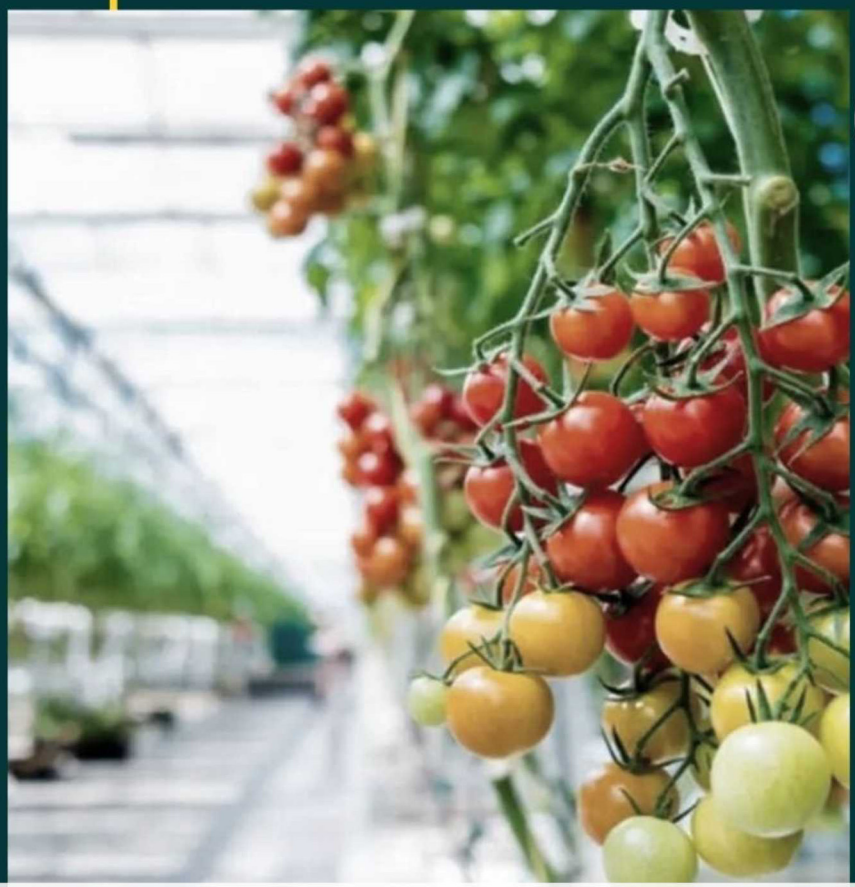
14th Swadesh Prem Jagriti Sangosthi

28-31 May, 2022

National Conference on Climate Resilient and Sustainable Development of Horticulture – A Way Forward

Excerpt of the Actiities and Recommendations



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14th Swadesh Prem Jagriti Sangosthi - 2022

National Conference on

Climate Resilient and Sustainable Development of Horticulture - A Way Forward

CSAUA&T, Kanpur, U.P., India

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Climate Resilient and Sustainable Development of Horticulture - A Way Forward

EXCERPT OF THE ACTIVITIES AND RECOMMENDATIONS

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Correct citation
Singh D.R., Babita Singh, H. Choudhary and J.S. Parihar 2022, **Climate Resilient and Sustainable Development of Horticulture – A Way Forward**.Proceeding of 14th Swadesh Prem Jagriti Sangosthi, ***National Conference on*** **"Climate Resilient and Sustainable Development of Horticulture - A Way Forward"**, 28-31, May 2022, Lt. Amit Singh Memorial Foundation, New Delhi, India.Pp 60.

Publishing Partner
Westville Publishing House
47, B-5, Paschim Vihar, New Delhi – 110063
Tel: 011-25284742, 45521968, 0-9868124228
Email: westville2002@gmail.com
www.westvillepublishing.com

Confederation of Horticulture Associations of India (CHAI)

(Reg. Section 25 of the act 1956 and ISO 9001-2008 certified Organisation)

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Foreword

Horticulture, comprising Fruits, Vegetables including tubers and potato, Floriculture, Spices, Plantation, Medicinal and Aromatic Plants, has emerged as vital for the socio-economic development of the country. This is inevitable to ensure nutritional security, environmental services, employment generation, health care and above all effective and productive land use. The emerging trend worldwide and also in the country is indicative of a paradigm shift in dietary preferences with health consciousness and rise in expandable income. This change is demanding more horticultural produce. A trend of horticulture development in the past, particularly during the last two decades, has been satisfying. The adoption of horticulture crops in a systematic manner has improved the quality of life of people in many regions, as farm profitability increased. The current challenges to the horticulture are investment and capital access to technology and initial learning for the development of the acquired skills. Attempts to address many of these issues were made through mission mode approach, which brought a revolution in horticulture, referred to as **Global Revolution**.

The initiatives provided access to technology and markets to enhance income and attract educated youth to the horticultural farming, considering that, it is economically rewarding and intellectually satisfying. However, in the last few years, climate change has become one of the threats in achieving the goal of enhanced production to meet the needs of growing population, likely to be 9.6 billion globally. The challenge in horticulture, thus, is much more than before. Wherein, we have to produce more with declining land and water availability in the scenario of climate change. This calls for climate resilient and sustainable development of horticulture through technological intervention, innovation and skill up-gradation. Accordingly, **ASM Foundation,** in association with **CSAUA&T,** Kanpur, Uttar Pradesh, organised the14th Swadesh Prem Jagriti Sangosthi (SPJS-14) –2022 and a National Conference on Climate Resilient and Sustainable Development of Horticulture, from 28-31 May 2022**.** The conference was well attended, and brought out recommendations which will go a long-way in addressing the challenges.

The conference deliberated the issues in 16 technical sessions along with a grand inaugural and action oriented, Valedictory and Award Function. The conference and other activities of SPJS-14 were highly successful and had lively discussions in the conference by the delegates and representatives of various sectors. The recommendations, which emanated from the conference, will have a far-reaching impact on developing strategies for enhancing sustainable development of horticulture. The conference also analysed the impact of climate change on production and productivity of horticultural crops and how these challenges can be mediated through various technologies.

I compliment the ASM Foundation and **CSAUA&T, Kanpur, Uttar Pradesh** for organising this National conference on **Climate Resilient and Sustainable Development of Horticulture** by providing valuable forum for dialogue and to bring focus on climate resilience and sustainable development. This publication is expected to be useful for all the stakeholders, working on Climate Resilient and Sustainable Development of Horticulture. I am sure that this document will be useful to all concerned with the perspective of innovations in agriculture including horticulture and climate change issues.

H.P. Singh

H.P. Singh
Chairman

ACKNOWLEDGEMENT

Recognising that, Climate change is happening, there is a need for climate resilient development. Since, climate change is likely to disturb the food chain, it is essential to develop strategies for sustainable development of horticulture. Therefore, to have dialogue and develop policy for climate resilient and sustainable development of horticulture, based on past knowledge, a National conference on Climate Resilient and Sustainable Development of Horticulture was organised jointly by ASM Foundation, New Delhi and CSAUA&T, Kanpur, Uttar Pradesh. The conference was a grand success in terms of participation, technical content, and outcome. More than 250 delegates from across the country, including scientists, farmers, students and representatives of industries, participated in the conference, in person and more than 500 delegates attended the conference on virtual mode.

The conference was inaugurated by Chief Guest, Dr. A.K. Srivastava, Chairman, ASRB, New Delhi. The deliberations were held in 16 technical sessions, which had 9 plenary lectures, 35 keynote presentations and 95 oral presentations. Besides technical sessions, farmer participatory discussions and a farmer quiz were also held. The conference concluded on 30th May, 2022, with Plenary and Award Function. The selected farmers from across the country were conferred with Amit Udyan Ratna Award-2022. Also, the awards for Best Oral Papers and farmers quiz were conferred on selected candidates. The recommendations of the conference were adopted for circulation and action.

The ASM Foundation places on the record, an appreciation to Dr D R Singh, VC, CSAUAT, Kanpur, U.P. for hosting 14th Swadesh Prem Jagriti Sangosthi-2022 and the National Conference, and for providing support to the extent possible, for the success of the conference. We extend our sincere thanks to dignitaries, farmers, chairperson of all the sessions, conveners, co-chairs, and speakers.

We are highly thankful to Chief Guest for attending the Valedictory Function of the conference and conferring the awards. We are also thankful to the volunteers, who supported the conference to ensure a successful and fruitful event. Last, but not the least, we are thankful to all, who contributed directly or indirectly for the success of this conference. Special thanks are also due to Dr. Karam Hussain, Director Research, CSAUA&T, Kanpur and the team for their dedicated co-operation and commitment to take the tasks for successful organisation of the conference.

I am looking forward for your continued support to achieve the goals and objectives of the Foundation, in our efforts to build New India through improved livelihood, education and health care. I have pleasure in presenting this proceeding of the conference for information and implementation of recommendations, as deemed to be fit.
Thanking you.

Yours sincerely,

Bimala Singh

(Bimala Singh)
Managing Trustee
ASM Foundation
and National Organising Secretary General

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CONFERENCE SUMMARY AND RECOMMENDATIONS

Horticulture, comprising of Fruits, Vegetables including tubers, Floriculture, Spices, Plantation, Medicinal and Aromatic Plants, has emerged as a vital for the socio-economic development of the country. A paradigm shift in dietary preference with increase in health consciousness and rise in expandable income is noted, which is demanding more horticultural produce. The initiatives of Government, with a turn of the century provided access to technology and markets to enhance income and attract educated youth to the horticultural farming. However, in the last few years climate change has become one of the threats in achieving the goal of enhancing production to meet the needs of growing population. This called for climate resilient and sustainable development of horticulture through technological intervention, innovation and skill up-gradation. Accordingly, **ASM Foundation** in association with **Chandra Shekhar Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh** organised a National conference on **Climate Resilient and Sustainable Development of Horticulture**, May 28-31, 2022. The conference was attended by over 250 delegates including farmers physically and above 500 online.

The conference was structured to deliberate and discuss the issues systematically through Plenary Lectures, Keynote Lectures and Oral presentations and finally adopting recommendations in the plenary session, to provide policy guidance for its adoption, to achieve accelerated growth of India horticulture. The Plenary lectures and keynote lectures were delivered by reputed theme leaders in their respective fields. The keynote speakers were also an expert of international repute. The conference deliberated on issues in 16 technical sessions, besides, introductory and valedictory session. There was an open session for industry, entrepreneurs and field functionaries, besides, workshop and panel discussion.

A farmers' quiz was organized to empower the farmers with new knowledge. The issues on climate resilience and sustainable development of horticulture were discussed. Awards of Confederation of Horticulture Associations of India (CHAI), in various categories *i.e.,* Honoured Fellow, Honorary Fellow, Life Time Achievement Award and Life Time Recognition Awards were also conferred on selected nominations. ASM Foundation Awards that were conferred are, Amit Krishi Rishi Award-2022, Amit Padma Jagariti Award-2022 and Amit Prabudh Manisi Award-2022 and also Amit Udyan Ratna Award-22. The Shodh Chintan Vol.14, other publications such as, Book of Abstract, Award and Fellowship of CHAI, Award and Awardees of ASM Foundation and CD of Conference were released.

The Technical Sessions were: Paradigms in Climate Resilient and Sustainable Development of Horticulture - Challenges and Options; Technological Challenges and Approaches for Climate Resilient Development of Horticulture; Innovations in Production Systems Management of Perennial Horticulture for Climate Resilient and Sustainability; Innovations in Production System Management for Vegetables, Tubers, Spices and Flowers for Climate Resilience and Sustainability; Innovations for Climate Smart Production Systems in Horticulture for Resilience to Climate Change; Varietal Improvement for Resilience to Climate Change and Sustainability in Production; Water Management for Enhancing Resilience to Climate Change; Nutrient Management for Enhancing Resilience to Climate Change; Plant Health Management for Resilience to Climate Change and Sustainability in production; Human Resource Development and Diffusion of Knowledge for Technological Changes for Climate Resilient and Sustainable Development of Horticulture; *National Workshop on* Digital Horticulture for Resilience to Climate Change and Sustainability; Post harvest management Access to Market and Value Chain Management for Sustainable Production of Horticulture Crops; Farmers' Participatory Discussion for Climate Resilient and Sustainable Development of Horticulture and Knowledge Empowerment of Farmers through Farmers' Quiz. A panel discussion for Climate Resilient and Sustainable Development of Horticulture was also organised.

After deliberation and discussion in 16 technical sessions with the presentation of 9 plenary lectures, 31 keynote presentations, 65 oral presentations, recommendations were developed and were presented in valedictory session for adoption. The recommendations which emanated are:

2.1 Recommendations

1. Considering that young students and farmers are future of the nation, there is a need for inculcation of the spirit of patriotism through education, secured health, economic upliftment and social values. Life has its beginning, and its maturity comes into being, when an individual rises above self to something greater for the country and community, which is a must, for improving quality of life of people in rural areas. Agriculture/horticulture based allied sector have potential to play a significant role in economic development of the people.

2. Horticulture, generally referred to as gardening, has expanded in its scope and activities, moving from rural confines to commercialisation, and now it is providing best option for land use, nutritional security, employment opportunity, health care and above all environmental services. The trend of development in the past, especially during the last decade, has been satisfying, that adoption of horticultural crops in a systematic manner has improved the quality of life of people in many regions of the country. However, to address the emerging challenges, innovations in technologies through institutional support, as well as, import of required knowledge and technological backing for the development, through skills are inevitable.

3. Diversification to horticulture has resulted in unprecedented development in last decades, as the production has reached to 333 million tonnes, with annual decadal growth rate of 6%. The farmers' income has also increased many folds by adoption of horticulture. However, potential still exist for enhancing the farmers income through diversification to horticulture. This will require a focus on the

development of appropriate cultivar, quality planting material, appropriate root stocks, plant architecture engineering and management, efficient system of pest and diseases management, on farm value addition and above all, linking the farmer to the market. Therefore, horticulture must have to be a priority for research and development.

