Sector. *[Action : Seed Division MoA & FW,GoI, ICAR, BSAI, FSII]*
9. There is an urgent need to critically examine-review the various rule, regulations and policies governing the seed sector and the procedures prescribed for compliance by the sector and those followed by the regulatory authorities and bring about harmony and coherence among them and eliminate contradictions between them. *[Action : Seed Division, MoA & FW].*

10. Seed priming or invigoration is a potential technique for seed quality enhancement and for managing biotic and abiotic stresses; and a range of such techniques have been reported. Apart from intensifying further research on this aspect, based on the authentic findings so far, crop wise schedules and procedures should be finalized for adoption by the seed sector with confidence. *[Action: ICAR-SAUs]*
11. Research should focus on identification of specific genes associated with various seed quality parameters, genomics assisted quality enhancement and on validation of already reported markers for seed quality traits. *[Action: ICAR-SAUs]*
12. Use of molecular techniques and such rapid detection tools and procedures should be standardized and preferred for testing the genetic purity of the varieties or hybrids and their parents in the seed chain. *[Action; ICAR, NSAI, FSII, Seed Div-MoA & FW]*
13. Gene related technologies, GWAS [Genome Wide Association Studies] have the potential for faster assessment or evaluation or development of varieties with biotic and abiotic stress tolerances, resilience to climate change and better values. Whether genetically engineered or gene edited, trait combination is highly essential for a genotype to be superior under climate resilient agriculture. Many developed countries have commercialized GM technology in most of the food and non-food crops. Developing countries have approved GM for commercialization; and India is well behind in this regard. As India is already importing Rs.170 crore worth edible oil based on GM crops, adopting gene technology to increase production of oilseeds is fully justified and hence should be rigorously pursued. *[Action: ICAR, Seed Div, MoA & FW]*
14. Seed Technologists should be an integral part of crop improvement programmes; and similarly breeding groups should get adequately exposed to the wide range of processes or activities involved in the seed sector. Such linkage between the two disciplines should be in- built in the system. *[Action: ICAR, SAUs, NSAI, FSII, NSC and SSCs]*
15. At GM research level, the delay in approval for developed GM varieties results in viability loss of the original GM seed developed and retrieving it may be difficult. Policy changes by the Government is essential with regard to GM

approval including genome edited crops. The crops where GM varieties are already developed in India may be approved for commercial release at the earliest. ICAR's stand on GM needs to be cleared with scientific footing. *[Action: ICAR, Seed Div MoA & FW]*

16. Advanced applications such as use of green nano particles, microbiome (endophytes), digitization, precision farming with drones and sensors, AI technology, nano sensors for testing seed quality during seed storage, Image Analysis, hyper spectral imaging technology, deep learning methods, and software tools for modelling germination are emerging as futuristic technologies and their adoption needs to be geared up. *[Action: ICAR, NSAI, FSII, Seed Div -MoA & FW]*
17. Seed program is built on the products from Crop Improvement supported by Seed Technology research. In order to ensure the best performance by these two spheres, significantly higher investment in R&D and fund allocation thereof are strongly recommended. Also, needed is policy Govt support for breeding climate resilient varieties by private research. *[Action: ICAR, SAU, ISST, Seed Division, MoA&FW, GoI]*
18. ISST should play a key role in facilitating inter-institutional partnership for Seed Science and Technology and human resource development through training in collaboration with research institutes. *[Action: ISST with MoA & FW, ICAR and SAUs]*
19. Seed sector should increasingly handle 'climate resilient varieties' and make their seed available to the farmers for commercial crop production so as to enable the crops withstand the climate vagaries. So also, bio-fortified varieties, wide range of millets and organic, chemical-free seed-seedling production should be promoted in seed programs. *[Action : NSAI, FSII, Seed Div MoA &FW, ICAR]*
20. Concepts such as Seed Village Program must be promoted and encouraged in remote areas along with need based advanced technologies and training modules. *[Action: NSAI, FSII, Seed Div -MoA & FW]*
21. Seed Plans or Schemes or Programs by the Seed Sector are needed to make available in time the required quantities of quality seed of Medicinal &Aromatic Plants required by the herbal medicines and perfumery industries.

NSC to take the initiative in the matter. Comprehensive, all-inclusive short-, medium- and long-term plans for cultivation of selected M&APs that will generate seed requirement are needed at the National or State levels; as was and is adopted for many other crops under HYVP, TMOP, ISOPOM, NFSM, AFDP, MIDH etc. which triggered seed demand in the concerned crops. *[Action: Seed Division- MoA & FW, GoI; National Medicinal Plants Board-AYUSH; NSAI, FSII, NSC]".*

22. Though FPOs involvement in the seed program is recognized, difficulties faced by the FPOs to operate in some States need attention [e.g. issues relating to bank loan facility, income tax burden, licenses, seed subsidies etc.]. Detailed interaction with a cross section of FPOs may help in identifying the areas for attention. *[Action: Seed Division, MoA & FW, GoI]*
23. Diversity in native or traditional varieties in millets available among the farmers needs to be preserved or sustained and profitably used. To this end, participatory varietal selection, community seed management system, on-farm conservation and community seed banks on scientific lines with consistent technical support should be adopted. Also, there is a need for social intervention and a special food and nutrition team to popularize millets. *[Action : ICAR, PPV & FRA, Seed Division, MoA & FW, GoI]*
24. With reference to millets, developing the mechanism for promotion of millets at global levels and the need for government funding to continue beyond the International Year of Millets- 31st December, 2023 are recommended. So also, attention should continue towards the breeding strategies, constraints, challenges, export prospects, policy interventions needed and the road map or way forward to increase millet production or consumption and thereby improving the nutrition, food security and farmers' welfare *[Action: MoA&FW, GoI, ICAR, PPV&FRA].*
25. The PPV&FR Act, 2001 needs to be revisited taking into account the current status of the seed industry and in coherence with the new /revised Seed Bill [pending final approval], providing for DNA Finger Printing for variety registration and accelerating the extant variety registration process. *[Action: MoA&FW, GoI, ICAR, PPV&FRA].*

INAUGURAL SESSION

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The following dignitaries were present on the dias at the Inaugural Session of the 12th National Seed Congress 2023 and shared their valuable views and vision.

1. **Dr. Mangala Rai**, Former Secretary, DARE & DG, ICAR, NewDelhi
2. **Dr. Indra Mani**, Hon.Vice-Chancellor, VNMKV, Parbhani
3. **Dr. S.A. Patil**, Former Director, IARI, New Delhi
4. **Dr. C.D. Mayee**, Former Chairman, ASRB, New Delhi
5. **Dr. Bijendra Singh**, Hon. Vice-Chancellor, NDUA&T, Ayodhya
6. **Dr. H.S. Gupta**, President, ISST, Chairman, Farmers Commission, Assam
7. **Dr. P.K. Singh**, Agriculture Commissioner, GoI, New Delhi
8. **Dr. D.K.Srivastava**,Deputy Commissioner(QC),GoI,NewDelhi
9. **Padmashri Smt. Rahibai S. Popere**, Seed Conservationist Farmer, Ahmednagar
10. **Padmashri Shri. Kanwal Singh Chauhan**, Progressive Farmer, Sonipat, Haryana
11. **Mr. Ajai Rana**, Chairman, FSII, New Delhi
12. **Mr. Raju Barwale**,Chairman, MAHYCO, Jalna
13. **Dr. D.P. Waskar**, Director of Research, VNMKV, Parbhani
14. **Dr. K.S. Baig,** Cotton Specialist, Cotton Research Station, Nanded
15. **Dr. Shiv K. Yadav**, Principal Sci, DSST, ICAR-IARI & Secretary (ISST), New Delhi
16. **Dr. M.P. Yadav**, Seed Technologist, NSRTC, Varanasi

Dr. Mangala Rai chaired the inaugural session. The dignitaries shared the need and uses on National Seed Research, Production and Distribution System by public and private industries.

Dr. Indra Mani, Hon. Vice-Chancellor, VNMKV, Parbhani elaborated on the various developments under taken in VNMKV, Parbhani in the recent years. He informed that 2000 acres of land in the University has been brought under seed production of different crops. In the last two years, four new Agricultural Colleges and two new research stations on Maize and Soybean have been sanctioned., a new unit for mechanization, along with a Training Center has been opened with the CSR fund.

Dr. H.S.Gupta briefed about the National Seed Congress. He also emphasized on production of quality seed and planting material to meet the requirement of farmers for sustainable agriculture.

Mr. Ajai Rana elaborated that in order to improve seed availability, there is a need for contract research project in collaboration with the University, ICAR institutes and the Industry. He also mentioned that seed being the medium of transfer of technology we need to train more personnel as seeds men and attend to capacity building to generate and sustain competent or capable seed professionals for the future.

Dr. P.K. Singh emphasized that there should be harmonization among seed related policies during the *AmritKal;* and the policies should be universal and all-inclusive considering both national and global market strategies and future prospects. Species specific crop baskets should be developed promoting climate resilient crops like millets and minor millets and biofortified varieties. Hopefully, the New Revised Seed Policy will take the issues in consideration.

Dr. S.A. Patil mentioned about the significant role of the ICAR's Mega Seed Project in the development of Indian seed sector. He advocated that Seed Technologists should be an integral part of all crop improvement programmes and breeding groups should get adequately exposed to the wide range of processes and activities involved in the seed sector. He emphasized the need of trust and building seed industry and research between institution and agricultural universities.

Dr. C.D. Mayee said that the National Seed Congress is held on the land where seed sector was born and which has now become a prominent hub of the Indian seed industry. He recalled the significant role of seed in the growth witnessed in cotton production.

Shri. Kanwal Singh Chauhan highlighted the importance of and need to promote Organic Farming and chemical free agriculture.

Smt. Rahibai S. Popere shared her story of developing seed bank, which brought in a social revolution through self-help groups. She suggested to undertake crop diversification and promote millets for protection of nature and nutrition security.

Dr. Mangala Rai elaborated on the various efforts behind the growth of Indian agriculture and highlighted the importance of and need for significantly higher investment in R&D and fund allocations thereof. He also recounted the significant roleplayed by the Mega Seed Project for variety development and technology transfer involving new varieties.

Setting the agenda for the future of seed technology by Dr. Mangala Rai

The session ended with a vote of thanks by Dr. D.P. Waskar, Director of Research, VNMKV, Parbhani.

Lightening of lamp ceremony marks the beginning of the NSC 2023
'Tamso Ma Jyotirgmaya'

Dignitaries of Inaugural Session

Dr. Indra Mani

Dr. H.S .Gupta

Mr. Ajai Rana

Dr. P.K. Singh

Dr. S.A. Patil

Dr. C.D. Mayee

Shri. Kanwal Singh Chauhan

Smt. Rahibai S. Popere

A grand start to the seed congress with welcome of Chief Guest

Dr. Mangala Rai : Sowing the seeds of progress

Glimpses of Inaugural Session

Dignitaries and experts gather for seed congress inauguration

Inaugural session sets the tone for a successful seed congress

TECHNICAL SESSIONS

TECHNICAL SESSION-I

Innovation in Seed Research for Climate-Resilience

Chairman	:	**Dr. Mangala Rai,** Former Secretary, DARE & DG ICAR, New Delhi
Co-chair	:	**Dr. Sanjay Kumar,** Director, ICAR-IISS, Mau
Rapporteurs	:	**Dr. Sangita Yadav,** PS, ICAR-IARI, New Delhi
		Dr. S.P. Mehtre, Associate Director (Seed), VNMKV, Parbhani
Session Coordinator	:	**Dr. R.D. Ahire,** ADP, CoA, Badnapur

Three lead lectures followed by three oral papers were presented.

The first lead presentation was by **Dr. M. Dadlani** who emphasized that under increasing population pressure adding to changing climatic conditions, seed plays an indispensable role as we have to grow more from less inputs. She brought out examples of how Seed Technological innovations/ interventions can significantly contribute to Sustainable Agriculture / Farming. She presented a set of proven seed enhancement techniques such as priming, use of plant bio stimulants, microbiomes, biologicals, nano priming, hygeinisation, electromagnetic treatment and seed coating for climate resilience.

The next lead presentation was by **Dr. Uma Rani** who elaborated on conventional priming as well as novel seed-based solutions to mitigate climate impact like quick spin coating, pro / pre-biotic coating, nano-coating, hydrophilic hormone- based coating, hydrogel coating, and seed cubes for enhanced seed quality to overcome abiotic stresses. She also presented about the TNAU's Seed Coating Formulation -*Vidhai Amirdham* and its positive influences on seeds' performance.

The last lead presentation was by **Dr. B. M. Khadi**. He explained the importance of maintenance breeding in ensuring varietal identity and genetic purity and narrated the full procedure for maintenance breeding in hybrids - GMS and CGMS, parents and varieties of often cross-pollinated crops with special reference to cotton. He also listed its advantages and limitations.

The first oral presentation was by **Dr. D. Vijay.** He mentioned about the high susceptibility of rice to heat stress during seed germination and seedling establishment; and therefore, emphasized on the need to explore the thermo-tolerance diversity at the seedling stage in rice in terms of - basal, short term and long term acquired tolerances. From the study, involving physiological and biochemical responses, 48°C for 30 min was identified and validated as the basal thermo-tolerance temperatures for rice seedlings to help in screening of large germplasms.

The second oral presentation was by **Dr. H. M. Pallavi.** She presented the positive response of pre sowing treatment with BABA (2.00 mM) [Beta Amino Butyric Acid] to improve seed germination and vigour under high temperature stress conditions in coriander seeds. Developing pre-sowing formulation and compatibility of BABA with bio-agents are the areas for future work.

The third oral presentation was by **Mr. Poomani.** His study brought out the scope of priming by 600 ppm humic acid for 18 hours as climate resilient techniques to mitigate high temperature stress in lentil seed by boosting anti-oxidant activities.

Dr. Mayee suggested that seed ball concept and use should be popularized more as the seed inside is provided with the essential elements / nutrition for better germination and seedling establishment. He cited the example of Kenya where large-scale afforestation was achieved broadcasting seed balls.

Dr. Mangala Rai, the Session Chairman, in his concluding remarks, recommended that seed priming is a potential technique for seed enhancement and for managing biotic and abiotic stresses and thus research and adoption should be intensified so as to finalize the crop wise schedules and procedures for adoption by the seed sector with confidence. Though maintenance breeding is of paramount significance, it cannot be practiced all the time and thus he suggested the use of molecular techniques and tools for testing the genetic purity of the varieties / hybrid parents in the seed chain.

Glimpses of Technical Session - I

Dr. Mangala Rai and Dr. Sanjay Kumar

Dr. M. Dadlani

Dr. Uma Rani

Dr. B.M. Khadi

Glimpses of Technical Session - I

Dr. D. Vijay

Dr. H.M. Pallavi

Mr. Poomani

Dr. R.D. Ahire

A bountiful harvest of knowledge of innovations in seed research

TECHNICAL SESSION-II

Seed Quality Assurance: Challenges and Solutions

Chairman	:	**Dr. M. Dadlani,** Former President, ISST, New Delhi
Co-chair	:	**Dr. S. Rajandra Prasad,** Former Vice Chancellor, UAS, Bangaluru
Rapporteurs	:	**Dr. M. P. Yadav,** Seed Technologist, NSRTC, Varanasi **Dr. D.K. Patil,** Sr. Scientist, NARP, Aurangabad
Session Coordinator	:	**Dr. H.V. Kalpande,** Head, Departmentof Agricultural Botany, VNMKV, Parbhani

The lead presentations were 4 followed by three oral presentations.

Dr. Sanjay Kumar, Director ICAR-Indian Institute of Seed Science, Mau, in his lead presentation on *Seed Supply System in India: Challenges and Opportunities*, explained in detail about the seed supply systems of public as well private sectors and clearly brought out the positive increased trends of breeder seed production right from 1981 to 2023, especially due to the ICAR's Mega Seed Project. He further elaborated the national requirement as per the enumerated SMR and action plan up to 2047.

The second lead presentation by **Dr. M. Bhaskaran,** Pro-Vice chancellor, Vistas, Chennai, on *Key Challenges and Future Strategies for Seed Quality Regime* clearly elaborated on the legal frame work and trade facilitation; and brought out in great detail the various issues requiring priority attention. He also emphasized on the speedy implementation of SATHI portal by all concerned; and also, on the need to make appropriate amendments and new legislations.

The third lead presentation on capacity building activities and achievements of the projects of the Indo-German Cooperation on Seed Sector Development (IGCSSD) was delivered by **Mr. Ekkehard Schroeder,** German Project Consulting, Germany. He mentioned the overall structure, their activities and achievements in the 3 phases of the IGCSSD Project, technical partners at National as well as international levels. He briefed about the Challenges and Solutions for seed quality assurance in India and also elaborated on the achievements and expected impact at Zonal and Regional Levels.

The last lead lecture was delivered by **Dr. S.P. Mehetre,** Associate Director (Seed), VNMKV, Parbhani on *Quality Seed Production Technologies for Soybean* with reference to changing climatic conditions. He brought out the constraints in soybean seed production, their management and achievements of VNMKV, Parbhani in soybean seed production.

The first oral presentation was by **Dr. V. Santhy,** ICAR-CICR, Nagpur, on *Seed Technology challenges for effective Refugia-In-Bag [RIB] implementation in cotton*. She explained the seed testing protocols developed and recommended for *Bt*-Cotton seeds both Pre-RIB and Post RIB and brought out the various challenges in the use of Refugia seeds. She also elaborated on a 4-step sampling and testing developed by CICR, Nagpur.