4. Climate change, a cause of concern globally, will have impact on horticultural crops due to erratic rainfall, rise in temperature and CO_2 concentration, and likely to lead to enhanced biotic and abiotic stresses and high demand for water. However, the changes will not only be harmful, as enhanced CO_2 concentration may enhance photosynthesis, and increased temperature may hasten the process of maturity. Innovations and concerted efforts may convert weaknesses into the opportunities. Thus, addressing the issue of resilience to climate change is essential. This demands for better understanding of the impact of climate change variables on horticulture to develop strategies to mediate and achieve resilience to climate change.
5. The potential of perennial fruit and plantation crops for higher carbon sequestration provides an opportunity to be a sink for increased carbon dioxide and, additionally, opportunity for soil carbon sequestration. Interior and exterior landscape gardening has proven beneficial in reducing carbon concentration. Taking stock of current knowledge about the effect of climate variables and their synthesis for new knowledge in relation to climate change is imperative for adaptive strategies.
6. There is a need to promote and support urban and peri-urban horticulture. The carbon credit scheme should be extended to vertical gardens. Trees furnish live green technology to suffice environmental moderation with cooler, healthier and aesthetic touch in urban life. Tree plantation should be encouraged in the residential as well as private and public urban neighbourhoods. Interior-landscaping with indoor plants should be increased in homes and offices, as these are found to be linked with improved indoor air quality and better human health. Thus, there is a need to promote Environmental horticulture,
7. The strategies should be considered to formulate innovative packages of options based on past experiences to promote improved and innovative development options. In this context, precision horticulture has emerged as one of the options, considering that it is economically rewarding and intellectually satisfying and has potential to provide better employment and involves more skilled people in the diverse activities, above all, enhancing farmers' income.
8. Digital horticulture aims to improve industrial matrix such as, yield, profit and sustainability and to transform the sector's commodity trading, purchase of inputs, and traceability of product. The technique used are Block Chain, IoT (Internet of things) and data information platform. The Block Chain is a type of distributed ledger that is to be used to capture, organise, and validate data. Blockchain makes complex transaction quicker and cheaper to execute, which benefits the stakeholders. Thus, digital horticulture needs focused attention
9. Internet of Things (IoT) is the network of physical devices that collect, connect and exchange data. The devices measure variability of parameters at multiple places for effectively managing the crop. The crop management is tailored on information about, within field variability in soil and/or nutrient and water. A well architected Artificial Intelligence (AI) helps in achieving higher yields while optimising resources efficiency, thus, enabling farm to be more sustainable, viable and profitable. However, AI (Artificial Intelligence) has to be integrated with IA (Information Architecture).
10. Digital marketing, referred as online marketing is a promotion of brands to connect with potential customers using the internet and other form of digital communication. There is a growing interest on digital horticulture, using e-platform for information exchange and management, not only for

marketing but also for production system management and value chain management using various types of data driven platforms for decision making. This need to be promoted.

11. Hydroponics/ Aeroponics is emerging as a technology to produce seeds and plants free from the diseases. This technology has been successfully applied in seed tuber production in potato, and can be adopted effectively in quality production of high value fruits and vegetables. The technology has its application in vertical gardening also. Therefore, there is a need for promoting hydroponics/ aeroponics to provide higher income per unit area of land and water, which can help farmers to achieve the enhanced income.

12. Investment and capital, access to technology and the initial learning curve to develop the required skills must find focused area. Private participation for innovation must be encouraged with reforms in rules and regulations. Policy must encourage farmers for producing more with less by adopting precision horticulture integrated with IT technology. A digital platform is needed at national level, state level, district level connected to block level where input supplier, technology provider, consumers and farmers can interact for the required product. Farmers can get inputs and technology and consumer can get their products. Value chain technologies may be promoted, utilising Blockchain technology and AI.

13. Water is critical resource for sustainable development, which is getting scarcer and meeting multifaceted uses will be a great challenge of the future. The long-lasting solution to water problem could be addressed through water governance and management paradigm. A new paradigm is encapsulated in integrated water resource management, which promotes land development and management of water and related resources, for maximising the related economic and social welfare without compromising the sustainability of vital system. Therefore, integrated system of water managements need to be promoted.

14. Micro-irrigation system of irrigation has benefitted farmers across the country. The potential of micro irrigation has been identified by Task Force on Micro irrigation to the tune of 69 million hectare. Through the programmes of the Government, only 13 million hectares have been covered. One of the hindrances in coverage of area is the policy. It would be essential to **declare micro irrigation as Infrastructure and Priority sector**; which will help farmers in adaption, as credit support will be adequately improved.

15. Impact analysis of micro irrigation revealed that farmers invariably introduced high value horticultural crops like grapes, banana, mango, cashew nut and coconut after installing the drip system, and achieved yield increment ranging between 41% (grapes) to 141% (Pomegranate) over the state average yield. Economic analysis of 695 beneficiary farmers and 76 non-beneficiary (who installed drip system without any Govt. subsidy) farmers indicated that the cost was recovered in a period of less than three seasons in majority of the cases. Therefore, this system must be promoted.

16. Smart Nutrient Management system recommends the nutrient requirement of crops on the basis of general nutrient uptake by the plant and further adjusts the dose on the basis of targeted yield and the level of nutrients already available in the soil, soil pH, bulk density, organic carbon content, *etc.* by analysing and interpreting the soil, water and tissue (leaf) analysis report of the farmer's field (Soil Health Card). It also takes the antagonistic and synergistic interaction among nutrients into consideration. The system economies the nutrient needs and gives optimum targeted yield. Therefore, more intensive research is needed to make the system adoptable by the farmers for efficient use of soil heath card, and to maximise the income.

17. Integrated Nutrient Management (INM), improved planting stock, organic farming, trap crops, bio-control measures, high-tech nurseries and improved productivity has to be emphasised to boost the

production in horticultural crops and also to mitigate the effects of climate change. Research on cropping schedule should be intensified to adapt to climate change. With advancement in technology, it has been possible to grow several crops out of the season. Therefore, there is a need to develop cultivars and production technologies, which can fit well for industrial production under controlled climate and light conditions.

18. Increasing the use of chemical fertilizers, while degrading the soil health at the same time has significantly contributed in the buildup of greenhouse gases. Use of bio-fertilizers can reduce the application of chemical fertilizers and increase crop productivity and help in reduction of the buildup of greenhouse gases. Organic farming could be very much adapted to climate smart agriculture which will provide a high degree of diversity in the ecosystem. Therefore, work on microbes and its application need priority.

19. Improved planting stock through high-tech nurseries and use of hybrids in vegetable have to be emphasised to boost the production in horticultural crops. Tissue culture in banana and pomegranate has not only improved the production and productivity, but has multiplier effect on employment and assuring best quality plants Therefore, this technology must be promoted for other horticultural crops to assure high quality production mechanism.

20. Rootstock plays a significant role in mitigating soil related problems, both biotic and abiotic stress, beside appropriate plant architecture. Thus, the development of new root stock has to be a continued practice. New rootstocks, besides mitigating soil related problem must provide plant architecture suitable for changing production system and management of mechanisation for efficiency of the orchards. Therefore, rootstock research and application have to be given a focused attention.

21. In recent years, use of root stock for managing soil borne diseases and problematic soil, for growing vegetables have been found successful. The rootstocks have been found useful in melons, brinjal, tomato for its growing in problematic soils. However, understanding of rootstock and scion interaction is limited. Therefore, intensified research is needed to identify appropriate rootstock in vegetables, ensuring freeness of scion from virus diseases for enhancing productivity. The rootstock research and development must be intensified to harness the potentiality in vegetable crops.

22. With advancement in technology, it has been possible to grow various crops out of season, by modification in weather variability trough adoption of green house technologies. Green house protects from weather fluctuation and also provides better quality of produce. Poly tunnels are used to protect against low temperature for advancing harvest to catch to early market. However, there are limited cultivars suitable for the production system in green house. Therefore, there is a strong need to develop cultivars and production technologies, which can fit well for industrial production under controlled climate and light conditions.

23. Integrated approach towards the management of pathogens is needed. Practices such as crop rotation, application of micro-nutrients, soil pH management, exploitation of bio-agents, weather-based monitoring of plant diseases and rapid diagnostics are some of the important and emerging components of this holistic approach. Therefore, strategies must be developed for smart management of biotic stress, on the principle of observe, measure and respond to achieve maximum output and results. Improved plant health will improve water productivity.

24. Modified Integrated Pest Management (IPM) technology, incorporating all possible and available pest control techniques to keep pests below Economic Injury Level (EIL) is strongly needed in climate smart horticulture, having greater emphasis on weather data, crop phenology, physical and mechanical methods, agronomic techniques, use of trap and border crops, non-pesticides management, need

based chemical management and economics. Intelligent Pest Management should, therefore, be incorporated in climate smart horticulture and agriculture for improving water productivity.

25. The plants respond to light conditions both in term of energy and illumination. Growth and reproductive phases have requirement of different spectrum. However, understanding of light requirement for different crops in phases of growth and development have been inadequate for adjustment to harness the potentiality. LED light has been adopted to some extent to enhance productivity. But requires better understanding. Therefore, there is an urgent need for improving our understanding for light manipulation to maximise the output in relation to inputs. This calls for intensiveresearchwork on light in production of horticultural crops under modified atmosphere.

26. To achieve targeted growth there is a need for effective value chain, the activities starting from conceptualisation till it reaches to the consumers, involving all the stake holders in the chain of production to consumption. With enhanced efficiency of links in the chain there is enhanced output which improves profitability. The value chains could be further made effective through technological integration, logistic and policy support. It can help in maintaining inclusive ecosystem where farmers, entrepreneurs and all the stakeholders get benefitted by employment, income and quality produce to consumer. Therefore, value chain management has to be a priority.

27. Linking the farmer with markets is essential for remunerative returns from farm produce. There is a need for strengthening farmer producer organisation in terms of skills and investment. Choosing a right market and market development strategies are essential to scale up the operation through innovations in products and business models. Partnering with private sector for marketing and convergence with various ongoing programmes for backward linkage would provide a private sector taking care of forward linkages. Therefore, market research and developments needs emphasis

28. As horticulture provides ample opportunity for skilled employment through multiplier effect at various activities from production to consumption having the links in planting material production, input production and supply, packaging, storage, branding and its promotion. Thus, horticulture be declared as priority sector having the mission mode approach for value chain management Therefore, skill development and mentoring should be a focused part of any schemes to support horticulture.

29. Cold Chain Management empowers the farmers to get better income and better pricerealization from their farm produces. The cold chain also improves the quality and extends the shelf-life of perishable fruits and vegetables, and it ensures that fresh produce reaches to the consumers with no negative impact. Therefore, cold chain management has to be promoted to enhance income of the farmers.

30. There is need for augmenting an extension system with back stocking of feedback extension strategies and working out technology options in different climatic situation. Institutional support system linked with public and private enterprises would be essential. A concerted effort with identified goal involving all the stakeholders, keeping the technology at driving seat and farmers as centre of attention, would definitely help in achieving faster and inclusive growth. The existing system has to be empowered with knowledge to serve the farmers better with not only technological changes but with new paradigm in marketing. Therefore, there is a need for reorienting extension system.

31. Market reform and value chain management system should be such, which provide access to market and better realisation of price for the produce. Developing markets and agricultural credit will be a key to ensuring that India's farmers have access to affordable institutional credit for quality horticultural inputs, as well as access to adequate remuneration for the produce. This is essential to enhance farmers' income.

32. Nano-technology provides opportunities for the development of processes and product, which are impossible to achieve through conventional system. Therefore, use of nanotechnologies in agriculture has to be given emphasis through the appropriate investment on research and development. Diagnostics based on nanotechnology, nano- pheromon for insect, pests and nano sheets for packing needs have to be encouraged through appropriate investment.

33. There is a need to build a society of innovators, manufacturers and technology providers, as the development needs innovation on the driving seat for expected output. Therefore, it would be imperative to build atmosphere of policy framework where innovators and innovative companies make their investment in future technologies. Doubling of farmers income can only be achieved with new innovation and enabling policy for investment.

34. A concerted effort with identified goal involving all the stakeholders, keeping the technology at driving seat and farmers as centre of attention, would help in achieving faster and inclusive growth. The extension must, focus on producer aggregation at various levels and provide forward linkages. The existing system must be empowered with knowledge to serve the farmers better with not only technological changes but with new model in marketing. Therefore, there is a need for reorienting extension system

35. There is a need to plan strategies for Local to Global, as we have strength in agriculture with demographic deviants. For hygiene reasons, in the future, food items might be required to be pre-packaged. This can lead to labelling requirements and a change in-store or market arrangements. Redesigning of the food logistic centres with larger storage capacities and computerised systems that can respond to demand with less manpower and high efficiency is essentially needed. The government may encourage consumers to support local products over imports.

36. There is a need for change in land aggregation policies. The Government of India has already prepared a model act for aggregation of land, which provides opportunity for investment even on leased land. This would also help in adopting technologies and investment on infrastructure. However, it has to be implemented by the states to legalize the land leasing for promoting horticulture efficiency and for achieving needed productivity improvement in horticulture. This would enable the use of technologies, which may lead to improved water productivity

37. Honeybees are the pollinator, which enhances the crop yield, from 25 to 100 percent, more so in horticultural crops, and also provides honey and other products as additional income to the farmers. Therefore, bee keeping has to be promoted more effectively in farm sector by having end to end approach. This will include bee colony, management strategies, and value addition in honey. This would help farmers in realizing better income from unit area of farm. Therefore, bee keeping must be promoted in mission mode in the suitable area, identifying appropriate bees and support for colony and boxes coupled with skills up-gradation

38. Well planned strategies based on knowledge and technology could convert the threat into the opportunity, provided work is done in mission mode, integrating all the efforts together, addressing the issues concurrently involving all the stakeholders. There is a need to analyse the impact locally and develop partnership in managing the climate change for resilience in production of horticultural crops.

1. PROCEEDINGS OF SWADESH PREM JAGRITI SANGOSTHI (SPJS) – 2022 AND NATIONAL CONFERENCE

innovation and skill up-gradation. Therefore, ASM Foundation in association with Chandra Shekhar Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh organised a National Conference on Climate Resilient and Sustainable Development of Horticulture May 28-31, 2022.

SPJS-14 had many other activities, besides the conference, befitting to the objectives of the Foundation. The conference was organised in 16 technical sessions along with a grand inaugural and action oriented Valedictory and Award Function. The conference and other activities of SPJS-14 were highly successful and had lively discussions in the conference by the delegates and

Horticulture, comprising Fruits, Vegetables including tubers, floriculture, Spices, Plantation, Medicinal and Aromatic Plants, has emerged as vital for the socio-economic development of the country. A paradigm shift in dietary preference with health consciousness and rise in expandable income is demanding more horticultural produce. The adoption of horticulture crops in the systematic manner has improved the quality of life of people in many regions as farm profitability increased. However, in the last few years climate change has become one of the threats in achieving the goal of enhanced production to meet the needs of growing population. In the emerging scenario more have to be produced with declining land and water availability, where the climate change is a threat. This calls for climate resilient and sustainable development of horticulture through technological intervention,

representatives of various sectors. The recommendations, which emanated from the conference, have a far-reaching impact on developing strategies for climate resilient and sustainable development of horticulture. The deliberations and discussion in the national conference provided an insight and strategies, which provided a direction for climate resilient and sustainable development of horticulture.

Considering that horticulture has to play a pivotal role to achieve quantum jump in economy and providing livelihood to millions, while learning from pandemic, horticulture require to be vibrant and competitive to ensure food and nutrition beside enhanced income to farmers and better employment. Therefore, new paradigm with effective dynamics is called for changing scenario, which will demand technological changes, upfront policy and technology led value chain management. Recognising this urgency, a dialogue with leaders and stakeholders, this conference was organised. A national workshop and plenary discussions were also organised. During the inaugural session award and fellowship of CHAI and award of the Amit Singh Memorial Foundation were conferred on selected nominations. Amit Udyan Ratna Award**s** on 26 farmers from across the country, farmers Quiz award and best paper awards were conferred during award functions. The contribution of the volunteers was recognised by giving a certificate of appreciation.

1.1. Inaugural Function of SPJS and National Conference

The Inaugural function of the national conference started with prayer to Goddess Saraswati and University song. Dr. D. R. Singh, Vice Chancellor, CSAUAT, Kanpur and Chairman, Organising Committee welcomed the chief guest, other guests, delegates, press and media.