The second oral presentation was by **Dr. Soumya K.S.** from UAS, GKVK, Bangalore, on the *Infrared thermography as a non-invasive method for estimating seed vigour in rice*. She presented the methodology, standardization and application of infrared thermography and their practical utility for estimating seed vigour in rice.

The fourth oral presentation was by **Dr. Debashis Paul,** ICAR-CICR-RS, Sirsa, on *In- planta field evaluation of commercially available BG-II hybrids for Haryana* with respect to the proportion of non-*Bt* seeds as 'refugia' in commercial seed packets. He emphasized on structured refugia in bag and use of ELISA methodology for testing. He also expressed that *Bt* cotton seed used in proper manner still has shown effective protection against pink bollworm.

The chairperson acknowledged the new ideas and views put forward by the speakers. The session ended with vote of thanks.

Dr. M. Dadlani and Dr. S. Rajendra Prasad

Glimpses of Technical Session - II

Dr. Sanjay Kumar

Dr. M. Bhaskaran

Mr. Ekkehard Schroeder

Dr. S.P. Mehtre

Dr. V. Santhy

Dr. Soumya K.S.

Dr. Debashis Paul

Dr. H.V. Kalpande

Glimpses of Technical Session - II

Seeds of change are being planted to assured quality seed

TECHNICAL SESSION-III

Advancement in Seed Bio technology for Enhanced Adaptability and Yields

Co-chair 1	: **Dr. A.K. Singh,** Director, IARI, New Delhi
Co-chair 2	**Dr. D.K. Yadava,** ADG (Seeds), ICAR, New Delhi
Rapporteurs	: **Dr. Nagamani Sandra,** Scientist, ICAR-IARI, New Delhi
	Dr. M.S. Pendke, Associate Professor, VNMKV, Parbhani
Session Coordinator	: **Dr. Syed Ismail,** ADP, CoA, Parbhani

Two lead papers were presented followed by three oral presentations during this session. The first lead presentation was by **Shri. Sachin Kalantri,** MD, Mahabeej, Akola who narrated the role of MSSCL, its market share in seed distribution and seed production of 25 crops with 250 varieties in the Indian seed sector. He expressed that the challenge is to increase the area under pulses, especially Mungbean. He also elaborated the MSSCL's collaboration with public and private sectors, interventions like SATHI software, seed authentication and key challenges like short shelf life, resource scarcity, global and local competition, unpredictable demand, varietal replacement, regulatory framework, IP Protection, climate change etc. which have to be addressed in the seed programs. He further highlighted the various opportunities available to strengthen the seed sector and listed the issues for way forward.

The second lead paper was presented by **Dr. Gopala Krishnan S.,** Head, Division of Genetics, ICAR-IARI, New Delhi on *Genomics assisted enhancement and maintenance of seed quality.* He explained about seed quality enhancement through creation of novel alleles through genome editing, improving anaerobic germination, genetic improvement of grain and cooking quality and development of herbicide tolerant basmati varieties of rice, marker assisted breeding/ selection in Basmati rice. He emphasized on the importance of genetic purity maintenance through maintenance breeding and grow out test. In way forward, he narrated the need for developing and refining of SOP, mapping of genes, genomic editing, marker assisted improvement for quality traits, etc.

The first oral presentation was by **Dr. Deepanshu Jayaswal,** ICAR-IISS, Mau who elaborated on the *Elucidation of plant immunity genes and memory inheritance through seeds* in *Allium* species and identified immunity containing wild *Allium* germplasm resistant against anthracnose caused by *Colletotrichum gleosporoides;* offering scope for their use for developing varieties with resistance against the pathogen.

The second oral presentation was by **Dr. Nagamani Sandra,** Scientists (SS), ICAR- IARI, New Delhi. She emphasized on the seed transmission nature of *Mungbean yellow mosaic India virus* and confirmed the same by various detection methods. Also, identification of the route for virus invasion during seed development and maturation and seed protein interaction with viral proteins were listed as Future Thrust areas.

The third oral presentation was by **Dr. S. G. Shinde,** Assistant Professor, VNMKV, Parbhani on *Molecular profiling of rice for biotic and abiotic stresses*. He brought out the role of microsatellite SSR markers for screening rice germplasm against biotic and abiotic stress conditions. The study identified Primers linked with various stresses in rice viz blast, gall midge, BPH, drought and salinity and pointed out the scope for using the markers to manage the stresses.

Dr. A.K. Singh, Director, IARI, New Delhi and Co-chair of the session in his concluding remarks recommended that there should be a flow back of financial resources from Mahabeej (MSSCL) to the State Agricultural Universities to enhance research and development activities. He also suggested that ICAR varieties must be popularized in collaboration with State Agricultural Universities. He emphasized on identification of various genes associated with seed quality parameters and validation of already reported markers for seed quality traits. He further recommended to provide training for quality seed production as a national mandate and special guidelines for markers.

Dr. D.K. Yadava, ADG (Seeds), ICAR, New Delhi and Co-chair of the session in his concluding remarks suggested to adopt climate resilient varieties along with the latest ones. He stressed on the issues like maintenance breeding to maintain genetic purity, establishment of molecular breeding laboratory to develop rapid detection tools for seed quality traits along with maintenance of seed health. He also highlighted the progress made in achieving higher seed replacement rates in most of the crops which is more than 80% across the crops.

He showed serious concern about the flood of unregulated spurious truthfully labelled seed of un-notified varieties in the market which is causing a big loss to small and marginal farmers. However, he informed that provision for regulation is being made in the Seed Authentication, Traceability & Holistic Inventory [SATHI] portal to check sale of spurious seed.

Dr. A.K. Singh and Dr. D.K. Yadava

Shri. Sachin Kalantri

Dr. Gopala Krishnan S.

Glimpses of Technical Session - III

Dr. Deepanshu Jayaswal

Dr. Nagamani Sandra

Dr. S.G. Shinde

Luminaries

Passionate minds, powerful ideas for advancement of seed biotechnology

TECHNICAL SESSION-IV

Emerging Trends in Seed Processing and Seed Storage Research

Co-chair 1	:	**Dr. S. N. Jha,** DDG, ICAR, New Delhi
Co-chair 2		**Dr. S.R. Gadakh,** Vice Chancellor, Dr. PDKV, Akola
Rapporteurs	:	**Dr. S.B. Ghuge,** Officer In-charge, SPP, VNMKV, Parbhani
		Dr. P. Y. Shinde, Assistant Professor, CoA, Pune, MPKV, Rahuri
Session Coordinator	:	**Dr. S.B. Pawar,** Asso. Director Research, NARP, Chh.Sambhajinagar

There were 5 lead presentations and 5 oral presentations in this session.

At the outset **Dr. S. N. Jha** gave introductory remarks and highlighted the importance of determining the actual seed maturity stage in all the crops, so as to harvest good quality seed. He stressed upon the need for 'accelerated maturity protocols' to manage probable natural calamities at the time of harvesting of crops. He suggested the ISST to arrange 2 sessions of the Seed Congress devoted to [i] Mechanical seed harvesting, seed transportation and seed handling and [ii] Use of sensor technology in seed production. The need for developing hand held machines for varietal identification was also indicated.

Dr. S.R. Gadakh highlighted the issues relating to Soybean seed production and gave tips for mechanical harvesting in Soybean.

First presentation was given by **Mr. Steven Groot,** WUR, Netherland on *Emerging trends in processing and storage research*. Explaining an experiment based on Cabbage seed he brought out the possibility of using chlorophyll content / fluorescence in seed as one of the parameters for vigour estimation. He further explained the Genome-Wide Association Studies [GWAS]to bring out seed sensitivity to ageing. He also mentioned the importance of seed microbiome for seedling resilience. He concluded with the experiment demonstrating anoxia/low O2 seed storage, offering an additional tool to reduce vigour loss due to ageing.

Second presentation was by **Bharatkumar M. Devda,** Tara Instruments, Vadodara who elaborated the technology and equipment for automation of the entire chain of steps involved in seed germination table and germination analyzer, which can prepare 1600 germination rolls per hour.

The next presentation was by **Sweta Patel,** Tara Instruments, Vadodara who explained about the digitalization in seed quality assessment by Multispectral Image Analyser / video meter.

The presentation on Airborne Low Intensity Multi Frequency Ultra Sound [ALIMFUS] technology was by **Bharat Mehta,** wherein he described the Bactster the ultrasound-based technology for seed sanitization.

Last presentation was by **P.G. Shinde,** GM, Ajeet Seeds, Ch. Sambhajinagar on the recent advances in seed mechanization. He elaborated the technique of dilute H2SO4 acid delinting method for cotton which is environment friendly. He briefed about maize cob drying, soybean processing, vegetable seed coating etc.

The oral presentation on *R packages on germination metrics and viability metrics* was delivered by **J. Aravind,** ICAR-NBPGR, New Delhi in which he explained the use of software tools for modelling germination progress and viability loss. He brought out the significance of several germination indices for developing the matrix for germination and viability losses predictions.

In the second presentation on *Genetic basis of seed longevity in Wheat* by **Sampa Saha,** ICAR-NBPGR, New Delhi, she explained the Genome Wide Association Studies in Wheat which identified 10 marker Trait Associations for seed longevity. Also, she brought out the identification of 4 land races in Wheat for seed longevity.

In the 3rd presentation, **Dr. Ramanadane T.,** PAJNCOA, Karaikal explained the scope and merits in using 'super grain bags' for maintaining the minimum germination in Paddy, Soybean and Groundnut (including kernels) during storage under ambient conditions.

The 4th presentation was by **Dr. S.K. Chakrabarty,** Principal Scientist, DSST, ICAR- IARI, N Delhi in place of Tanya Singh. He explained in detail the use of rapid, simple, non- destructive hyper spectral imaging technology in differentiating paddy seed lots with varied germination and longevity which are correlated with seed quality parameters. He also explained the Partial Least Squares Regression [PLSR] model which is the most acceptable regression model.

The effect of modified gases on seed storability of Cotton was presented by **Dr.Sunil S. Mahajan,** ICAR-CICR, Nagpur in which he highlighted the use of Argon gas for maintaining high germination under ambient as well as T & RH controlled conditions.

At the end, **Dr. Jha,** Chairman of this session, emphasized on development of climate resilient varieties by breeders and stressed upon the need for standardization of climate resilience parameters in different crops. **Dr. Gadakh** appreciated all the presentations in general and seed storage studies in Groundnut in particular explaining the possibility to store groundnut kernels in Super grain / HDPE bags after treatment with double spectrum fungicides.

Dr. S.N. Jha and Dr. S.R. Gadakh

Mr. Steven Groot

Mr. B.M. Devda

Glimpses of Technical Session - IV

Mrs. Sweta Patel

Mr. Bharat Mehta

Mr. P.G Shinde

Mr. J. Aravind

Ms. Sampa Saha

Dr. Ramanadane T.

Dr. S.K. Chakrabarty

Dr. Sunil S. Mahajan

TECHNICAL SESSION-V

Protection of Varieties for Augmenting Seed Supplies and Export

Co-chair 1	:	**Dr. Rajendra Prasad,** Former VC, UAS, Bangaluru
Co-chair 2		**Dr. T.K. Behera,** Director, ICAR-IIVR, Varanasi
Convenor	:	**Dr. S.K. Chakrabarty,** Principal Sci., DSST, ICAR-IARI, New Delhi
Rapporteurs	:	**Dr. Sunil Mahajan,** Pri. Sci. ICAR-CICR, Nagpur **Dr. Sunil Umate,** Wheat & Maize Breeder, VNMKV, Parbhani.
Session Coordinator	:	**Dr. M. V. Dhuppe,** Oilseed Specialist, ORS, Latur,

The Technical Session V started with opening remarks by the Co-chairs followed by the lead presentation by **Dr. Raoul Haegens,** DUST, the Netherlands on '*Trends and innovations in DUS - testing with focus on horticulture varieties*'. He listed the activities handled *viz.* exercise on market access, project trainings and research and development, and UPOV's cooperation among member countries for testing and sharing of data. He recognized the merit in the Indian PPV & FR 2001, Act where farmers' and plant breeders' rights have been protected. He explained the new developments in DUS testing, viz., Disease resistance testing using TaqMan PCR and new genomic techniques to obtain common data base for comparing and distinguishing the varieties. He also dealt on the use of Artificial Intelligence in image analysis and preparation of national list for achieving breeding goals and future of DUS testing needs; and further clarified that the size, shape and colour of leaf, fruit and seeds of all fruit crops can be used for image analysis. He also suggested to refer the UPOV web site wherein all the pending legal cases are available which are mostly related with infringements and confrontation with breeders for new registration.

The lead presentation was followed by three oral presentations. In the first oral presentation, **Dr. S. K. Chakrabarty,** DSST, ICAR-IARI, New Delhi, dealt about *'Plant image analysis using deep learning methods for distinguishing Basmati rice varieties'*. He stressed upon the lack of variation in basmati rice and

drawbacks / limitations in adopting DUS testing. For this, he suggested image-based electrotechniques for varietal identification using simple DSLR camera and freely available image analysis software. He elaborated on the varietal identification study using 24 monomorphic and 25 polymorphic characters, involving observations categorizing four plant growth stages in 16 Basmati varieties. Stage 4 was found to be the most suitable for testing accuracy. For image analysis, free soft wares like VGG 16, VGG 19, INCEPTION_V3 and RESNET-152V2 are available; out of which VGG 16 shows better/higher accuracy and therefore more suitable for image processing. He also pointed out the need for skilled technical personnel and large image database for distinguishing the Basmati rice varieties.

The next presenter, **Dr. S. B. Ghuge**, VNMKV, Parbhani explained about his research on '*Variability studies for seed characteristics in safflower (Carthamus tinctorius* L.*) genotypes*' involving 30 genotypes and observations on 10 morphological and qualitative characters. He concluded that, in safflower, hull thickness and oil content are negatively corelated. Mexican germplasm has more oil content and seed characters were of medium type as compared to wild genotypes. Cultivated species have all dominant morphological characters but are low in oil content. In the final remarks the Co-chair suggested to group the genotypes according to seed size / color. Also, the need to prescribe Seed Standards for ODVs and test for ODVs was proposed.

The last presenter **Jadav Mamta J.**, AAU, Anand dealt on *'DUS characterization of okra (Abelmoschus esculentus* L.*) genotypes through qualitative characters'* based on her evaluation of different okra varieties using 12 morphological diagnostic characters. The genotypes were grouped according to the colour of the stem, leaf, petal, fruit, and seed, and fruit length and pubescence on fruit. As some genotypes in the study were brown seeded, availability of such types among cultivated varieties need confirmation.

The co- chair mentioned about the importance of the stage and scale for recording pubescence, seed hairiness and flower colour.

During final remarks, co-chair **Dr. Rajendra Prasad** acknowledged Dr. Raoul Haegens's inclusion of new technologies in DUS testing and DNA markers database. **Dr. T.K. Behara** recommended that farmer's privilege and plant breeder exemption are important. He also highlighted the importance and use of deep learning in DUS testing. With the permission of Co-Chairs, Technical Session V ended with vote of thanks by Convener.

Glimpses of Technical Session - V

Dr. Rajendra Prasad and Dr. T.K. Behera

Dr. Raoul Haegens

Dr. S.K. Chakrabarty

Dr. S.B. Ghuge

Ms. Mamta Jadhav

Glimpses of Technical Session - V

Brainiacs assembled in NSC - 2023

Experts discuss the latest advancements in seed supply and export

TECHNICAL SESSION-VI

Challenges and opportunities in quality seedlings and seed availability of spices, horticulture and plantation crops

Co-chair 1	:	**Dr. T.K. Behera,** Director, IIVR, Varanasi
Co-chair 2	:	**Dr. Laxmikant,** Director, ICAR-VPKAS, Almora
Convenor	:	**Dr. V. Sankaran,** GM, NSC (Retd.)
Rapporteurs	:	**Dr. Satish K. Yadav,** Nodal Officer, NBPGR, New Delhi **Dr. G.R. Munde,** Officer Incharge, CARS, Ambejogai
Session Coordinator	:	**Dr. K.S. Baig,** Cotton Specialist, CRS, Nanded

In this technical session, there were two lead presentations by Dr. T. K. Behera and Dr V. Sankaran followed by two oral presentations by Dr Sudipta Basu, ICAR, IARI, New Delhi and Dr. Nethra N., UAS, Bengaluru.

Dr. T.K. Behera in his lead lecture on *Challenges and opportunities in vegetable seed industry in India* emphasized on vegetables as protective food, the consumption of fruits and vegetables on daily basis i.e. at least 400 gm vegetable per head per day. He informed that nationally vegetables are about 42% of the total horticultural crop area and 60% of horticultural production; and globally India's share is 15.8% and 16.5% in terms of area and production respectively. He also reported that around 26000 exotic and indigenous germplasm of 23 vegetables crops have been collected; 181 F1 hybrids in ten vegetables and 59 resistant varieties have been identified for different zones. Globally India is second largest vegetable producer in the world. India ranks 1st in the world for Okra production and ranks 2nd in Tomato, Cabbage, Onion, Brinjal, Green pea, Cauliflower and Broccoli and Potato production. Indian vegetable seed market is around Rs 4000 crores out of Rs 20000 crores, the total seed market; and ranks 5th in the world He highlighted the challenges in vegetable seed production, seed marketing and seed related policies; and listed the SWOT factors. He also emphasized on the PPP model and capacity building for enhancing progress in various aspects of the vegetable seed sector. Protected

environmental conditions are better alternatives to escape from abiotic stresses.