1.1.1 Tribute to the Inspirer

During the inaugural function, floral tribute was paid to Lt. Amit Singh by the chief guest and dignitaries, to a hero, who sacrificed his life for mother nation. Lt. Amit Singh Memorial (ASM) Foundation was formed in the memory of Lt Amit Singh. ASM Foundation, has been doing appreciable work for rural development through various programmes, which is well known. This Swadesh Prem Jagriti Sangosthi - 2022 is the 14th in the series, which has succeeded in improving livelihood through various activities. All the dignitaries expressed their gratefulness to Dr. H.P. Singh and Mrs. Bimala Singh, who have devoted their lives for the cause of farmers and students. Activities of the Foundation were explained in detail during the programme. Chief Guest and all the Dignitaries paid their floral tribute to Lt Amit Singh, who is an inspiration to all of us.

1.1.2 Blessings of Dignitaries

Dr. D. R. Singh, while speaking on the occasion explained about various activities of the University, which is moving dynamically under his leadership. He thanked Mrs Bimala Singh, Managing Trustee, ASM Foundation and expressed his gratitude for choosing this University, CSAUA&T, Kanpur to organise this important National Conference on Climate Resilient and Sustainable Development of Horticulture, which is highly topical, considering that climate change is the most critical for horticulture. He welcomed Dr. A.K. Srivastava, Chief Guest of the function and said that Dr. Srivastava, Chairman, ASRB has been on the forefront in the development of dairy science and has provided leadership of par excellence. He welcomed Dr. H.P. Singh, the man behind the organisation of the event, who is providing a leadership of par excellence in agriculture, especially horticulture. He also extended a warm welcome to Dr. T. Janakiram, VC, Dr.YSRHU, Venkataramannagudem, A.P., Dr. V. Praveen Rao, VC, PJTSAU, Hyderabad, Telangana, Prof. (Dr.) K. P. Singh, VC, MJPRU, Bareilly, U.P., Dr. B. Neeraja Prabhakar, VC, SKLTSHU, Mulugu, Siddipet, Dr P. Rethinam, Plantation Crops Specialist and Former; Executive Director, APCC. He added that after formation of Chandra Shekhar Azad University of Agriculture and Technology, the state has made appreciable growth. He briefly explained about the achievements of the university and its role in the growth of agriculture in the state of Uttar Pradesh.

Dr. B. Neeraja Prabhakar, VC, SKLTSHU, Mulugu, Siddipet, Telangna, speaking on the occasion, expressed her sincere thanks to the organiser for giving an opportunity and said that this national conference on climate resilient and sustainable development of horticulture is highly topical and befitting to the needs. The organisers have thought it more appropriately to discuss on the emerging issues of climate change and bring out the recommendations, which can go a long way for sustainable development of horticulture. She also, briefly outlined the

work of her University and said that Telangana Horticulture University is making all the efforts towards the sustainable development of horticulture through the research and human resource development. She also appreciated the efforts of Dr. H. P. Singh in bringing horticulture to forefront, which is now considered as best option for enhancing farmers' income.

Dr. T. Janakiram, VC, Dr. YSRHU, Venkataramannagudem, Andhra Pradesh shared his experience in relation to climate change and its impact on horticulture. He thanked the organisers for giving him an opportunity to be the part of the conference. He also expressed his gratitude to Chairman, CHAI, Dr. H. P. Singh for conferring Lifetime Achievement Award for his exceptionally outstanding contributions to the horticulture. Dr. Jankiram complimented the ASM Foundation for organising this conference on a topical issue. He further added that horticulture has made phenomenal growth during the decade, reaching to the target of production of more than 330 MT,however challenges ahead are much greater as we have to produce more with less. However, technological advancement in achieving higher production is critical, He further said that enhanced production has to be achieved with declining land and declining water and stressed upon greenhouse technologies, automation in irrigation systems, remote sensing based monitoring, use of artificial intelligence and drone technology. He also explained about various activities taken up by his University for sustainable development.

Dr. V. Praveen Rao, VC, PJTSAU, Hyderabad, Telangana, while speaking on the occasion, expressed his gratitude to Dr. H.P. Singh for inviting him to this conference, which is highly topical and timely. He also spoke about contributions of Dr. H.P. Singh to the horticulture revolution. Dr. Rao gave a brief account of various programme taken up by his University, especially on greenhouse technologies and water management and said that the conference organised last year in his University had deliberated and discussed regarding water productivity in agriculture, which has created an impact and many initiatives have been taken up to enhance unit productivity of water. He also explained about the resilience which uphold for preparedness to challenges and said that technologies are now available to mitigate and adopt to the climate change. Varieties have been developed which can sustain high temperature and can be grown with less water. The water management system has been developed which can produce more food with less water. Similarly, drone technologies will be effective in efficient management of pest and diseases. He also extended his thanks to Dr. Singh and Bimala Singh for their commitment to enhancing the income of the farmers through technological improvement.

Dr.P. Rethinam, Plantation Crops Specialist and Former Executive Director, APCC, Jakarta, said that he has been associated with Lt Amit Singh Foundation, since its inceptions and has been attending the programme organised by the Foundation from time to time. He expressed his gratitude to Dr. H.P. Sigh and Bimala Singh for their commitment in developing patriotic society through economic

development in rural area, education, health care and ethics and values. They require all the appreciates for their efforts. He further added about climate change and challenge to produce more with less. He said that climate is changing and its impact is seen on unprecedented increase in temperature and change in rainfall pattern. He also said that occurrence of drought is noted often. This phenomenon has impacted the horticulture in terms of yield and quality. He further said that many of the plantation crops like coconut, oil palm, cocoa, rubber, arecanut, coffee, and tea are likely to benefit by rise in Carbon Dioxide (CO^2) in environment subject to the availability of water. Deliberation in the conference will bring the issues in the focus to develop strategies for climate resilience and sustainable development of horticulture.

Dr. H.P. Singh gave a brief remark appreciating efforts of the Dr. D. R. Singh, Vice Chancellor, CSAUAT, Kanpur and Dr. Karam Hussain, DR, CSAUA&T, Kanpur, for hosting the National conference. He also said that Dr. D. R. Singh in his entire career has worked on horticulture. Under the dynamic leadership of Dr. Singh, the university has achieved excellence. He also expressed his gratitude to Chief Guest Dr. A.K. Srivastava, Chairman, ASRB, DARE, MoA&FW, New Delhi for agreeing to be the chief guest and gracing the conference. He highlighted the contribution of Dr. A.K.Srivastava for the development of Dairy in India. He paid a tribute to Lt. Amit Singh, who sacrificed fighting for the nation, in Operation Rakshak, 2000 and is the inspiration to all of us. Lt. Amit Singh Memorial Foundation is an organisation committed to the economic development and knowledge empowerment of people through various activities. The ASM Foundation has successfully organised various Global and National Conferences in the country and conducted farmer-friendly activities, mainly dedicated to education, health care and economic development. The Foundation also confers awards in various categories to recognise the contributions of individuals/organisations. Dr. Singh also briefed about the role of CHAI and gave background information regarding the conference. He stated that the climate change is most critical in the agriculture and horticulture for food and nutritional security. We have to produce more with less. The climate change is a global phenomenon which increases the vulnerability of crops to weathe variables. Thus, there is a need to work on strategies for resilience to achieve sustainable development. Thus, this conference is highly topical to feed growing population with declining land and water in the scenario of climate change. To deliberate on the issue and come with strategies which can bring resilience to climate change and achieve sustainable development. He further explained about the conference which has 16 technical sessions and shall conclude on 30th May followed by a field visit.

Dr. A.K. Srivastava, the Chief Guest and Chairman, ASRB, New Delhi, speaking on the occasion thanked Dr. H.P. Singh and Mrs Bimala Singh for their efforts in managing the the Foundation for the economic development in rural area through conferences, Sangosthi, conferment of awards and adoption of student for higher education. He also shared his experience of participating in the conference in different capacity and delivering plenary lectures. Further, he added the topic chosen by the organisers is high topical and the deliberation and discussion may bring new knowledge for resilience to climate change. Dr. Srivastava explained the resilience and sustainability and said that to achieve the goal we have to produce more with less. He also emphasised the need for integration of dairy and horticulture to get maximum output specially in terms of products. He opened the conference for deliberations

1.1.3 Conferment of Awards

The Award was conferred by the Chief Guest, Chairman, CHAI and all the guests on dias.

1.1.3.1 Award and Fellowship of CHAI: The Award of Confederation of Horticulture Associations of India (CHAI) was announced by Dr. Bir Pal Singh, Former Director, CPRI, Shimla. He briefly outlined about CHAI and said that the CHAI is committed to the furtherance of horticulture and agriculture through activities integrating scientists, institutions, and farmers. It recognises the contributions of individual and organisation by conferring fellowships and awards. He read citation of awardees and requested the Chief Guest and also the Chairman, CHAI to confer the award to selected nominations. Selected nominations were conferred the awards by the Chief Guest and dignitaries on the dais. CHAI-**Honoured Fellow- 2022,** which recognises the contributions and leadership of par excellence, was conferred on **Dr. A. K. Srivastava**, Chairman, ASRB, DARE, MoA&FW, New Delhi by Dr. H.P. Singh, Chairman, CHAI. The award carried a citation,

plaque of honour and certificate. This is the most prestigious award of CHAI. The **CHAI- Life Time Achievement Award-2022**, which recognises the outstanding contributions to horticulture and the CHAI-Honorary Fellow-2022, recognises exceptionally outstanding contributors were conferred by the chief guest and dignitaries, which consisted of plaque of honour a citation and certificates. The CHAI- Life Time Achievement Award-2022 was conferred on Dr. T. Janakiram, VC, Dr.YSRHU, Venkataramannagudem, A.P. CHAI-Life Time Recognition Award-2022 was conferred on Dr. Anoop K. Srivastava, CCRI, Nagpur for their exceptionally outstanding contributions to horticulture. CHAI-Honorary fellow- 2022 were conferred on Dr. B. Neeraja Prabhakar, VC, SKLTSHU, Mulugu, Siddipet Dist; Dr. R. K. Singh, Former Director/VC, IVRI, Bareilly, U.P.; Dr. Narendra Kumar Gontia, VC, JAU, Junagadh, Gujarat and Prof. (Dr.) K. P. Singh, VC, MJPRU, Bareilly, U.P. for their contributions and providing leadership of par excellence.

1.1.3.2 Lt. Amit Singh Foundation Award: Lt. Amit Singh Foundation recognises the exceptionally outstanding contributions in the field research, education, and development by conferring various awards for leadership. Dr. Babita Singh, Trustee ASM Foundation, announced the award, read the citation of selected nominations, and requested the Chief Guest for the conferment of the awards, which carries a plaque of honour, citation and certificates. The awards were conferred by the Chief Guest and dignitaries on the dais. Amit Krishi Rishi Award-22 was conferred on Dr. Ashok Dalwai, IAS, CEO, NRAA, MoA&FW, New Delhi (inabsentia) for his exemplary contribution in the field of agriculture and horticulture and leadership of par excellence. Amit Padma Jagriti Award for innovations and commercialisation of technology was conferred on Sahyadri Farmers' Producer Company Ltd. Adgaon, Nashik, Maharashtra. Amit Prabudh Manishi Award, which recognises the leadership of par excellence in academics and agriculture development, was conferred on Prof. (Dr.) K. P. Singh, Vice-Chancellor, MJPRU, Bareilly, U.P.

1.1.4 Release of Publications

Several publications of the ASM Foundation were released by the Chief Guest and dignitaries on the dais, which included Sodh Chintan, Vol.14 (ISBN:978-81-932266-9-8**) -2022**, a compilation of articles from the experts in the field of horticulture/agriculture/water management, Book of Abstracts-2022 covering more than 365 abstracts, and Proceedings of the ASM Conference-2021, covering the brief of activities and the recommendations of the conference held at PJTSAU, Hyderabad 16-19th September, 2021, the CD containing soft copies of Sodh Chintan, Book of Abstract, Proceedings, ASM Award and Awardees, and the CHAI-

Awards and Fellowship book were also released on the occasion. International Journal of Innovative Horticulture (Special issue, 75 years of Independence) was also brought out and released.

2. TECHNICAL SESSIONS

The deliberations in theme area started with Plenary Lectures from experts in the field of their expertise. The Plenary Lectures were organised in 3 sessions. Subsequently, next day technical sessions were organised concurrently at 3 locations (Halls). A workshop was also organized. The session deliberated and discussed to develop logical conclusion for strategic recommendations, which were discussed in Plenary sessions and award function, to adopt the recommendations.

2.1.1 Plenary Session-I (a): Paradigms in Climate Resilient and Sustainable Development of Horticulture - Challenges and Options

This session was chaired by Dr. T. Janakiram, VC, Dr.YSRHU, Venkataramannagudem, A.P. and Co-chaired by Dr. K. K. Kumar, Former Director, NRC on Litchi. The conveners of this session were Dr. K. Suresh, PS, IIOPR, West Godavari, A.P. and Dr Ajay Kumar Sharma, NRC Grape, Pune. In this session plenary lectures were delivered by the experts.

Dr. H.P. Singh in his plenary lecture – **Climate Resilient and Sustainable Development of Horticulture,** said that agriculture is deeply ingrained in the Indian cultural ethos and Despite many initiative of the Government, growth in food production was inadequate to meet the consumption needs of the growing population and food imports became essential in India till the mid–1960s. India responded to the challenge by reorganising research and undertaking agricultural activities, creation of institutions, price support mechanism to the produce. These steps led to quantum jump in production and productivity and the phenomena was called the Green Revolution. The country called for diversification and the diversification to horticulture became highly productive for enhancing income of farmers besides assuring nutritional security. But the challenge of climate resilient needs a new paradigm in research and development. He explained in detail and urged for taking up the challenges to strategically address.

2.1.2. Plenary Session-II:Paradigms in Climate Resilient and Sustainable Development of Horticulture - Challenges and Options

This session was chaired by **Dr. P. Rethinam,** Former Executive Director, APCC, Jakarta and co-chaired by Dr. R. G. Somkuwar, NRC for Grapes, Pune, Maharashtra and Dr. M. Feza,BAU, Sabour, Bhagalpur, Bihar. The conveners of this session were Dr. H. Usha Nandhini Devi,TAU, Coimbatore and Dr. Harshawardhan Choudhary, IARI, New Delhi. In this session plenary lectures were delivered by the experts.

In the presentation on **Strategic development of horticulture in Telangana for resilience to climate change**, Dr. B. Neeraja Prabakar, VC, SKLTSHU, Siddipet District, Telangana stated that Climate change refers to long term changes in temperature, relative humidity, rainfall and other climatic variables. The horticulture crops are exceedingly prone to climate change owing to long economic life of the plant which requires

huge initial investment and cultivating these crops has made farmers more vulnerable to climate change. There is a demand for climate smart horticultural practices or interventions which are customised to suit local needs. Strategies like conservation agriculture, natural resources conservation, reforestation, checks on population growth and pollution, reduction of greenhouse gases emissions, breeding drought resistant crops, tolerant to pests and diseases, early maturity, etc. are the need of the hour.