Dr. V. Sankaran made a lead presentation on the *Scope and need for planned seed programs for medicinal and aromatic plants*. He gave an over view of the medicinal plant species available in India, mostly in the wild, the data base status and the constraints / gaps in various issues relating to medicinal plants. He cautioned about indiscriminate harvesting / collection practices from the wild without caring for regeneration even leading to valuable species becoming threatened, endangered and extinct. He sought attention to consolidating basic information on floral biology, pollination, reproduction, seed development and maturation and seed quality aspects for medicinal plants.

With reference to Medicinal Plants he highlighted the need to formulate / develop seed quality standards and verification procedures, seed production practices, undertake seed technology studies, organize well planned seed programs at the State / National levels, ensure quality seed availability and use and initiate and maintain linkages between the various institutions and industries involved in handling medicinal plants. He stressed upon the Seed Sector's role in improving the availability and use of quality seed and thereby the status of Medicinal Plants.

Dr. Sudipta Basu, in her oral presentation on *Quality seed production of gynoecious cucumber hybrid under protected conditions*, gave detailed information about the sex expression status and varied sex forms in cucumber, inherent constraints in its seed production and brought out the merits in gynoecious cucumber hybrids, their cultivation for increased productivity and seed production under protected condition. Gynoecious lines bear high proportion of female flowers and facilitate easy hybridization by reducing labour cost required for pinching of staminate flowers. Based on the studies, she narrated the procedures for gynoecious hybrid seed production and maintenance of gynoecious lines; and informed that multiple pollination had no effect on enhancing the fruit setting, seed yield and quality. Stigma receptivity and pollen viability were high at the time of anthesis and pollination should be attempted up to 10.00 AM for higher seed yield. Seed dormancy status in cucumber and ways to break it were also presented.

Dr. Nethra N., presented on the *Coexistence of competitive interspersed staminate flowers [ISF] in pistillate line of castor: an obstacle in hybrid seed*

production. She highlighted the importance of castor as an important oil seed crop mainly used as lubricant due to high viscosity. She elaborated on the sex expression and sex conversion aspects typical to castor and the types of pistillate mechanism in castor especially the presence of interspersed staminate flowers [ISFs] in pistillate lines and the external factors [temperature, nitrogen and moisture] influencing the same. Roguing out ISFs in hybrid seed production is tedious, adds to the expenditure and affects hybrid seed yield. Therefore, the competitive nature of ISFs was studied and it was concluded that invitro pollen germination and invitro fertilization of ISF of pistillate lines are more competitive than male, so it is necessary to rouge out ISF flowers in bud condition i.e. before flower opening.

The session ended with vote of thanks to the chair.

Dr. T.K. Behera and Dr. Laxmikant

Glimpses of Technical Session - VI

Dr. T.K. Behera

Dr. V. Sankaran

Dr. Sudipta Basu

Dr. Nethra N.

High - level discussions on the seed industry's challenges and opportunities in horticulture and plantation crops

CH. AMIR SINGH MEMORIAL LIFETIME ACHIEVEMENT AWARD OF ISST

Ch. Amir Singh Memorial Lifetime Achievement Award of ISST

Co-chair 1	:	**Dr. Indra Mani,** Vice Chancellor, VNMKV, Parbhani
Co-chair 2	:	**Dr. H. S. Gupta,** President, ISST & Ex. Director, ICAR-IARI, New Delhi
Convenor	:	**Dr. S.K. Yadav,** Head, ICAR-IARI (RS), Karnal & Sec., ISST, New Delhi
Rapporteurs	:	**Dr. A.K. Gore,** PI, OFRC, VNMKV, Parbhani Officer, VNMKV, Parbhani **Dr. M.G. Patil,** Asstt. Seed Research
Session Coordinator	:	**Dr. D.S. Perke,** Head, Dept. of Economics, VNMKV, Parbhani
Awardee	:	**Dr. S. Rajendra Prasad**, Former Vice Chancellor, UAS, Bengaluru

The session began by paying floral tribute to Late Ch. Amir Singh, founder president of ISST. Dr. H.S. Gupta, acknowledged the contribution of Ch. Amir Singh in the field of Agriculture in general and Seed Technology in particular. His contribution in the improvement of wheat and maize at IARI, and with the release of NP wheat varieties were elaborated. Ch. Amir Singh ji played a key role in establishing the Seed Testing Laboratory at IARI, New Delhi in 1962 which was upgraded as the Central Seed Testing Laboratory. He was a member of the working group to draft the Seeds Act 1966. He was actively involved in polarization of Mexican Wheat varieties and was awarded Gold Medal by the then Prime Minister of India- Mrs. Indira Gandhi for starting the seed village scheme. He was the first Head of the Division of Seed Science &Technology at IARI, New Delhi and was the founder president of ISST. Breeder Seed Production Scheme was initiated by him and he was instrumental in promoting research activities on seed production and quality control. He was deeply involved with the activities of ISST and Division of Seed Science & Technology, IARI, New Delhi till the last day of his life and will always be remembered for his leadership, memorable contribution and service given to the nation.

Thereafter, **Dr. Indra Mani,** Vice Chancellor, VNMKV, Parbhani introduced Dr. S. Rajendra Prasad, former Vice Chancellor, UAS, Bengaluru and the Awardee

of Ch. Amir Singh Memorial Lifetime Achievement Award of ISST, New Delhi. Dr. Dr. S. Rajendra Prasad started his academic career from UAS, Bengaluru as a Research Assistant and served in various positions. He headed the centers like ICAR-NBAIM, Mau, ICAR-IISS, Mau, UP as their Director; and also as Dean, GKVK, Bengaluru and then as Vice Chancellor, UAS, Bengaluru. He guided many PG and Ph.D. students and handled several externally funded projects. He developed and strengthened the ICAR-IISC, Mau Centre under his leadership with full facilities and for giving prompt service to the stakeholders in the field of Seed Technology. He contributed immensely through Seed Village Programme and established two seed production cum demonstration centers in the Republic of Rwanda and Togolese. He developed two advanced Mobile Applications i.e. Beej Aadhar and Fertilizer Application for stakeholders.

Then, the co-chairmen Dr. Indra Mani and Dr. H.S. Gupta felicitated Dr. S. Rajendra Prasad and conferred the prestigious Ch. Amir Singh Memorial Lifetime Achievement Award on him for his dedicated work in the field of Seed Technology and Seed Production.

Honoring the best in the seed technology

Dr. S. Rajendra Prasad thanked the ISST and the Award Selection Committee and made a presentation as the recipient of award. He said that, to face the challenges like climate change, unavailability of quality seed, degraded soil health, etc. we have to work hard on various aspects of seed for quality seed

Proud recipient of the award : Dr. S. Rajendra Prasad

production as seed is a basic and most important input in agriculture. He stressed on advanced seed production technology, breeding for seed quality traits, use of green nano particles, microbiome (Endophytes), digitization in seed technology, precision farming with drones and sensors, use of AI technology for reducing errors in quality seed production, use of nano sensors for testing seed quality during seed storage, seed traceability etc. for improved seed production in the country. He also explained the feasibility of one common seed concept for all seed businesses including public sector, private seed growers etc. He stated that, under Atmanirbhar Bharat scheme of GOI the seed farmers groups will be strengthened benefiting the seed growers. He suggested that, ICAR varieties has to be popularized in collaboration with State Agricultural Universities, and emphasized that, organic seed and seedling production need to be addressed and standards for organic seed production developed. ISTA accreditation of seed testing laboratories needs to be taken up.

The Co-chair **Dr. Indra Mani,** in his concluding remarks, congratulated Dr. S. Rajendra Prasad and narrated the importance and need of Agril. Engineering interventions at every stage of seed production and handling. He also recommended to explore the use of drones and sensors in the field of seed technology for improving quality seed production.

The Co-Chair, **Dr. H.S. Gupta** in his concluding remarks appreciated the contribution of Dr. S. Rajendra Prasad in promotion and implementation of seed village concept and he recommended to popularize the use of Beej Aadhar Application developed by Dr. Prasad. Further, he stressed that, to improve seed production program and quality seed production KVKs have a major role to play in popularization of seed technology interventions for quality seed production at lower cost. He appealed to all administrators of research institutes and SAUs to see that at least one Seed Technologist must be in working in every institute working with the mandate for seed production.

With the permission of Co-Chairs the session ended with vote of thanks by the convener **Dr. Shiv K. Yadav.**

PANEL DISCUSSION

PANEL DISCUSSION I

Gene Technologies: Potential and Challenges

Co-chair 1	:	**Dr. C.D. Mayee,** Ex Chairman, ASRB, New Delhi
Co-chair 2		**Dr. Bijendra Singh,** Vice Chancellor, NDUA & T, Ayodhya
Convenor	:	**Dr. D.P. Waskar,** Director of Research, Parbhani
Rapporteurs	:	**Dr. V. Santhy,** PS-ICAR-CICR, Nagpur **Dr. W.N. Narkhede,** Head [Agronomy], VNMKV, Parbhani
Session Coordinator	:	**Dr. H.W. Awari,** VNMKV, Parbhani
Panelists	:	1. **Dr. B.M. Khadi,** Ex Director, CICR, Nagpur 2. **Dr. Bharat Char,** Mahyco, Jalna 3. **Dr. G.P. Mishra,** Head, DSST, ICAR-IARI, New Delhi 4. **Dr. Padmakar Muramkar,** Crystal Crop, Hyderabad

Dr. C.D. Mayee in his initial address mentioned about the GM crops being cultivated commercially at global level in both non-food as well as food crops. There are many developing countries such as the Philippines, Indonesia, Vietnam and Bangladesh with Government approved GM crops ready to be commercialized. He emphasized on the benefits of cultivating GM crops citing the example of *Bt* Cotton in India. GM technology enabled large scale export of cotton and its by-products thereby boosting the country's earnings and promoting the seed industry through generation of more revenue and establishing superior facilities for seed production. GM crops promise biotic and abiotic stress control, better nutrition, resilience to climate change and healthy foods. He also emphasized that India imports Rs. 170 crore edible oil from outside which are already having GM and recently, GoI has accorded approval for import of GM soymeal. Illegal cultivation of HT *Bt* cotton is increasing in the country and farmers' demand for access to better technology and superior seeds is genuine. Under such circumstances, it is essential that Government's approval of GM technology be announced at the earliest for those crops where GM variety has been developed.

Dr. B.M. Khadi spoke about the time taken for development of newer crop varieties through conventional techniques. There are indeed many faster techniques in non-molecular (speed breeding, double haploid technique) as well as molecular (MAS, GWAS, Omics, RNAi and QTL's.) concepts and approaches which can be adopted for varietal development. These also come with various risks such as somatic mutagenesis, unwanted segregation and linkage etc. Gene technology is more powerful in developing superior varieties and is much faster. He also emphasized on positive policy changes by Government towards GM technology approval.

Dr. Bharat Char supported gene technology as very powerful in making Indian Seed industry a large exporter earning up to Rs. 10000 crores. He emphasized the right of farmers to have access to new technologies and suggested harmonization between various regulatory authorities and policies. It was also mentioned that whether genetically engineered or gene edited, trait combination is highly essential for a genotype to be superior under climate resilient agriculture.

Dr. G. P. Mishra spoke about various issues faced by the researchers due to the delay in the Government's approval for GM crops. Over time, the original seeds lose their viability and access to them also become difficult. There is scarcity in research funding for GM crop development. He mentioned that Japan has released genome edited crops which India is importing and consuming. But in our country, the approval for GM crop cultivation is still awaited. He suggested that conventional breeding and genetic engineering technology should go together.

Dr. Padmakar Muramkar in his remarks favoured the use of genetic engineering tools in development of newer crop varieties for high yield and superior biotic and abiotic stress tolerances.

At the end, **Dr Mangala Rai** listed the following points for the way forward:

1. We should have our own indigenous GM technology for the genetic engineered crops to flourish;
2. Contractual arrangements be made clear by the Government;
3. The Government can formulate a license agreement to public sector institution for commercialization of GM crops and more funding and higher priority are needed for GM based technologies.

Dr. Bijendra Singh concluded the session and endorsed the views on early approval for GM crops in the country with provision for intellectual property protection.

Important conclusions /recommendations

1. Gene technologies have the potential for faster development of varieties with biotic and abiotic stress control, better nutrition, resilience to climate change and healthy foods
2. Many developed countries have already commercialized GM technology in most of the food as well as non-food crops. Developing countries have already approved GM for commercialization and India is behind in this regard.
3. As India is already importing Rs. 170 crore worth edible oil based on GM crops from above countries, it is high time we increase production of oilseeds adopting gene technology.
4. Indian farmers have every right for access to superior technology and superior seeds.
5. At GM research level also, the delay in approval of developed GM varieties results in viability loss of the original GM seed developed and retrieving them may be difficult.
6. More funding is required for GM research in public sector institutions.
7. Policy changes SDN3 by the Government is essential with regard to GM approval including genome edited crops. The crops where GM varieties are already developed in India may be approved for commercial release at the earliest.
8. ICAR's stand on GM needs to be clear with scientific footing with an understanding that no technology comes risk free without any challenge.

Glimpses of Panel Discussion - I

Dr. C.D. Mayee, Dr. Bijendra Singh and Dr. D.P. Waskar

Dr. B.M. Khadi

Dr. Bharat Char

Dr. Padmakar Muramkar

Deep dive into seed science

PANEL DISCUSSION II

Strengthening seed systems for distribution and access to millets for health, food security and farmers prosperity

Co-chair 1	:		**Dr. B. Venkateswarlu,** Former Vice-Chancellor,VNMKV, Parbhani
Co-chair 2	:		**Dr. S.A. Patil,** Former Director,ICAR-IARI,New Delhi
Co-chair 3	:		**Dr. Vilas Tonapi,** Former Director, ICAR-IIMR, Hyderabad
Convenor	:		**Shri. Swaminathan,** RRA, Network, Hydrabad
Rapporteurs	:	1	**Dr. S.B. Pawar,** ADR,NARP,Ch.Sambhajinagar
		2	**Dr. L.N. Jawale,** O/I, Sorghum Res.Stn., VNMKV, Parbhani
Session Coordinator	:		**Dr. S. B. Pawar,** ADR, NARP, Ch. Sambhajinagar
Panelists	:	1	**Dr. J.C. Rana,** NPC,Biodiversity International, New Delhi
		2	**Dr. Suresh Kumar,** Bayer Crop Science
		3	**Dr. Sharmila Oswal,** Pahle India Foundation (Online Mode)
		4	**Dr. D.P. Waskar,** Director of Research,VNMKV, Parbhani
		5	**Dr. Krishna Prasad,** Director, Sahaja Samrudha,Bengaluru

Dr. B. Venkateswarlu, the Co-chair in his, opening remarks mentioned about shortage of millets and ensuring good seed availability to farmers. For promotion of local germplasm, regulatory barriers arise. Karnataka and Odisha have drawn up clear guidelines and have taken up projects and plans for profitable utilization of local germplasm on farmers' fields. Immense scope is available for other States to follow suit, as various millet types have been traditionally growing in various parts of the country.

Dr. Vilas Tonapi, brought out the diversity and many merits of the range of millets which were popular in traditional farming nationally and globally, but got sidelined following the Green Revolution which prioritized wheat and paddy in the mid-60s in India, resulting in drastic area reduction, especially under small millets. Yet, due to crop improvement efforts and the climate resilient feature of the millets, the overall millets production was kept up due to increase in productivity of millets. He also highlighted the health benefits of millets and the significant developments in processing, value addition and recipes preparation with millets. He explained about the Position Paper on Millets, breeding

strategies, constraints, challenges, export prospects, policy interventions needed and the road map / way forward to increase millet production / consumption and thereby improving the nutrition, food security and farmers' welfare.

Dr. Krishna Prasad, explained about the efforts by Sahaja Samrudha in promoting varieties developed / maintained by farmers, millets diversity in Karnataka and laid emphasis on conservation of millet varieties by panchayats. He also stressed upon participatory varietal selection, community seed management system, on-farm conservation, and the need for community seed banks.

Dr. S. B. Pawar highlighted bio fortified variety of Sorghum variety Parbhani Shakti and Pearl Millet hybrids AHB- 1200 and AHB- 1269 developed by VNMKV, Parbhani in collaboration with ICRISAT, Hyderabad and ICAR, New Delhi.

Dr. J.C. Rana stressed up on working on integrated mode i.e. ICAR-SAUs, KVKs and NGOs; creating and maintaining community seed banks with native / traditional varieties on scientific lines with consistent technical support. He also emphasized on sharing of benefits among the partners.

Dr. Suresh Kumar, stressed up on the need for quality seeds of millets and competitive price to the farmers. He also suggested to develop new innovative technologies in millets for farmers.

Dr. Sharmila Oswal spoke about capacity building for women in Odisha Sate by giving training on value addition of millets and supply of millets products under Prime Minister *Poshan Yojana*. She said that many start-ups are working on millets as self-help groups and FPOs; and public private partnerships are needed. She emphasized on the challenges and the need for legal policies for export of millets. Millet can be popularized among the people by preparing millet recipes and organizing millet festivals.