Dr. Dilip Kumar, Former Director, CIFE, Mumbai, highlighted the contributions of **Integrated aquaculture crop /horticulture – Livestock System (**IACHLS) to food security, social, environmental and economic benefits, and resilience, and proposed strategies to adopt IAHLSs in low and medium-income countries (LMICs). In Asia, China accounts for approximately 50% of the world's smallholders, followed by India with 23%, and Indonesia, Bangladesh, and Vietnam. These smallholders account for 380 million farming households, hold roughly 30% of the agricultural land, contribute up to 70% of the food calories produced in LMIC, and are responsible for 53% of the global food calories production for human consumption. The diversified cropping systems in IACHLS can improve the productivity of the principal crop as well as enhance food security through increasing nutritional indicators such as food consumption score and household dietary diversity. IACHLS, therefore, could be a key to achieving food and nutritional security and environmental sustainability both in the short and long term.

2.1.3 Plenary Session-III: Paradigms in Climate Resilient and Sustainable Development of Horticulture - Challenges and Options

The Session was chaired by Dr P Rethinam, Former Executive Director, APCC, Jakarta. Dr.Babita Singh, Project Manager, GEF, Rainforest Alliance and Dr. Karam Hussain, DR, CSAUA&T, Kanpur Co-chaired the session. Dr. V. Suchitra, HRS, Adilabad, Telangana and Dr. Babita Chaudhary, CPRI, RS, Modipuram, Meerut, U.P.were the Convenor. The chairman introduced the subject and requested the respective speaker for delivery of plenary lecture.

Dr. A.K. Srivastava, Chairman ASRB, New Delhi in his lecture entitled **Milk-Fruits Based Composite Products: Novel Approach for Harnessing the Therapeutic Virtues of Milk and Fruits** explained about wide-spread prevalence of malnutrition and emergence of life-style associated diseases among children, women and other vulnerable groups. Further he added that about 194 million children are stunted, wasted and suffering with micronutrient deficiency disorders. Malnutrition is responsible for 15% of the disease burden, 4% loss in GDP and about 8% loss of

productivity. One of the prime reasons of malnutrition is lack of diversity in our diet resulting in inadequate intake of certain key nutrients. Our ancestors in Palaeolithic era used to derive their daily food requirement from almost 500 different plants, whereas at present 80% of nutrients are derived from only 17 plants and 50% of calories from 8 food grains across the globe. On the other side, well-off strata of the society need to address the health issues primarily due to the changing life-style and food habits. Milk is considered as unique source of nutrients as well as physiologically active components, but milk also lacks some micronutrients (iron, copper and certain vitamins) and fiber. Therefore, there is obvious need for supplementing milk with necessary micronutrients as well as health promoting components form suitable sources. Traditionally, milk shakes, smoothies etc. are examples of milk-fruit based beverages. Fruit ice-cream, desserts, yoghurt and even traditional sweets specially those made with fresh fruit pulp/juice are appearing in Indian market and becoming popular. However, need is felt to improve the quality and stability of such formulations. Carotenoids, anthocyanin and chlorophyll extracts act both as colourant and anti-oxidants in composite dairy products. More than 1000 plant metabolites present in fruit and vegetables have potential in developing functional foods and nutraceuticals along with milk/milk ingredients. There is need to expand the research and development on composites with unique health characteristics and health benefits. It is expected that milk-fruit composites may modulate immunity, improve gut health, enhance vision and alleviate the free radical/reactive oxygen species (ROS) mediated cellular degeneration process. Scientific validation through in-vivo and clinical trials could be an appropriate strategy for promoting the commercialisation of these products,

In a Plenary lecture on **Strategic approaches for climate resilient and sustainable development of horticulture through technological changes**- **Dr. V. Praveen Rao,** VC, PJTSAU, Rajendranagar, Hyderabad, Telangana said that Commercial application of agrochemicals (pesticides, fungicides and herbicides) using Unmanned Aerial Vehicles (UAVs) popularly known as drones is now well established as a crop protection technique in several countries including China, USA and Australia. The brief but intense evolution and adoption of drone technology in agriculture has been disruptive in the crop protection industry. In this backdrop two interesting events occurred in India during the last couple of years: (i) Drones morphed into an affordable technology for field application by small and marginal farmers, and (ii) Relaxation of norms by DGCA for registering and operating drones by various stakeholders.End users of drone are challenged with the lack of trained and certified pilots and applicator experience that is far beyond basic drone operations but involves comprehensive understanding of the multiple variables affecting drone spray quality and pesticide efficacy. At PJTSAU holistic approach was employed with cross-disciplinary considerations. The SOPs were developed considering monitoring and identification of pests, guidelines to spray preparation and proper tank mixing sequence, calibration of UAV spray system, variables affecting accurate drone spraying. These SOPs may begin to mitigate the many challenges and variables that affect a quality spray by UAV aerial application of agrochemicals, but numerous knowledge gaps still exist that require further research to continually improve future best management guidance.

Mr. Sanjay Singh, Slavs Agro-tech Pvt Ltd, Karnataka spoke on Complimenting Nutritional Needs of Horticulture Crops through the Use of bio-stimulants as Supplements**.** He said that Nutrients are an essential component of plant health to increase the productivity, which depend on balance use. The bio stimulant "Wealth" has been used in Banana, Grapes, Vegetable, and other fruit crops, which increases yield ranging from 20-50% with improved quality and marketability of produce. Various farming systems have been suggested throughout the last few years with bio-stimulants being a novel and sustainable approach towards horticultural crop production, especially under biotic and abiotic stress. Therefore, there is increasing interest in the farming sector for new and effective biostimulant products. Application of bio-stimulant increases the root and shoot growth, improves resistance against stressors, rehabilitation of degraded soil and reduction in nitrogen fertilizer inputs are some of the most noteworthy benefits. The research reports suggest that it is highly beneficial.

2.2. Technical Session-2:Technological Challenges and Approaches for Climate Resilient Development of Horticulture

This session was chaired by **Dr. Dilip Kumar**, Former Director, CIFE, Mumbai and Co-chaired by Dr. Major Singh, DOGR, Rajgurunagar, Pune and Dr. Vijay K. Yadav, JDR, CSAUAT, Kanpur. The convener of this session were Dr A. K. Singh, FSRCHPR, Ranchi, Jharkhand and Dr. Swati Saha,IARI, RS, Pune, Maharashtra. In this session keynote lectures were delivered by the experts.

Dr. H.P. Singh spoke on **Regenerative Agriculture including Horticulture for Resilience to Climate Change and Sustainability** and said that regenerative agriculture is a holistic approach of conservation and farm management practice that improves soil health by rebuilding soil organic matter and restoring degraded soil biodiversity, crop resilience and nutrient density. This results in increased biodiversity both above and below the soil surface, as well as increased water holding capacity and carbon sequestration at greater depths, lowering climate-damaging CO2 levels in the atmosphere. Diversity and perennially are the essential components of regenerative agriculture, therefore, promoting perennial horticulture can help build healthy soils, restore clean surface and groundwater, and enhance the resilience of our food system. In order to counteract climate change, it is critical to support an agriculture system that is both ecologically and economically viable. While India's current economic and political structures are geared toward monocultural production, and for this type of perennial horticulture to prosper, appropriate socio-political and economic systems must be in place to support such system. In horticulture production system, there are examples which states that with effective soil management, soil health can be improved and crops can be grown with minimum inputs.

A presentation on **Diversification of Alliums in View of Present Climatic Conditions in India Dr.Vijay Mahajan,** explained about fascinating aspect of onion domestication in Western India. Among the cultivated species of *Allium*, onion (*A. cepa* L.), leek (*A. porrum* L.), shallot (*A. ascalonicum* L.) and chives (*A. schoenoprasum* L.) are well known vegetable crops grown in different part of India. Bulb/pseudostem of *A. clarkei*, *A. griffithianum*, *A. pratii* and *A. victorialis* are consumed raw, cooked or pickled. Cloves or bulbs of *A. ampeloprasum* and *A. chinense* are pickled. In Pithoragarh region of Uttarakhand Himalaya, India, young leaves of *A. stracheyi* are used as potherb or cooked mixed with potato. Fleshy fibrous roots of *A. hookeri* are consumed as vegetable in the north-eastern hill region or in soups and pickles in same way as *A. stracheyi* in the north-western Himalaya. In Bhutan, *A. fasciculatum* is generally used as vegetable (leaves and scape), salad and in soups (young inflorescence).

In the oral presentation **Dr.K. Kandiannan,**explained his study on analysis of rainfall variability. The monthly and annual rainfall data of 42 years (1980-2021) and weekly data for 31 years (1991-2021) were used for calculating summary statistics of rainfall (annual, seasonal, monthly and weekly), initial and conditional probabilities in MS Excel. The results indicated that annual average rainfall of this tract is 4594mm with range of 2893mm – 6413mm having CV of 16.8%. ($y = 8.3392x + 4414.8$ $R^2 = 0.0167$). The probability of getting 3976.4mm annual rainfall is 75% and it was predicted that chance of receiving 4000mm rainfall per year is 77.86%. **Dr. Veru, Dean**, JAU, Junagadh, Gujarat in his oral presentation explained about the experiment conducted at P.G. laboratory, Department of Horticulture, Junagadh Agricultural University, Junagadh to study the biochemical parameters of mango cv. Kesar. The effect of polymides was found significant on biochemical characters. The better response for different biochemical parameters like TSS (%Brix), reducing sugar (%), total sugar (%), non reducing sugar (%), ascorbic acid (mg/100g) and acidity (%) was recorded with fruit treated with 175 ppm Putrescinedihydrochloride for 5 minute, as it increased shelf life and quality up to 12 days' storage at room temperature.

Dr. S. Elain Apshara, explained about Cocoa (*Theobroma cacao* L.), the beverage crop of the world, introduced to India in 1798 as an agro forestry/plantation crop in western ghats hills and plains has become a commercial crop and is adapted to palm-based cropping systems, To test the adaptability of cocoa in different environments/ cropping systems and to identify multi-purpose and site-specific varieties, selective clones were evaluated in four southern states. Thirteen cocoa genotypes including parental clones and hybrids were for dry bean yields contributed by more no. of pods, no. of beans per pod and bean size. These best performing clones should be multiplied as clonal orchards she suggested.**Dr.K. Suresh** explained about Oil content and fatty acid composition in three different sources of oil palm hybrids. The fruit weight and mesocarp contents were higher in all the hybrids during summer compared to that of rainy months, while oil content was high during rainy months. The study confirms that oil content and fatty acid composition is influenced by temperature and rainfall during rainy and summer months. **Dr.Ajay Kumar** expressed that rising temperature continue to affect the agriculture and horticulture crops. In Uttar Pradesh, the crops such as banana, papaya, mango, etc., that require specific climatic conditions have been suffering lately.

2.3 Technical Session-3: Innovations in Production Systems Management of Perennial Horticulture for Climate Resilient and Sustainability

This session was chaired by **Dr.S. K. Malhotra,** PD, ICAR-PD, AC Agriculture and Former Agriculture Commissioner, MoA&FW, GoI, New Delhi. The Co-chair of this session were Dr R. K. Mathur, IIOPR, Pedavegi, West Godavari District, A.P. and Dr. Anita Karun, Acting Director, ICAR-Central Plantation Crops Research Institute, Kasaragod, Kerala. The conveners of this session were,Dr S. Elain Apshara**,** CPCRI, Vittal, Karnataka; Dr. Kundan Kishore, PS, FIAHS, CHES, Bhubaneswar; Dhananjay N. Gawande, scientist, NRCG Pune and Dr. M. D. Ojha, Noor Sarai.

Keynote lecture entitled Knowledge diffusion for sustainable development of horticulture was presented by **Dr.Suresh K. Malhotra,** Project Director, ICAR-Directorate of Knowledge Management in Agriculture and Former Agriculture Commissioner, MoA&FW, GoI, New Delhi**.** He explained various facts of knowledge which has emerged through intensive research. Fruitful documents and its dissemination are pre-requisite for making a dialogue. He emphasised on various technologies of knowledge management giving

several examples**.** He further added that knowledge which is converted to technology is of great power and has to be strategically managed to address the challenges.**Dr. Vishal Nath,** IARI, Jharkhand, Gauria Karma, Hazaribagh, in his Keynote presentation entitled Strategies and approaches for climate resilient and sustainable production of Litchi, highlighted that Litchi is a specialty fruit whose flavour and taste are beyond compare.. In recent past, lot many efforts have been made to test the crop performance in various regions of the country with successful outcomes. Climate-resilient adaptation strategies hasto be implemented for higher productivity.The smart use of adaptation strategies at an appropriate time is the key for success and overcoming the ill effects of climatic change and achieve sustained production of litchi in India.

In the presentation entitled Strategies for climate resilient and sustainable development of Oil Palm**,** Dr. Mathur said that Oil palm is a humid tropical crop and it is native of West Africa. It is highly adaptive to climatic variations and because of this, its cultivation has spread even to South-East Asian countries. It is imperative to develop adaptation and mitigation strategies for areas presently suitable and to concentrate on areas at higher altitudes for developing production technologies to successfully grow oil palm in a sustainable manner. In the Keynote presentation entitled Strategic Approaches for Climate Resilient and Sustainable Production of Plantation crops in India, **Dr.P. Rethinam**, explained about Plantation crops like coconut .oil palm, cocoa, rubber, arecanut, coffee ,and tea which are high value commercial crops and play a vital role in the indian economy in earning foreign exchange. Climate change might worsen existing regional disparities as it will reduce yields mostly in lands located at lower latitudes, where many developing countries are situated. Strategies to enhance local adaptation capacity are therefore required to reduce climatic impacts and maintain regional stability in oil production. At the same time, plantation crops offer several opportunities to mitigate the portion of global greenhouse gas emissions that are directly dependent upon land use and land-management techniques.

Dr. Anitha Karun, in her keynote presentation entitled Climate Resilient Approaches for Sustainable Coconut Production said that,the long-term changes in weather parameters are well established and it has become necessary to work towards developing an action plan to cope with these changes in every facet of life. The possible impact of climate change on coconut production in India has been studied using the 'Info Crop' model and results indicate an increase in overall production, but in certain coconut growing tracts where at present the precipitation is less with increase in frequency of droughts, may become unsuitable in future. Based on physiological, biochemical, and anatomical characteristics, ten released varieties/hybrids were identified as moisture stress tolerant. Studies on understanding the unpredictability of pest incidence, preparation of contingency plans, developing robust cropping systems, and dissemination and skill development of crop protection techniques are some of the suggested strategies. It is important to document in detail, how coconut based cropping systems are capable of enhancing carbon sequestration and achieving net emission zero, which were the two important commitments made at COP26.

Dr. R.G. Somkuwar, in his keynote presentation entitiled Post-Independence Scenario of Table Grape Cultivation in India, explained about Grape cultivation on a commercial basis. Besides widening of varietal

base and development of abiotic stress tolerant rootstocks, there is a need tolook for areas with potential foradoption of protected cultivation, off-season availability and mechanization friendly crop husbandry techniques for enhancing the export potential of the country. **Dr. R. H. Laxman,**said that the diversity and wide adaptability of horticultural crops has facilitated their suitability and successful cultivation in different climatic conditions. The understandings of the interaction effects of environmental stresses and crop response at different phenological stages are very much essential. The influence of unfavourable weather conditions on physiology of horticultural crops is comprehensively documented. The studies point out the unfavourable effects of stresses on morpho-anatomical, physiological and biochemical changes in crops, which lead to considerable reductions in yield and quality of the produce. Thus, a thorough understanding of the individual and interaction effects of these stresses on physiological processes is of utmost importance in devising phenophase based interventions in horticulture.