Dr. S.A. Patil, elaborated regarding the need for social intervention to propagate millets and for a special food and nutrition team to popularize millets. He advocated better price and incentive to the farmers and suggested that all Universities handling millets should meet once in a year for promotion of millets. Also suggested need of special FPO for millets.

Dr. B. Venkateswarlu evaluated the session with following recommendations.

1. To develop mechanism for promotion of millets at global levels as India being G-20 leader.
2. Need of funding from government to continue International Year of Millets beyond 31st December, 2023.
3. Millets should be consumed by malnourished women and people in rural area.
4. Collection of local germplasm of millet and there is a need of documents how the informal seed system should be main streamed for availability of good seed to farmers.

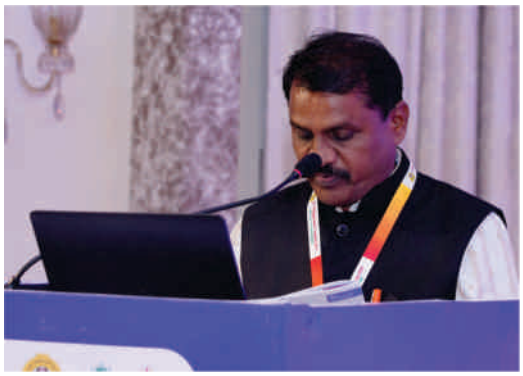
Dr. B. Venkateswarlu, Dr. S.A. Patil, Dr. Vilas Tonapi and panelists

Dr. B. Venkateswarlu

Dr. Vilas Tonapi

Glimpses of Panel Discussion - II

Dr. Krishna Prasad



Dr. S.B. Pawar

Dr. Suresh Kumar

Dr. J.C Rana

Dr. Sharmila Oswal

PANEL DISCUSSION III

Seed Industry and Farmers Organizations
[A]: Seed industry: Contributions, Constraints and Expectations

Co-chair 1	:	**Padma Bhushan Dr. R.S. Paroda,** Former Secretary(DARE)
	:	& DG (ICAR), New Delhi
Co-chair 2	:	**Dr. Indra Mani,** Vice Chancellor, VNMKV, Parbhani
Co-chair 3	:	**Shri. Raghavan Sampathkumar,** Executive Director, FSII, New Delhi
Rapporteurs	:	**J.B. Patel,** Head, DSST, JAU, Junagadh
		Dr. A.B. Jadhav, Office Incharge, BSP, VNMKV, Parbhani
Session Coordinator	:	**Dr. K.S. Baig,** Cotton Specialist, CRS, Nanded
Panelists	:	**Dr. Sanjay Kumar,** Director, IISS, Mau
		Dr. T.K. Behra, Director, IIVR,Varanasi
		Dr. Kishor Veer, Ellora Seeds, Ch. Sambhajinagar
		Dr. Baljindar Singh Nandra, Seed Works India Ltd, Hyderabad
		Dr. Prabhakar Dubey, MAHYCO, Jalna
		Dr. Shaligram Wankhede, SIAM, Ch. Sambhajinagar
		Dr. Suresh Kumar, Bayer Crop Science

Dr. R.S. Paroda in his opening remarks narrated the emergence, growth and development of the Indian seed industry and its useful role in fulfilling the food security through the Green, Yellow, and White Revolutions. He highlighted the scope available for the seed sector to expand and contribute including the export market; and recognized the place of a congenial policy environment. He also expressed concern on the delays in formal clearances and sought speedy approvals, citing the Revised Seed Bill pending for nearly a decade.

Dr. Sanjay Kumar, Director, IISS, Mau emphasized on the merits in public-private partnership mode for achieving better results and growth of seed industry. In this context, he stressed upon the principles of mutual trust, confidence, and transparency in implementing the PPP. He also drew attention to 'price moderation 'so as to make it affordable by the farmers.

Dr. T. K. Behera, Director, IIVR, Varanasi briefly traced back the growth of public research in vegetables resulting in 587 varieties and 181 hybrids in 50

years. But the seed sector has not taken advantage of those varieties / hybrids and hence many of them have not reached the farmers. This needs attention. Private seed firms can have requisite Partnerships / MoUs with ICAR-IIVR for outright purchase of the varieties / hybrid parents and proceed with seed production and marketing. He expressed concern on the absence of authentic data regarding seed requirement, availability, replacement rate in many vegetable crops.

Dr. Rajkumar, Ellora Seeds, Chh. Sambhajinagar, highlighted the following issues: difficulties due to each State demanding Seed License to operate in the State- hence, 'One Nation One License' is badly needed; license is restricted to 'dealership only ' and does not cover R&D etc affecting other activities; States bringing out Acts / Laws over and above the Seeds Act; high cost involved in trials ; high cost of breeder seed- why not authorize seed companies with DSIR approved R&D to produce BS themselves after taking the BS from public research system.

Dr. Baljindar Singh Nandra, Seed Works India Ltd, Hyderabad, briefed about the Company's contribution; and expressed concerns regarding IPR infringements, PPV&FRA enforcement, counterfeit seeds and need for policy / Govt support for breeding climate resilient varieties by private research. He hoped that the SATHI concept introduced in the recent years will help in ensuring seed traceability end to end.

Dr. Prabhakar Dubey, MAHYCO, Jalna felt that farmers are ready to pay provided the seed is of high quality. He expressed concern on the lengthy time taking procedures in some States for issuing Seed License for new varieties / hybrids from in-house R&D and lack of uniformity between the States in the procedures. He also cautioned about the practice of opting for L1 rates [that may be compromising on quality] for meeting the State's seed requirements. He also suggested to simplify the procedure for executing the PPP.

Dr. Shaligram Wankhede, SIAM, Chh. Sambhajinagar, wanted standardized procedure for the registration of private bred varieties. He also felt the need for workable model formats to implement PPP mode; and emphasized on the PPP mode for research.

Dr. Suresh Kumar, Bayer Crop Science, proposed for cost saving mechanization / automation and application of advancement of molecular techniques in seed quality testing.

By way of clarification, **Dr. Sanjay Kumar** mentioned that the '*New Seed Policy for Amritkal"* which is in the final stage will hopefully answer many of the issues raised during the deliberations especially relating to the private seed sector. Dr. D. K. Srivastava, Dy Commr [QC], DAC also endorsed / confirmed the same.

Shri. Raghavan Sampathkumar, Executive Director, FSII, New Delhi emphasized on improving public perception about agricultural science / research in implementing new technologies, ensuring IP protection for research and giving due regard to science while making policies i.e. place for science behind the policies.

Dr. R.S. Paroda, at the end, suggested to make the recommendation about the speedy approval for the revised Seed Bill drawn up in 2004, but still pending passage by the Parliament; and so also the revised New Policy on Seed Development.

Padma Bhushan Dr. R.S. Paroda, Dr. Indra Mani and Shri. Raghavan Sampathkumar

Passionate minds, fruitful discussion on challenges on opportunities in the seed industry

Glimpses of Panel Discussion - III A

Panelists : Dr. Sanjay Kumar, Dr. T.K. Behera, Dr. Kishor Veer, Dr. Baljindar Singh Nandra, Prabhakar Dubey, Dr. Shaligram Wankhede and Suresh Kumar

Experts share insights on seed industries contributions, constraints and expectations

PANEL DISCUSSION III

Seed Industry and Farmers Organizations [B] Farmer Organizations : Contributions, Constraints and Expectations

Co-chair 1	:	**Padma Bhushan Dr. R.S. Paroda,** Former Secretary (DARE) & DG (ICAR), New Delhi
Co-chair 2	:	**Dr. Indra Mani,** Vice Chancellor, VNMKV, Parbhani
Co-chair 3	:	**Dr. D.K. Srivastava,** Dy, Commissioner (QC), GoI, New Delhi
Rapporteurs	:	**1. Dr. Pritam Y. Shinde,** Assistant Professor, CoA, Pune **2. Dr. M.B. Dhuppe,** Oilseed Specialist, ORS, Latur
Session Coordinator	:	**Dr. S.P. Mehetre,** Associate Director (Seed), VNMKV, Parbhani
Panelists	:	**1. Padamshri Shri. Kamal S. Chauhan,** FPO, Sonipat, Haryana **2. Dr. A.A. Akhre,** Nodal Officer, AICRP on Seeds, Dr.PDKV, Akola **3. Dr. Veershetti Patil Biradar,** CEO, SS Agri Foundation, Telangana **4. Dr. Tukaram Mote,** JDA, Chh.Sambhajinagar **5. Shir. Amol Randive,** ODSF Agro Producer Co. Ltd **6. Dr. S.B. Ghuge,** Incharge, Safflower Research Station, Parbhani 7. Representatives from different FPOs

Padmabhushan **Dr. R. S. Paroda** presided over this important session with **Dr. Indra Mani Mishra,** Vice-Chancellor, VNMKV, Parbhani, and **Dr. Srivastava,** Deputy Commissioner, Government of India, New Delhi.

In the beginning, **Dr. D. P. Waskar,** Director of Research, VNMKV, Parbhani, welcomed all the participants of this session. He mentioned about the importance of this session while giving an overview of the Congress due to the participation of the farmers in the Congress.

Dr. Paroda congratulated Shri. Kamal S. Chauhan, a progressive farmer from Haryana, for being awarded as the best farmer by ICAR. The discussion started with the remarks of **Shri Chauhan.** He highlighted the potential challenges and benefits of Farmer Producer Organizations (FPOs) in Haryana. He emphasized the significance of FPOs in the state, suggesting they play a crucial role in the agricultural sector. He mentioned there are approximately 10,000 FPOs in Haryana. He pointed out difficulties related to income tax exemption for

directors of FPOs and mentioned challenges faced by FPOs in obtaining loans due to bad civil records of directors. The role of NABARD in providing credit facilities to FPO was highlighted by Dr Paroda. He also stressed the need for a single license at the national level for the smooth functioning of the FPO.

Dr. Amrapali Akhare's remarks add another layer to the discussion on FPOs, specifically focusing on their role in seed production within Maharashtra. Dr. Akhare emphasized the crucial role of seed FPOs in Maharashtra in augmenting the seed production of the public sector. She emphasized the importance of FPOs maintaining a healthy seed chain after procuring breeder seeds from the university. Dr. Akhare appealed to the FPOs to support the university by advocating for a 30% increase in the breeder seed price. Overall, Dr. Akhare's remarks suggest a potential partnership between seed FPOs and universities in Maharashtra for seed production and distribution.

Dr. Veershetti Patil Biradar from the state of Karnataka, who is a millet man, was instrumental in increasing millet production in various states of India through his FPO and Agri Foundation. He felt that there was a need for the supply of good quality millet seeds to the farmers. Dr Paroda suggested that a success story of Shri. Patil's success story should be published in order to encourage the other farmers to take up this activity. Dr Paroda also mentioned that seed village concept should be implemented for seed production in commercial seed production area.

Shri. Tukaram Mote, JDA, Chh. Sambhajinagar actively participated in the discussion by mentioning the achievements of FPO in Maharashtra in seed production in general and soybean seed production in particular. He highlighted FPO's contribution to the achievement of a high varietal replacement rate in soybean in Maharashtra. He mentioned certain difficulties faced by FPO like payment of 2% royalty on seed sale, difficulty in getting breeder seed from university, high cost of MoU with university per variety etc.

Shri. Adv. Amol Randive from the Federation of FPOs mentioned the importance of genetic purity of seeds produced by FPOs. He emphasized the need for more accredited seed testing laboratories for unbiased quality testing of seeds produced by FPOs. Dr Paroda intervened by mentioning that young professionals should be encouraged to start the seed testing laboratory in the state.

Dr. S.B. Ghuge, Officer-in-charge, Seed Processing Plant, VNMKV, Parbhani, suggested to the FPOs that they should make advance reservations for the demand of breeder seeds from the SAUs.

Various representatives from different FPOs expressed their views. **Shri Kadam** from Hinganel village stressed the need for large scale seed production by the public and private sector to meet the demand of the farmers. **Mrs. Sushama Dev**, an organic farmer from Hathgaon village, demanded the availability of disease-free seeds to ensure proper germination of the seed crop in the farmer's field.

Dr. Indra Mani, in his concluding remarks, said that this was the most important session of the Congress as it involved farmers, scientists, seed industry and policy makers. He assured the FPO representatives that a separate meeting would be convened to address their issues.

Dr. Shrivastva congratulated Dr Indra Mani for organizing the important meeting in the Congress and for giving justice to both the farmers and the industry. He was of the opinion that all the important issues are being taken up at the ministry level and soon there will be an amicable solution to all the issues.

Dr. Paroda's closing address highlighted the role of quality seed in reducing the yield gap in various crops. He congratulated Dr Indra Mani for the organization of this important conference in the city of Chh. Sambhaji Nagar, which is a seat of seed revolution in India.

Padma Bhushan Dr. R.S. Paroda, Dr. Indra Mani and Dr. D.K. Srivastava

Glimpses of Panel Discussion - III B

Panelists : Dr. Veershetti Patil Biradar, Shri. Amol Randive, Dr. Amrapali Akhre, Padmashri Shri. Kamal S. Chauhan, Dr. Tukaram Mote, Dr. S.B. Ghuge and representatives of FPOs

Let's grow something amazing together :Connecting farmers, researchers and industry

PLENARY-CUM-DISTRIBUTION SESSION

Plenary-Cum-Distribution Session-Proceedings

Chief Guest	:	**Padma Bhushan Dr. R.S. Paroda,** Former Secretary (DARE) & DG (ICAR), New Delhi
Chair 1	:	**Dr. Indra Mani,** Vice Chancellor, VNMKV, Parbhani
Chair 2	:	**Dr. H.S. Gupta,** President, ISST, New Delhi
Convenor	:	**Dr. D.P. Waskar,** Director of Research, VNMKV, Parbhani
Organizing Secretaries	:	**1. Dr. K.S. Baig,** Cotton Specialist, VNMKV, Parbhani **2. Dr. Shiv K.Yadav,** Secretary ISST, New Delhi
Rapporteurs	:	**1. Dr. D.Vijay,** Principal Scientist, DSST, ICAR-IARI, New Delhi **2. Dr. B.V. Bhede,** Assistant Entomologist, CRS, Nanded
Session Coordinator	:	**Dr. D.G. More**, Assistant Professor, COA, Latur

The Session started with the welcome address by the convener, **Dr. D. P. Waskar,** who introduced the chief guest and other dignitaries on the dais to the audience. **Dr H.S. Gupta,** President of ISST, summarized the issues covered during the three-day seminar. He observed that, for the first time, the horticulture sector was adequately involved in the seed congress along with agriculture. He explained about the various technical session themes and panel discussion topics, their broad contents and highlighted the active involvement of all the stakeholders in the congress. Of the total 315+ participants, 200+ are registered researchers, 43 are farmer representatives, 15 are industry representatives, and the remaining are policymakers at state and central levels and various officials of ICAR and VNMKV. Along with the delegates, industry representatives, farmers and students from multiple institutes were also actively involved in different sessions and the three-panel discussions. He expressed satisfaction on the fruitful deliberations and hoped for follow up action on the recommendations of the Congress.

Dr. Shiv Kumar Yadav, Secretary, ISST, presented the recommendations emanated from various technical sessions and panel discussions. Later, awards from the Indian Society of Seed Technology, *viz.*, Scientist of Eminence, Young Scientist, ISST Fellow, and Best Research Paper in the Seed Research journal as

well as certificate of appreciation for the best oral and poster presentations during various sessions were conferred / presented by the Chief Guest and dignitaries on the dais.

The Session Chairman **Dr. Indra Mani Mishra,** VC of VNMKV, Parbhani, expressed his gratitude to various firms involved in the successful organization of the event. He emphasized on the role of the four pillars of the seed system, viz the research institutes, government, farmers and industry and the need for active collaboration between them.

During the concluding remarks, the Chief Guest, **Padma Bhushan Dr R.S. Paroda,** the towering personality in Indian Agriculture known for his vast contributions to the wholistic development and modernization of agriculture research in the country, inspired and motivated the audience with suggestions for the overall improvement of the seed system in the country and revitalization of the ISST. He congratulated the organizers and delegates for the tremendous success of the congress and expressed his delight over the extensive participation of various stakeholders during the congress. At the end, the chief guest felicitated the organizers.

Padma Bhushan Dr. R.S. Paroda : A leader with global vision and local impact

The vote of thanks to all those involved in the successful conduct of this congress was presented by **Dr. K.S. Baig.**

Glimpses of Plenary - cum Distribution Session

Inspiring leadership for the future of agriculture Padma Bhushan Dr. R.S. Paroda

Dr. Indra Mani cultivating knowledge and commitment to advancing seed sector

Glimpses of Plenary - cum Distribution Session

Dr. H.S. Gupta addressing to shape the future of seed technology

Dr. K.S. Baig

Dr. Shiv K. Yadav

Dignitaries of plenary session

Awards Distribution







Awards Distribution












Awards Distribution

Padam Bhushan Dr. R.S. Paroda : Guiding the seed sector towards a sustainable future

POSTER SESSION, EXHIBITION AND REGISTRATION

Poster session : Visualizing innovation

Interactive platform for knowledge exchange and collaboration

Exhibition

Seeds of innovation on display

Glimpses of NSC

Registration for NSC - 2023

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