Dr. Kundan Kishore, spoke on Emerging fruit crops for Domestic and International markets.In his oral presentation **Dr.Pradeep Kumar Bisen** said that A field study has been conducted during 2019-2021 in district Lakhimpur Kheri at farmer's field regarding scope of intercropping in sole crop of banana **Dr. H.K. Porika** stated that Red Globe is the most important table grape cultivars which is known for its prolific bearing, compactness of bunches and inadequate colour development, which ultimately lowers its export quality in international market. This study was started with the aim to improve berry size and better cluster compactness along with uniform colour development, to improve the bunch quality with application of different viticultural practices *viz*., berry thinning at 8mm stage, ethrel dip (500 ppm), basal leaf removal and bunch covering either alone or in combinations which was compared against untreated control. Berry thinning along with Ethel dip and basal leaf removal in 'Red Globe' was efficient for reducing bunch compactness. Dr. **Kuldeep K Shukla** explained about the Effect of gamma irradiation on germination percentage, survival rate, growth, chlorophyll content, carbohydrate, protein, flavonoids, phenol, and proline content of dragon fruits. Reduction in germination percentage and survival rate with the increase the dose of gamma rays was seen. However, at lower concentration of gamma irradiation (50and 100Gy), germination percentage (~ 85%) and survival rate (~82%) was at par with the control.

2.4 Technical Session-4:Innovations in Production System Management for Vegetables, Tubers, Spices and Flowers for Climate Resilience and Sustainability

This session was chaired by **Dr. B. Neeraja Prabhakar,** VC, SKLTSHU, Mulugu, SiddipetDist-Telangana. Co-chaired by Dr. Tusar Kanti Behera,IIVR, Varanasi and Dr. K. V. Prasad, Director, DFR, CoAC, Pune, Maharashtra. The conveners of this session were Dr. D. C. Manjunatha Gowda,,DOGR, Rajgurunagar, Pune and Dr. P. K. Singh, Head Vegetable Section, CSAUAT Kanpur. In this session lectures were delivered by the experts.

Impact & Improvement Strategies for Climate Resilience and Sustainability in Onion & Garlic' was presented by Dr **Major Singh**. He stated that Climate change is global, but its impact and extent vary in different region and crops. There should be area specific intelligent forecasting model with farmer friendly management strategies. Innovative methods are needed for making simulation models for onion crop and must be validated in different agro-climatic zones. Thus, various improved adaptation strategies and mitigation technologies could be worked out.Farmer's awareness will successfully helps in overcoming this environmental disasters and thereby saving crops. **Dr. Gopal Lal**, Member (Agriculture)**,** CWMA and Formerly Director NRC on Seed Spices, Ajmer, presented on Strategies approaches for climate resilient and sustainable production of Seed spices. High temperature with low rainfall results in reduction of plant growth, pollination and flower & seed development. Besides plant growth and seed yield, the quality of the produce is also influenced negatively by the adverse environmental conditions. Development of climate resilient varieties and technologies is the need of the hour in seed spices sector. Cultivation of seed spices under protected structures, walls (plastic/cloth/gunny bags) against cold winds in winters and under shade nets in summers also proved to minimise the impact of hail, frost, snow, hot winds and drought.

Dr. Manoj Kumar, Director, CPRI, Shimla, H.P. presented on Strategic approaches for climate resilient and sustainable production of potato and said that Potato is a crucial crop for global as well as national food and nutritional security. Breeding varieties with high yield and early maturity, tolerant to abiotic stresses (heat, drought, and salinity), resistant to biotic stresses (Late blight, emerging insect pests, viruses, nematodes, bacterial wilt, etc) can ensure wholesome potato production in traditional areas and potential new areas (topicalisation) in the future. Region-specific improvement in the local technologies in line with the farmer's needs and establishing a reliable and steady supply chain between producer, processor, and policymakers driven by the market is crucial for sustainability. **Dr. P. K. Gupta**, Director, NHRDF, New Delhi in his presentation on Strategies approaches for climate resilient and sustainable production of Onion and Garlic said that Climate change presents one of the greatest challenges to the productivity and sustainable growth of onion and garlic. **Dr. K. V. Prasad,** Director, DFR, CoAC, Pune, Maharashtra in his presentation on Strategies approaches for climate resilient and sustainable development of ornamental Horticulture said that Floriculture is a multifaceted enterprise in India. Changing pattern in photoperiodism and thermoperiodism would greatly alter the blooming pattern in such flower crops. Climate change is expected to enhance the global temperatures by 2-3^{0}C by 2050. This would alter the chilling requirement of some of the temperate flower crops. The insect pest and disease dynamics would bring about a change in use of pesticides in open and protected environments. Increase in temperature would alter the relative humidity levels that would have profound impact on disease incidence and its spread.

Dr. K. Kandiannan in his presentation entitled Strategies approaches for climate resilient and sustainable production of Spices said that Spices are high value and low volume crops, grown in an area of 4.2 million ha with a production of 39.6 million tonnes. The demand for spices and its products is increasing and sustaining their production in the era of climate change will be a great challenge. Creating soil resilience, practice of organic farming, growing climate resilient varieties, water harvesting and recycling, efficient irrigation systems and fertiliser use techniques, use of bio-controls, growing multiple cropping with integrated farming system, following crop advisories for timely operations, protected cultivation, mechanisation for planting, intercultural operations and harvesting and institutional support would help sustainable spice production in the changing climate in India.

Dr. L. Pugalendhi in his keynote presentation on Recent progress in vegetable grafting - a tool to combat biotic stress said that Biotic stress causes considerable losses in crop productivity thereby inflicting economic as well as nutritional insecurity. Grafting applications have expanded mainly in Solanaceous and cucurbitaceous crops, which are facing serious threat by both, biotic and abiotic stress. It was found in studies that cucurbitaceous species viz., kumatikai (*C. colocynthis*), African horned cucumber (*C. metuliferus*) and pumpkin (*C. moschata*) with high or moderate levels of biochemical constituents suffered less due Fusarium wilt pathogen.These rootstocks served as the best rootstocks for grafting with bitter gourd scions followed by mithipakal (*M. charantia* var. *muricata*) and sponge gourd (*L. cylindrica*). Hence, under the situation of unprecedented climate change leading to biotic stress, research impetus on grafting of vegetable crops can offer potential solution.

Dr. D. C. Manjunatha Gowda in his oral presentation explained about Bunching onion (*Allium fistulosum* L.) species assessed for identification of male-sterile trait among the germ-plasm. The identified male sterile line was confirmed by the *orf725* gene and *orf501* gene-specific. Phenotypically male-sterile plants produce flowers, does produce pollen grains they were lacking in the anthers. In her oral presentation, **Dr. Suchitra. V** explained about Potato (*Solanum tuberosum*.L) and said that it is an important temperate tuber crop around the world that performs best in cool climate between 15 and 18^{o}C. After introduction of heat tolerant varieties, the growers in the tropical regions have taken the advantage of the availability of such cultivars and its short duration nature, to trap its production in the prevailing short winters.

2.5 Technical Session-5:Innovations for Climate Smart Production Systems in Horticulture for Resilience to Climate Change

This session was chaired by **Dr. Gopal Lal**, Member (Agriculture)**,** CWMA. Co-chaired by Dr Salil Tiwari, Professor, Joint Director, GBPUA&T, Pant Nagar and Dr Arvind Kumar Singh, Director Extension, CSAUAT, Kanpur. The conveners of this session were Dr. Krishna Prakash, Scientist, ICAR-IARI, Jharkhand and Dr. Mahak Singh, Prof., Genetics & P Breeding, CSAUAT, Kanpur. In this session plenary lectures were delivered by the experts.

Dr. Manoj Kumar, Joint Director Horticulture and Dr. Sudhir Kumar, Deputy Director Horticulture, Center of Excellence for Vegetables, Gharaunda, Karnal, Haryana in their presentation on experience in vegetable nursery for sustainable development of horticulture – Case study Haryana, explained in detail about vegetable nursery which is operative at Gharoda, as centre of excellence. He said that if hybrid seeds are grown in common nursery there is high range of mortality. This has necessitated having organised nursery with modern facility. In this system seeds are germinated at appropriate temperature and grown in small pots. The seedlings at the age of 3 weeks are distributed. This system enhances productivity and income to farmers. The initial attempts have been successful and this system is gaining popularity.

Dr. Awani Kumar Singh in his presentation on Protected Cultivation Technologies: Play A Key Role for Climate Resilient and Sustainable Development of Horticultural Crop**s** explained about protected structures which act as physical barrier and play a key role to minimise biotic and abiotic stress to the crop. The greenhouse maintained 4 to 5 degree centigrade higher temperature (in day and night) during winter season and exhibited early fruit setting and harvesting as compared to all other design of polyhouses. The average temperature maintained in different greenhouses was 4–6 ^{0}C higher than the ambient temperature. The electric consumption was not required for energy conserving in any greenhouse; hence cultivation cost of all vegetable crops was relatively high as compared to naturally ventilated polyhouse/greenhouse.

Dr. Bir Pal Singh, Ex. Director, CPRI. Shimla, H.P. in his presentation Strategies approaches for climate resilient and sustainable production of potato seeds said that potato seed production is based on climate, soil, vectors and pest and diseases management. Cool climate is considered ideal for potato seed production due to less vector pressure and slow rate of degeneration. A new system of seed production known as Seed Plot Technique was developed,which is based on concept of Tuber Indexing coupled with field multiplication in four stages. Protected cultivation of G0 and some times G1 seed is part of this new system. Climate is changing and increase in temperature in the years to come will pose big challenge to potato seed production. It calls for total overhauling of the seed system. To start with, short duration varieties need to be developed to take care of the ever-shrinking seed production window. The seed agronomy needs to be changed with respect to fertigation and seed preparation before the actual planting.Production of early generation seed under protected condition needs to be adopted. Number of field multiplication needs to be reduced by taking advantage of the tissue culture and aeroponics technologies. Vector management needs to be improved and avoidance based sound cultural practices need to be adopted. Time has come to put more focus on Diploid breeding for developing sound seed system based on TPS.

In his oral presentation **Dr. P. H. Nikumbhe** talked about Ber and said that Y-Shape training system can be used for yield and quality improvement in apple ber. **Dr. Tarak Nath Saha** stated that in chrysanthemum induced mutants account for over 50% of all the commercial cultivars. Increasing demands to new forms of chrysanthemum leads to research for obtaining new varieties. Based on the first year of evaluation the Gamma Mutant was found similar to parent in terms of morphological and other traits, except flower colour. The mutant was comparable for other traits and found better than the parent in terms of flower yield (0.96 % more) over the control. It can therefore be inferred that irradiation with Gamma rays (20 Gy) had a potential to create variation in chrysanthemum.

Dr. Ajay Kumar Sharma said that in last few years, demand of coloured grape varieties is increasing however, under tropical conditions, uniform colour development is the main constraint. Significantly high anthocyanin accumulation is recorded at 20 °C than at 30 °C. Under tropical conditions various stage of berry passes through temperature of more than 20 °C and it is reflected in poor and uneven colour development. To achieve early and uniform colour, about one week before harvesting, growers remove berries from bunches. This practice is known as Neating and about 8 to 10% of total produce is discarded which result in economic. Inactivated yeast-based product was a good option. **Dr. N. Chaudhary** said that Agro Charger @ 2 ml/litre and @ 3 ml/litre.in cumin and coriander, respectively is better and eco-friendly source of nutrition.

2.6 Technical Session-6: Varietal Improvement for Resilience to Climate Change and Sustainability in Production

This session was chaired by **Dr. Suresh K. Malhotra,** Project Director, DKMA&FAC, MoA&FW, GoI, New Delhi.Co-chaired by Dr Vishal Nath, OSD, ICAR-IARI, Jharkhand and Dr. C.L. Maurya, Registrar, CSAUAT, Kanpur. The convener of this session wereDr.K. Kandiannan, IISR, Kozhikode, Kerala; Dr. Kausha Kumar and Dr. K.Suresh. In this session lectures were delivered by the experts.

Prof. T. K. Behera, Director**,** IIVR, Varanasi in his keynote presentation, Biotechnological Approaches for Climate Resilient Vegetable Crops Development said that Human society has reached a point where climate change is turning more and more inevitable. These conditions have aroused attention towards the utilisation of CWRs in agriculture and development of climate-resilience crops. Such crops with the ability to cope with array of climatic stresses such as heat, drought, flood, cold, salinity, submergence, will help to attain increased productivity of quality food while ensuring nutritional security. To achieve this, next-generation breeding technology appears to be moving towards improving crop responsiveness and adaptability to climatic stresses by tracing the underlying alleles and genes/QTLs from diverse genetic resources and their successful introgression into the new genetic background. He further described the prospects and progress in biotechnological approaches for enhancing climate resilience in vegetable crops.

Dr. Harshawardhan Choudhary in his keynote presentation, Innovations in Vegetable Breeding for Improving Resilience towards Climate Change said that the Nutritional requirement of human beings for good health, productivity and longevity are obtained from various food systems of which vegetables are a rich source of various health promoting substances, especially vitamins, minerals, micronutrients, dietary fibres and other phytochemical. Vegetable crops are supposed to have better resilience towards changing climate as diverse varietal wealth and concerted efforts of breeding programme could lead to development of varieties with improved tolerance to higher temperature and many diseases. Technology for year-round cultivation of cauliflower, carrot, radish and palak were developed by integrating suitable varietal development for specific temperature regime as per seasonal variation along with standardised agronomical practices. Varieties/hybrids of tomato, cucumber, bitter-gourd, melons have been

specifically designed and developed for protected cultivation where these are being grown under vertical system of farming and accommodating 4 to 6 times higher number of plants per unit area and producing 8 to 10 times higher yield than open field and even their produce are available beyond the normal growing season which helps farmer to realise better economic gain as well. Recently, technological advances in functional genomics have been made and they have helped to reveal the numerous gene families and processes that alter adaptation to abiotic stresses and thereby improve yield. Many special traits have been incorporated in different vegetables to make them grow out of season, having resistance against diseases and pest for growing safe vegetables by minimising chemical use, with enhanced shelf life and long distance transportation ability, better nutritional content, overall quality and higher consumer acceptability and better adaptability to changing climate as well.

Dr. M. Feza Ahamad, BAU, Sabour, Bhagalpur in his paper entitled Biotechnological approaches for improving horticulture productivity stated that the development of transgenic fruit plants and their commercialization are hindered by many regulatory and social hurdles.He summarised the recent progress achieved in the genetic engineering of fruit plants and their applications in crop improvement for increasing production.

In her oral presentation **Dr. Babita Chaudhary** said that 18 promising clones of 11 families were evaluated of which four clones namely, MS/17-1055 (43 t/ha), MS/17-379 (40 t/ha), MS/17-379 (40 t/ha) and MS/17-739 (38 t/ha) were top yielder as compared to check Kufri Bahar (38 t/ha) but lower than the check Kufri Mohan (49 t/ha). In her oral presentation **Dr. Swati Saha** explained about Papaya Ring Spot Virus (PRSV) as one of the major impediments in papaya cultivation, which recorded yield loss ranging from 80-100%; and has threatened commercial cultivation across the globe. Various lines were evaluated for production and theseare suitable and recommended for commercial cultivation. **Dr. H. Usha Nandhini Devi** explained about the experiment conducted to evaluate genotypes of capsicum and genotype CC-CBE-003 with highest capsaicin content and oleoresin content can be recommended for industrial application. **Dr. A K. Singh** stated that the genetic diversity of land races can be utilised for the improvement of bottle gourd.

In his oral presentation **Dr. B Kalyana Babu** said that in Oil palm (*Elaeis guineensis* Jacq.) SNP markers are able to clearly differentiate the sterile and fertile dura germplasm. identified SNP based molecular markers for SHELL gene which are able to differentiate oil palm fruit forms at early stage and SSR marker for dwarf trait were also developed. Thus,focus is on genomic selection model development in strengthening our molecular breeding programmes for selection of high oil yield and oil quality parameters at early stage to reduce the breeding cycle. **Dr. H.P. Bhagya** stated that marker assisted selection can give solution for identification of dwarf genotypes and by this we can develop dwarf hybrids by reducing breeding cycle of oil palm by early detection through SSR markers. The marker was identified based on Bulked Segregant Analysis (BSA), association mapping and bioinformatics analysis in which the marker was found to be located in chromosome 14. This will ultimately lead to rapid breeding and developing dwarf hybrids.

Dr. Anitha Pedapati discussing Oil Palm (*Elaeis guineensis*) said that evaluation and characterisation of existing oil palm germ-plasm have resulted in identification of genetically diverse trait-specific germ-plasm meeting the needs of oil palm breeders for use in developing high yielding cultivars with a broad genetic base. One QTL for bunch number, two for Oil to dry mesocarp and one for oil to wet mesocarp were identified on chromosome one. Highly significant QTL was identified for Oil to dry mesocarp at an LOD value of 13, which explains 4% phenotypic variance. The ultimate goal is to identify QTL and closely linked markers that can be used for molecular breeding to improve oil palm oil yield production. **Dr. S. S. Meena** presented the evaluation results of 13 genotype of Ajwain (*Trachyspermum ammi* L.) The significant differences were obtained for all the parameters studied. Maximum seed yield was recorded as 1652.45 kg/ha in AA-73 followed by IA-1(1406.91 kg/ha) showing an increase of 88.06 & 57.03 % over Ajmer Ajwain -2 and Ajmer Ajwain -1 (checks), respectively. Seeds of AA-73 contains 9.15% total oil and 6.38% essential oil which is higher (39.26 and 17.27 percent respectively) as compared to Ajmer Ajwain-2, national check.

2.7 Technical Session-7: Water Management for Enhancing Resilience to Climate Change

This session was chaired by **Dr. Arjun Singh Saini**, Director General Horticulture, Haryana.Co-chaired by Dr. Manoj Kumar, Former Director, CPRI, Shimla, H.P. and Dr Babita Singh,Director, CHAI. The conveners of this session were Dr. S. R. Singh, CISH, Rehmankhera, Lucknow and Dr. Vijay Mahajan, DOGR, Rajgurunagar, Pune. In this session lectures were delivered by the experts.

In keynote presentation Enhancing Water Productivity for Resilient and Sustainable Development of Horticulture. **Dr. H.P. Singh** stated that among various resources, water is most critical as many of the countries are already in scarcity zone. In India also, availability of water has declined drastically reaching to scarce zone, with estimated availability of 1453 m3, compared to 1700 m3/ person recommended. The scenario demands for increasing production per unit of water and changes in consumption practices. Water productivity is usually estimated as the amount of horticultural output produced per unit of water consumed. In field water productivity enhancement micro-irrigation has proved as success story in many horticultural crops. It maximises the synergistic interactions of improved cultivars, water and fertiliser and could be seen as the congruence of sustainability, productivity, profitability and equity. Since micro- irrigation greatly enhances water, fertiliser and energy use efficiency and promotes precision horticulture, the sustainability could be achieved without the burden of environmental degradation. At present, the country has coverage of about 12.5 million hectares in micro- irrigation with a plan to cover about 69 million hectares by 2050.

In his presentation entitled New Paradigms in Micro Irrigation for Enhancing Water Productivity and achieving nutritional security, **Dr. Veru** explained that water is one of the most critical inputs for agricultural development. The Task Force on Micro Irrigation had estimated a potential of 69.5 Mha under micro irrigation in India, whereas the area covered so far is only about 10.3 Mha. The innovative cluster-based Community Irrigation projects for Micro irrigation coverage should be encouraged. The only adoption of MIS is not enough, but the efficient and frequent operation of the system and application of water at the rate of crop water requirement is also desired. In his oral presentation **Dr. J. Ravi Kanth** said, that the treatment, daily fertigation with 80% RDF (D_2F_2) resulted in optimum value of net returns, 242030.89 Rs/ha. and BC ratio of 3.34 compared to other levels of fertigation. From the experimental results it can be concluded that application of fertilizers in the form of daily fertigation (D_1F_2) during fruit development stage of mango will improve the yield and quality parameters. **Dr.Binod Kumar** stated that higher yield of French bean was obtained with treatment combinations of sowing on raised beds, moisture regime at 1.0 IW/CPE ratio and 75 % RDF through chemical fertilizers + 25 % N through biocompost.

2.8 Technical Session-8:Nutrient Management for Enhancing Resilience to Climate Change

This session was chaired by **Dr. Vishal Nath**, OSD, IARI, Jharkhand, Hazaribagh and Co-chaired by Dr. L. Pugalendhi, TNAU, Coimbatore and Dr. A. K. Srivastava, PS, CCRI, Nagpur, Maharashtra. The conveners of

this session were Dr. Awadh Ram and Dr Dhananjay Singh, Head, KVK Etawah, CSAUAT, Kanpur. In this session plenary lectures were delivered by the experts.

In keynote presentation - Climate Smart Nutrient Management in Fruit crops **Dr. A. K. Srivastava,** PS, CCRI, Nagpur, Maharashtra said that the soil is an environmental medium, playing crucial role in global C cycle (soil C pool as the second biggest carbon pool), mainly through changes in soil fertility. Response of different fruit crops under elevated CO_2 condition is a function of nutrition status of the crop. The studies demonstrated the maximum nutrient demand at fruit set stage (March-April for winter crop and August-September for summer crop under sub-humid tropical climate of central India). A large difference in fertility of two sites (Ustorthent versus Haplustert) indicated by a much greater increase in yield response at the low fertility soil site (Ustorthent) than the high fertility soil site (Haplustert), when nutrient wee augmented to the same optimal fertility. But with climate change, such responses will be caused by nutrient limitation that can develop in poor fertility sites having shallow rooting depth.

In the presentation entitled Organic Farming A Way Forward for Climate Resilient and Sustainable Horticulture by **Dr. R.A. Ram**, it was stated that ten to twelve per cent of global greenhouse gas emissions are due to food production. In addition, intensive agriculture has led to deforestation, overgrazing resulting in soil degradation. These changes in land use contribute considerably to global CO_2 emissions. Organic agriculture is claimed to be the most sustainable approach in food production. It emphasizes recycling techniques and low external input and high output strategies. As per FiBl survey (2018), 2.6 million farmers across the world and 178 countries are now growing organically produced commodities on more than 57.8 million hectares of agricultural lands. In India, 8,35,200 farmers are engaged in organic production of various crops.

In his presentation entitiled Drip-Fertigation Technology Assisted Precision Farming-Future of Horticultural Crop Production, **Dr. P.Soman** said that management and maintenance of irrigation canal net works and field channels is becoming a major challenge for institutions. One of the very positive benefits to a farmer from adopting drip irrigation is the direct yield enhancement of the crop; a factor that has been proved in India in almost all the crops, both horticultural and agricultural. He presented the results of the performance of horticultural crop at Jain Irrigation, Jalgaon

Dr. Vijay Mahajan said that PSB and *Piriformosporaindica* inoculation increased NPKS uptake significantly in comparison to the control. Inoculation of biofertilizers did not affect soil available nutrient contents significantly. This result indicated that inoculation of PSB and *Piriformosporaindica* has potential to increase onion production and nutrient use efficiency. **Dr. Ram Batuk Singh** said that two years trial with Cv. Agrifound Dark Red revealed that the application of nitrogen had significant effect on Onion yield, while levels of phosphorus and potassium did not influence the quality parameters. The application of 150 kg N +80 kg P2O5 +100 Kg K2O/ ha was most appropriate combination of nutrients with respect to yield and quality of the rainy season onion crop propagated through seedling. **Dr. V. K. Tripathi** observed that to obtain higher yields plants of Aonla should be fertilized with an integrated dose of 75 per cent NPK + 4kg vermicompost + 100g *Azotobacter* + 100g PSB in the plains of northern India.

2.9 Technical Session-9:Plant Health Management for Resilience to Climate Change and Sustainability in production

This session was chaired by Dr Ajeet Singh, Tomar, Dhanuka Agritech Ltd. Gurgaon.Panalists were Dr. Bir Pal Singh, Ex. Director, CPRI. Shimla, H.P.; Dr. Dilip K. Ghosh, CCRI, Amravati Road, Nagpu; Dr. Dharm Raj Singh, Dean Co Agriculture, CSAUAT, Kanpur; Dr. Ahmed Sabeer**,** ICAR-NRC Grapes, Pune and Dr. H. S. Singh, CISH, Rehmankhera, Lucknow. The conveners of this session were Dr. P. K. Shukla, PS, CISH, Rehmankhera, Lucknow; Dr. Popy Bora, Assam Agricultural University, Jorhat, Assam and Dr. A. K. Chakravarth**y,** EMPRI, Bangalore. In this session plenary lectures were delivered by the experts.

In his presentation entitled Climate Resilient and Sustainable Development of Horticulture, the representative of **Mr. R.G. Agarwal** said that Climate-resilient farming systems are very important to promote the sustainability of agriculture at global level. Mobile network operator (MNO) assets provide the basis for further innovation, facilitating localization and scale-up of these services. The role of agri-drones for spray of fertilizers and pesticides is all the more critical for precision spraying while saving water. Agricultural financial services, such as credit, enables farmers to access inputs and assets to support climate-smart agricultural practices, while agricultural index insurance provides a safety net for those affected by adverse weather events. In presentation entitled Bio-intensive Management of Insect Pests in Horticulture Crops was presented by **Dr. H. S. Singh**, explained that agriculture sustainability, soil degradation, biodiversity, impact on human health and the environment as a whole are some of the concerns that are raised against the current chemical-based strategy. In order to achieve these resilence, various practices have been recommended. There are certain researchable issues in bio-intensive pest management which have been elaborated . The benefits of implementing BIPM can include reduced chemical input costs, reduced environmental impacts, and more effective and sustainable pest management and such reductions will benefit the grower and in turn the society. In his presentation entitled Recent Trends in Developing Molecular Diagnostics for Virus/ Virus-like Pathogens Infecting Horticultural Crops and their Novel Management Strategy **Dr. Dilip K. Ghosh**, stated that diseases caused by Virus/ Virus-like pathogens **(**VLPs) are considered as an important limiting factor for sustainable development of horticulture particularly, vegetatively propagated fruits and vegetables., Effective and economical management of these systemic and graft transmissible pathogens infecting a vegetatively propagated important fruit crop like citrus or banana are likely to be developed based on integrated strategies involving host resistance to the pathogen(s) and vectors; inoculum exclusion, removal or reduction of pathogen load; vector control; cultural practices; and new novel approaches that includes transgenic virus resistance through future research.

In his paper entitled Effective Management of Insect Pests for Sustainable Development of Horticulture **Dr. A. K. Chakravarthy** stated that crop monocultures encourage the proliferation of pest and pathogens on cultivated crops. Habitat manipulation techniques as intercropping, relay cropping, crop rotation and boarder cropping can significantly assist the farmers in management of pests and diseases. Intercropping and mixed cropping of different crops or varieties or traditional practices that have long been used for preventing disease and pest infestations across different regions worldwide require to be adopted. In the keynote presentation entitled Harnessing Plant Microbiome for Disease Management of Horticultural Crops:Changing Paradigms **Dr. Popy Bora** said that seed treatment of vegetable seeds with nano-bio formulation of *Trichoderma asperellum* and Chitosan NP suppressed the growth of *F. oxysporum, Sclerotium rolfsii* and *Rhizoctonia solani*. **Dr. Sukanya Gogoi** stated that that all the three bacterial isolates showed higher effectiveness compared to the control. Secondary metabolite profiling of the bacterial isolates demonstrated presence of pesticidal compounds. Scanning Electron Microscope (SEM) study of the dead mites further established entomopathogenic ability of *Bacillus* spp against RSM in tea.

In his oral presentation **Dr. V. Karuppaiah** said that Climate change impacts the spread of agricultural pests outside their dynamic range, severity, and invasion. Onion thrips, *Thrips tabaci* Lindeman is an economically important pest of onion in India and poses a significant threat evaluation of models performance using the

area under the receiver operating characteristic curve (AUC) and the Jackknife test to determine the dominant variable, model demonstrated higher accuracy, with significant AUC values in training and testing. The information generated is of paramount importance in framing monitoring and management strategies for one of the destructive pests of onion. **Dr. Mehi Lal** explained that resistance level of the cultivars would enhance or break down due to climate change. Three back grounds of potato cultivars 2 susceptible (Kufri Bahar & K. Sindhuri), three moderately resistant (K. Mohan, K.Garima and K Chipsona I) and two highly resistant (K. Girdhari and K. Himalini) were evaluated at three dates of planting (17 Oct, 2 Nov & 17 Nov) over four consecutive years (2017-21). The results revealed that these three sets of varieties showed different level of AUDPC (Area Under Disease Progress Curve) and rAUDPC (relative AUDPC) in three dates of planting and among the varieties. These variations in AUDPC may be due to genetic makeup of the varieties and environmental condition existed during different dates of planting. It may be said that at higher temperature & rainfall, different varieties will have varying level of resistance against *P. infestans*. In her oral presentation **Dr**. **Karanika Gogoi** explained about scarring beetle, *Basileptasubcostatum* Jacob The beetle population was co-related with different meteorological parameters viz.maximum and minimum temperatures (0C), morning and evening relative humidity (%) and total rainfall(mm). The mean beetle population was highest during August, 2020 (52.51 beetles/plant) when maximum temperature was 32.2°C, minimum temperature 24.9°C, morning relative humidity 97%,evening relative humidity 85% and rainfall 12 mm and the least was during January, 2021 (5.62 beetles/plant) when the maximum temperature was 24.6°C, minimum temperature 15.2°C, morning relative humidity 98%, evening relative humidity 92% and with no rainfall. The population of the beetle showed positive and significant correlation with various meteorological parameters.

2.10 Technical session-10: Human Resource Development and Diffusion of Knowledge for Technological Changes for Climate Resilient and Sustainable Development of Horticulture

This session was chaired by **Dr. Mathura Rai**, Former Director, IIVR Varanasi, Co-chaired by Dr. Sudheer Bhongre, Editor, JISL, Jalgaon and Dr. K. B. Patil, Sr Vice President, JSIL, Jalgaon. The conveners of this session were Dr. Babita Singh, Director, CHAI, New Delhi and Dr.Awani Kumar Singh, CPCT, IARI, New Delhi. In this session keynote lectures were delivered by the experts.

In his oral presentation **Dr. Binod Anand** stated that In the universe there are billions of galaxies, in our galaxy there are billions of planets, but there is Only One Earth. Stockholm+5 resolved to move with this theme, and globe is steering towards a new horizon post 5th June 2022.India has emerged as a ray of hope in the global efforts to tackle the menace of climate change. The world once used to see India as a challenge to climate change because of its huge population but now has emerged as an opportunity and has become the leader of climate justice and is a big force against a formidable crisis. India is moving ahead with a lofty global vision like the founding of International Solar Alliance for realizing the vision of One Sun, One World, One Grid and the Coalition for Disaster Resilient Infrastructure initiative and have stood up as the top 10 countries of the world in the Climate Change Performance Index. Without empowered and engaged Human resources the dream to fulfill the targets of COP 26 won't be possible. We will be able to give a safe environment to our coming generations only when all of us make an united effort to maintain the balance of water, air and land. i.e., May the whole earth, the whole environment be most advantageous for all of us and give an opportunity to our dreams. In the scenario, where the climate change is the reality, attempts have to be for both,mitigation as well as adaptation. Horticulture, which has emerged as prime mover of the economy with diversity of crops and wider adaptably, is also affected by climate change increasing temperature strength maturity and other variability has the impact on the various phenological process. Crops like coconut is likely to benefit from the climate change due to increase concentration of CO_2. Looking to the advantage and disadvantage of the climate change with the preparedness we can convert

this challenge into the opportunity. Which requires drought tolerant cultivars, Product management system, effective management and strategic value chain management which necessities the development of Human resource having the skill of managing the climate change, the resilience and sustainability.

Dr. Rajiv in his oral presentation stated that Integrated Crop Technology (ICT) based demonstrations were conducted on cucurbitaceous crops with improved technologies against farmers practices in farmer's fields during 2017-18 and 2018-19 in central plain zone of Uttar Pradesh. The demonstrations were conducted in the form of half-field demonstration. Each demonstration had an area of 0.2 ha, in which half area (0.1 ha) was kept under conventional system and rest half (0.1 ha) under improved techniques of crop production, placed side-by-side. Under improved techniques, integrated crop technology approach demonstration included several interventions *viz.*, use of improved variety with optimum seed rate, optimum plant stand, optimum dose of fertilizer application, use of plant growth regulator and proper weed management. Under conventional system, farmers used old varieties with high seed rate, without seed treatment, imbalanced use of fertilizer application, no plant growth regulator and without proper weed control. The demonstrations were conducted on bottle gourd (30), bitter gourd (28) and cucumber (35). The results showed that improved techniques increased yield over farmers practices by the margins of 130.16 q/ha or 52.43 % in bottle gourd, 45.64 q/ha or 38.87 % in bitter gourd and 77.58 q/ha or 68.93 % in cucumber. Net profit of Rs. 81,788.0/ha in bottle gourd and Rs. 53,512.0/ha in bitter gourd was realized by the farmers. Lowest increase of Rs. 35,204.5/ha net profit was in case of cucumber. There was wide technology gap, which needs to be bridged by promoting the scientific production and protection technologies of cucurbitaceous crops in central plain zone of Uttar Pradesh.

Dr. Netrapal Malik in his oral presentation said that prolonged and over-application of chemical fertilizers and pesticides in farming have started showing hazardous effects on soil, water, human health and on environment. Increasing cost of cultivation, stagnation in productivity, deterioration in soil health and degradation in the quality of human food are the side effects of modern agricultural practices. To address these issues, organic farming is being promoted as a way of balancing nature with human needs, predominantly for conserving natural resources and avoiding the negative effects of indiscriminate use of inputs in agriculture. For policymakers and managers, organic farming is about making better earth for sustained living, for the consumer it is about health and wellness, while for farmers sustaining the family and maximising farm income are the primary concerns. In this situation, farmers' knowledge about organic farming practices and attitude toward organic farming will play a vital role in accelerating the adoption of organic farming practices. Keeping these facts in view present study was conducted in Aligarh district of Uttar Pradesh to assess the knowledge level of farmers about organic farming and their attitude towards it. For assessing the farmers' attitude towards organic farming, a 5 point Likert scale was used and to assess the knowledge level a test was developed based on the package of practices for organic farming. Based on the finding of the study the present paper discusses an extension strategy for promoting organic farming in Aligarhdistrict in particular and in similar areas in general.

In his oral presentation **Dr. Netrapal Malik** said that as per an estimate, average public extension services reach only to 6.8 per cent of farmers. Another survey indicated that of the 40.6 per cent of households who received extension assistance, only 11 per cent of the services came from physical government machinery extension agents, Krishi Vigyan Kendras and agricultural universities. Information and Communication Technologies (ICTs) mediated extension has the potential of minimizing this gap. ICTs are reviving agricultural extension and advisory services around the world. In the present scenario, social media has emerged as a powerful tool for information sharing. Social media are web-based tools of electronic communication that allow users to personally and informally interact, create, share, retrieve, and exchange information and ideas in any form (text, pictures, video, etc.) that can be discussed upon, archived, and used by anyone in virtual communities and network. There is a vast diversity in the social, cultural and farming situation of the farmers of India. A single message cannot cater the information need of all the farmers. There is a need

to keep in view the socio-psychological and agro-ecological profile of the farmers before designing messages on farm advisory. The first step in designing the message is situation analysis. First of all extension agent must analyse the situation of the farming community with whom he/ she is going to share the farm advisory. Tools like Participatory Rural Appraisal (PRA), Focused Group Discussion (FGD), In-depth Interviews etc. can be used for situation analysis. After analyzing the situation extension agent must identify the best suitable and available technology to address the problem or information need of the particular farming community. The next step is to give the most preferred treatment to the message identified for sharing through social media. There is a need for pre-testing the message before sharing it. After sharing the message through social media, the next step is assessing the overall effectiveness of the message. In this way, we can harness the full potential of social media for sharing farm advisories with the farmers. The present paper discusses in detail the procedure for message designing for agricultural information sharing through social media.

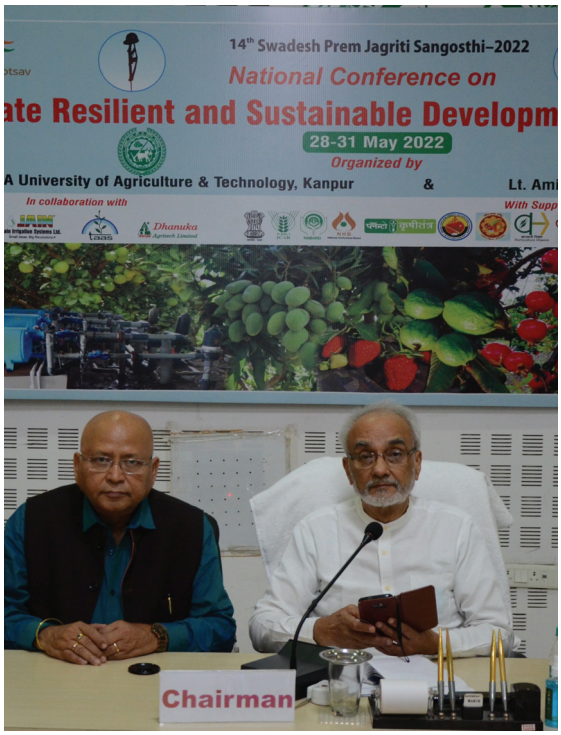
Dr. U. S. Tiwari in his oral presentation said that a field study was conducted during 2018-19 and 2019-20 on farmers filed under on-farm research at Tharion, Fatehpur to assess the response of major crop to nutrients in predominant cropping system in central plain zone of U.P. The experiment was executed in Randomized block design with seven treatments. The study results of both the years revealed that highest yield of paddy, wheat and system productivity was recorded with 150 kg N + 60 kg P_2O_5 + 40 kg K_2O + 25 kg $ZnSO_4$ in paddy and 120 kg N + 60 kg P_2O_5 + 40 kg K_2O in wheat crop during both the years. The highest Rice Yield Equivalent, Net return and B:C ratio was also observed with the treatment T_6. The highest nutrient concentration and uptake of nutrients in grain and straw of both paddy and wheat crops was also recorded with T_6. It is interesting to report that more than sufficient nutrients concentration of NPK & Zn in grain and straw of paddy and wheat crop was registered with T_6 i.e. balance fertilizer NPK & Zn. On the basis of result it can be concluded that balanced application of major nutrients NPK and minor nutrient Zn enhance the productivity, profitability and quality of paddy and wheat crop as it is helpful to secure livelihood security of farm house hold in central plain zone of U.P.

In her oral presentation **Dr. Sadhana Vaish** stated that Farm families work very hard to grow as much grain as possible from their marginal lands. Farmers are facing seed problem, he cannot purchase seed.Seed availability is very less and it is costly, therefore, as much as 15 percent of what they keep for seed is damaged or lost in storage. Considering that farm families store about 70 percent of the seeds they produce, this amounts to a considerable loss. But something can be done about these losses. Generally, there is a gap 7-10 months from the time of harvest until the next sowing of seed crops. Depending on the crop, the seed produced on one season must be saved for planting in next season. The quality of seed at time of sowing depends on the quality of seed that entered storage and how well it was stored. The village Jalulla and Dhamauli of district Fatehpur were selected with the purpose to save seed from the incidence of pulse beetle, khapra beetel by Krishi Vigyan Kendra, Thariaon, Fatehpur, Chandra Shekhar Azad University of Agrculture & Technology, Kanpur.In the first step a group of 100 women was trained in each village through training programme organized on “Store Grain Pest Control with Domestic Method”. The farm women were advocated to dry the pulses for seed thoroughly by spreading it uniformly over a clean and on Pucca floor made of stone, bricks and cement. The clean kernels of pulses from dust and debris were treated with oils through mixing. The edible oil of mustard @ 5g/kg of kernels of grams, pea, urd and moong were mixed by hand, which stored for domestic uses. The edible oil of *Taramira* andnon edible oil of Neem @ 5 g/kg kernels Parad Tikri 10 Pi US/ghi to use of aforementioned pulses were used in seed materials. Both typee of treated materials were stored in air tight store or Bakhari. It was observed that both the materials were saved from the incidence of pulse beetel and Khapra beetle up to six months. No harmfull effect was observed on the germination of seed. The technology generated through this experiment spread in the pilot area like forest fire.

Dr. Priya Vashishtha in her oral presentation explained about Community and nutrition gardens and said

that it can play an important role in enhancing national food security and dietary diversity to combat malnutrition. The study was undertaken by the KVK, Hardoi-I. In villages of Hardoi district, the major problems are poor health status, malnutrition causing growth retardation, reduced work output and high morbidity and mortality rate among the population. In order to improve food and nutritional security of family members, KVK, Hardoi-I demonstrated- FLD on kitchen gardening during 2018-19, 2019-20 and 2020-21 in 11 villages. A total of 30 numbers of families were selected constituting 30 farm women. It was found that the production of vegetables of respondents increased by 586.2 per cent resulting in increase in consumption of vegetable by 48.81 per cent and subsequently vegetable purchasing decreased by 32.1%. It was also seen that apart from saving on vegetable purchase, kitchen gardening also provided them a livelihood,enabled fighting against malnutrition and poverty by providing them an additional income besides empowerment of women. Likewise, intake of energy, protein and iron increased significantly after introduction of Nutri garden.

2.11 Technical Session-11: *National Workshop on* Digital Horticulture for Resilience to Climate Change and Sustainability



This session was chaired by **Dr. H.P. Singh,** Former DDG and Chairman, CHAI. Panelists were Dr. Jai Singh Parihar, Former Director, ISRO, Ahmedabad; Dr. A.K. Srivastava, PS, CCRI, Nagpur, Maharashtra; Dr. H. Chaudhary, IARI, New Delhi; Dr. Vishal Nath, OSD, IARI and Dr. Murtaza Hasan, PS, ICAR-IARI, New Delhi. The convener of this session was Dr. Awani Kumar Singh, CPCT, IARI, New Delhi. In his session plenary lectures were delivered by the experts.

In the keynote presentation entitled Paradigms in Digital Horticulture-Options and Opportunities, **Dr. H.P. Singh**. said that advancement in horticulture coupled with digitalisation, use of censors, ICT, remote servicing and robotics for different type of farming and horticulture business which is becoming important, referred to as Digital Horticulture. In the digital horticulture digital images and censors are used and integrated,robotics and machine learning are adopted. This aims to improve industrial metrics such as, yield, profit and sustainability and to transform the sector's commodity trading, purchase of inputs, and traceability of product. There is a growing interest on digital horticulture, using e-platform for information exchange and management, not only for marketing but also for production system and value chain management using various types of data driven platform for decision making. Therefore, Digital horticulture provides a lot of opportunities and also the challenges.

Dr. K. B. Hebbar, in his key note presentation, Current and Future Climate Suitability prediction for Plantation Crops (Coconut and Arecanut) Using Maxent and Adaptation Strategies for Sustainable Production, said that prediction of suitable climate for the cultivation of perennial plantation crops is essential for their sustainable production under changing future climate. In north east, Assam where arecanut is predominantly cultivated under current climate may become less suitable, while suitability may shift to neighbouring Meghalaya and Tripura under future climate. This understanding helps in devising appropriate policies for its cultivation in newer areas and to devise adaptive strategies in vulnerable regions so as to have sustainable cultivation and production under future climate.

Dr. Jai Singh Parihar stated that Geomatics comprising remote sensing, geographic information system, positioning system in association with information and communication technology has emerged as powerful tool for integrated use of variety of data. Satellite images of earth surface and observations of earth atmosphere provide regular information about the earth resources and environment. Such information coupled with in-situ observations have been found useful in survey, monitoring and management planning in many fields. The success of CAPE/FASAL resulted in regular and multiple in-season forecast of crop production, applications in horticulture development and management planning etc. The Technology Mission on Integrated Development of Horticulture in North-Eastern States including Sikkim, popularly known as technology mission led to major development of geomatics applications in horticulture. Applications for crop area estimation and production forecasting of horticulture crop, crop disease detection, site suitability analysis, planning for post-harvest support infrastructure etc. have been addressed. With the expertise developed and availability of open access and free of cost satellite data there are immense possibilities for developing newer applications to meet the requirements of new normal. Glimpse of procedure development, implementation and operationalisation of geomatics applications in the country was given in the presentation. **Dr. Murtaza Hasan** explained about protected structures which act as physical barrier and play a key role in minimising biotic and a biotic stress. In the paper entitled Geomatics Applications for Climate Resilience in Horticulture.

2.12 Technical Session 12: Post harvest management Access to Market and Value Chain Management for Sustainable Production of Horticulture Crops

This session was chaired by Dr. Suresh K. Malhotra, Project Director, DKMA&FAC, GoI, New Delhi. Co-chaired by Dr. K. Muralidharan, Head, Social Science, CPCRI, Kasaragod and Dr. Y. P. Malik, Director Admin, CSAUAT, Kanpur. The convener of this session was Dr. Bandana, CPRI Campus, Modipuram, Meerut, U.P. In this session keynote lectures were delivered by the experts.

In the paper entitled Branding, Labelling and Certification for Maximising Profits in Horticulture Produce, **Dr. Babita Singh** explained that post-harvest losses are the major issue and suggested for effective value chain management, including infrastructure development at the farm level which will ensure reduced losses . For obtaining a premium price for the produce and generate increased demand in domestic and international markets - branding, labelling and certification is a key. Branding helps identify a business, product, or service as unique and different from its competitors. An effective branding strategy is not only visually appealing, but also establishes consumer recognition of the brand's meaning. Labelling and certification of products and services that meet certain standards can be utilised as a strategy for achieving sustainable development. In his paper entitled Innovations in Coconut Production System: Role of Kalpa® Agri Business Incubator, **Dr. K. Muralidharan**, said that Kalpa®, Agri-Business Centre at ICARCPCRI, Kasaragod,established in 2013 is conducting structured and formal entrepreneurship programmes, technology backstopping, financial guidance and technical consultancy. It extends facilities for the production of virgin coconut oil, desiccated coconut, coconut chips, coconut sugar, vegan coconut frozen delicacy, Kalpa Krunch, bean to bar chocolate and activated carbon to its incubates.

In her oral presentation, **Dr. Archana Singh** explained that finishing of cotton fabric with fruit peels give it special functional properties that ensuresour safety from mosquito borne diseases. Anti-mosquito repellent

textiles with improved functionality find a variety of applications such as health and hygiene products. Finished and mordanted samples were tested for mosquito repellency in mosquito cage box. This peel extract protects the human beings from the bite of mosquito and there by promising safety from mosquito vector diseases when applied on cotton fabric. Thus, it can be successfully utilised in apparel, mosquito net, window curtain and other home furnishings. In his oral presentation **Dr. Ganesh B Kadam** explained that most dominantly distributed pigments in gladiolus are pelargonidin and peonidin in cultivars Deep Red, Pusa Suhagan and Shahnoda. The pigments cyanidin, peonidin and malvidin was dominantly distributed in cultivars Candyman, Pusa Urmi and Arka Pratham. The three major pigments along with other pigments in traces were responsible for light orange petals with dark orange macule in cultivar Pusa Gunjan and white petals with dark pink edges in cultivar Priscilla. The presence of anthocyanin pigments in white and yellow coloured cultivars might be due to the reddish spots/strips present on the perianth of florets.

2.13 Technical Session 13: Farmers' Participatory Discussion for Climate Resilient and Sustainable Development of Horticulture

This session was chaired by **Dr. D. R. Singh,** VC, CSAUA&T, Kanpur, U.P. and Co-chaired by Dr Manoj Kumar, Joint Director, CPRI Modipuram Campus and Dr. Arul Raj, Former Director, IIOPR, Pegabadi, Andhra Pradesh. The conveners of this session were Dr. Tarak Nath Saha, IIFR, DFR, CoAC, Pune, Maharashtra and Dr. Dhananjay Singh, Head, KVK Etawah, CSAUA&T, Kanpur. In this session keynote lectures were delivered by the experts.

In his presentation entitled Three decades of horticulture research and development in Haryana" **Dr. Arjun Singh Saini**, Director General Horticulture, Panchkula, Haryana said that the crop diversification is necessity for agriculture-based economy in Haryana to enhance income level of farmers,especially small and marginal. The agricultural diversification towards fruits and vegetables in Haryana started in early nineties when State had less than 1% area under horticulture which now has increased to 6.35% with a target to increase it to 15% by 2030. To provide nutritional security department has aligned with Sustainable Development Goals and has initiated many interventions in horticulture technologies to make horticulture a diversified sustainable activity. Haryana is budgeting roughly around Rs. 800 Cr. annually for promotion of horticulture in the state. Many innovative programs were initiated namely crop data management, price protection, horticulture insurance, vertical farming, hi-tech mushroom production, unique integration modal of farm water pond with plantation & MI and crop cluster development program. Technology demonstration and transfer to the farmers are other major interventions by establishment of 11 centre of excellence and 128 village of excellence including skill development by starting three months skill qualification packs at training institute. Department has collaborated with CCSHAU, MHU, CPRI, NCIPM, CIP and other international agencies for technology introductions and demonstration. Promotion of more than 700 farmer producer organizations and creation of supply chain in the form of pack houses and market development are other major initiatives of the Haryana Govt. in the horticulture sector. **Dr. Kalyansing B. Patil** explained about climate resilient and sustainable development and also about various practices which improve the quality of fruits.He stressed on practices adopted to safeguard against very low and high temperature. He also explaind about the fertigation and bunch management. He stressed on fruit thinning and brait removal to improve the quality. He also stressed on post harvest practices which can help in better price realization. He talked in detail about production and value chain management in banana.

2.14 Technical Session-14 (Hall No.1): Knowledge Empowerment of Farmers through Quiz

This session was chaired by **Dr. D. R. Singh,** VC, CSAUA&T, Kanpur, U.P. Panelists were Dr. Jai Singh Parihar,Former Director, ISRO, Ahmedabad ; Dr. Arul Raj, Former Director, IIOPR, Pegabadi, Andhra Pradesh ; Dr Anil B Patil, Sr Vice President, JISL, Jalgaon and Dr. P. K. Gupta, Director, NHRDF, New Delhi. The moderators of this session were Dr. Babita Singh, Dirctor, CHAI, New Delhi and Mr. K. B. Patil, Sr VP, JISL, Jalgaon.

To encourage the farmers' participation and inculcate competition to acquire knowledge on technology-led development, the foundation has conducted a quiz programme. Dr Babita Singh moderated the programme. Around 125 farmers from different states like Maharashtra, Gujarat, Bihar, Uttar Pradesh and Uttarakhand actively participated in the quiz. Questions based on various aspects of agriculture were asked and on the basis of answers given by the farmers, points were earned by them. At the end of qualifying round, 5 farmers were selected for the next round of the quiz. Finally, 3 farmers qualified for the final round and on the basis of marks obtained by them the first, second and third ranking of farmers was done.

The winners were awarded with cash prize of Rs 5000, Rs 3000 and Rs 2000, respectively along with certificates in the valedictory function of the conference.

3. VALEDICTORY AND AWARD FUNCTION

Valedictory and Award Function was organized on 30th May, 2022 wherein Dr. H.P. Singh, Chairman, CHAI, was the Chief Guest and Dr. D.R. Singh, Hon'ble Vice-Chancellor, CSAUAT presided over the function. The Award function started with floral welcome of Guests and dignitaries on the dias. After floral welcome, Dr.Karam Hussain, DR, CSAUAT, Kanpur, extended a warm welcome to all the guests and participants. He briefly explained about the activities of three days conference and said that discussion in all the technical session was lively, which helped in developing recommendations.

The recommendations, which emanated from the three-days deliberations were presented. It was briefly explained that the discussions were held in 14 technical sessions in a national workshop. In all, 3 plenary lectures, 42 keynote lectures, 68 oral papers were presented and discussed. Climate Resilient and Sustainable Development of Horticulture received major attention. The recommendations, which revolved around enhancing irrigation efficiency, effective fertiliser use through drip irrigation, development of less water requiring cultivars, production system management, protection against stresses and value chain management for improving water productivity. After discussion all the recommendations were adopted. Dr. H P Singh, the Chief Guest, while speaking on the occasions, said that the conference has been highly successful in terms of content, which has enhanced the knowledge. He also shared his experiences in precision irrigation, which helps the farmers to improve the profitability, and suggested for the adoption of the technologies. He further emphasised on precision horticulture having cluster approach integrated with value chain management for monitorising the value, leading to enhanced income to the farmers and all stakeholders.

Amit Udyan Ratna Award was conferred on farmers nominated from across the country based on the excellence in adoption of modern technology. In total of 26 farmers were conferred with ASM Foundation Award, each awardee was facilitated with shawl and plaque of honour, citation and certificates. Citation of each awardee farmer was read by Dr. Babita Singh and awards were presented by the Guest and dignitaries on the dias. The list of the farmers who received awards are annexed. Subsequently, recipient of best paper was announced and the selected candidatures were awarded by conferring certificate of appreciation.

Dr. D. R. Singh spoke on the occasion and shared his experience of interaction with the farmers in the conference and said that the farmers are ready to adopt the technologies for improving their income and profitability, provided inputs like quality seeds, fertilizer, agro-chemical are available in time and logistic are provided for linking them with the better access to market. He also spoke about contributions, made for the Kisan Mela and Krishi Vigyan Kendra for improving income of the farmers. He thanked Managing Trustee, Mrs. Bimala Singh for choosing this University for hosting of this National Conference. He emphasized on policy environment and enabling investment for improving water productivity. He said that water is most critical for economic growth and require to be used judiciously. We have to use micro irrigation and fertigation to optimize on water use for enhancing area under irrigation. He congratulated the farmers who have been conferred with Amit Udyan Ratna Award for their innovation. He also congratulated the winner of farmers quiz and also the scientists who received best paper award.

The session concluded with vote of thanks by Dr. Bir Pal Singh, who also shared his experience and interaction with the farmers, looking into various quality presentation and said that this conference, definitely be a way forward for improving water productivity and enhancing farmers income.

4. APPRECIATION MEETING

Appreciation meeting was organized to share the experience of the conference and appreciate the work done by the volunteers in background, by conferring certificate of appreciation. Mr. K. B. Patil spoke on the occasion and said that the conference has been highly successful and thanked all the volunteers, who worked day and night for the success. He invited all the participants to the"Global Conference on Precision Horticulture", to be organized at JISL, Jalgaon from 28-31st May, 2023. Dr. D.R. Singh also shared his experience and appreciated works done by volunteers. Mrs. Bimala Singh thanked Vice Chancellors, Deans, all the

volunteers, who have contributed for the success of the programme. She specially thanked Dr. D. R. Singh, who have been constantly associated with the Foundation. Thereafter, the certificates of appreciation were conferred to all the volunteers, who served for the success of this conference. Dr. H.P. Singh in his concluding remarks thanked Dr. D. R. Singh, VC, CSAUAT, Kanpur and Dr Karam Hussain, DR, CSAUAT, Kanpur for their assistance in organization of this important conference. Dr. Singh said that Dr. D. R. Singh has been on the forefront for Climate

Resilient and Sustainable Development of Horticulturethrough promotion of micro irrigation. He expressed his sincere thanks to Dr Karam Hussain, DR, CSAUAT, Kanpur, organizing secretary of the conference and his team for excellent work with commitment and dedication. Finally, he thanked all the faculty members and students who contributed to the success of the conference and said that the event will be remembered as milestone for Sustainable Development of Horticulture. The meeting extended a vote of thanks to chair and all the participants.

5. List of Awardees of ASM Foundation

5.1 Recipients of Krishi Rishi, Padma Jagriti & Prabudh Manishi Awards

Amit Krishi Rishi Award

Dr. Ashok Dalwai, IAS, CEO, NRAA, MoA&FW, New Delhi

Amit Padma Jagriti Award

Sahyadri Farmers' Producer Company Ltd. Adgaon, Nashik, Maharashtra

Amit Prabudh Manishi Award

Prof. (Dr.) K. P. Singh, Vice-Chancellor, MJPRU, Bareilly, U.P.

5.2 The list of farmers who received Udyan Ratna Award-2022

Shri Omveer Singh, Tatarpur, Hapur, Uttar Pradesh

Shri Nirmal Varshney, Chandra Nagar, Kankhal, Haridwar

Smt. Neelam Tyagi, Muradnagar, Ghaziabad, Uttar Pradesh

Shri Mishrilal Rajput, BHEL, Bhopal, Madhya Pradesh

Shri Kishor Ravindra Phalak, Hingona, Yawal, Jalgaon

Shri Nilesh Mohan Patil, Nimbol, Raver, Jalgaon, Maharashtra

Shri Chitubhai Patel, The Shree Kamrej Co-Op Fruits and Vegetables Growers' Society, Kamrej, Surat, Gujarat

Shri. Mohanbhai Vasani, Vadva Kaya, Nakhatrana, Bhuj- Kutch, Gujarat

Shri. Narayansing Rathod, Tilora, Sayla, Jalore, Rajasthan

Akshay Singh, Balrampur, Uttar Pradesh

Moh. Ateeq, Mohamddi, Lakhimpur kheri, Uttar Pradesh

Shri Sandeep Arun Narke Kolhapur, Maharashtra

Shri Vipul Anil Chaudhari, Nimandad, Khaknar, Dist - Burhanpur, Madhya Pradesh

Shri Hardeep Singh SolankGahelgawon, kukshi, Dhar, Madhya Pradesh

Shri M.C. Raja Sekhar Reddy, Palli, Anantapur, Andhra Pradesh

Shri. Basavaraj Katral, Sangapur, Babaleshwar, Vijayapura, Karnataka

Shri Vijay Samadhan Khawale, village Kumbhari,Akola, Maharashtra

Shri Somnath Bhaskar HulgeBemble, Madha Solapur

Dr. Prashant Rajput Virwada Tal. Chopda, Jalgaon

Shri Vivek Chaturvedi, 113/197 Swaroop Nagar, Distt.-Kanpur Nagar U.P.

Shri Shivam Tiwari, Vill.-Navli, P.O.- Chitwan, Block-Basrehar, District- Etawah (UP.)

Shri Anand Mishra, Kachnawa, Deeh,, Raebareli

Shri Ram Singh Patel, Aung, Malawa, Fatehpur, Uttar Pradesh

Shri Jaypal, Raghunathpur Majre, Aurei, Haswa, Fatehpur, UP

Shri Yadram Kushwah, Manpur, Khair, Aligarh

Shri Sarvdeep Singh, Pachpukhra, Jalalabad, Kannauj, UP

5.3 Award for Best Oral and Poster Papers

5.3.1 Best oral presentation

1. Rainfall Variability and Probability Analysis for Identifying Planting Season at High Rainfall Tract of Northern Agro-Climatic Zone of Kerala- **K. Kandiannan**& Others, IISR, Kozhikode, Kerala
2. Cocoa (*Theobroma cacao* L.) the agro forestry crop and its resilience to palm based cropping system- **S. Elain Apshara,** CPCRI, Vittal, Karnataka
3. Seasonal variation (Summer and Rainy Season) in Oil Content and Fatty Acid Composition in Oil Palm Hybrids**- K. Suresh**& Others, IIOPR, Pedavegi, A.P.
4. Gross return maximization through inclusion of vegetables crops as intercrops and application of bio agents in sole crop of banana in district Lakhimpur-Kheri of U.P. - **Pradeep Kumar Bisen** & Others, KVK-I, Lakhimpur –Kheri, CSAUA&T, Kanpur
5. Influence of Gamma irradiation on germination, growth and physiological traits of Dragon fruit. **Kuldeep K Shukla and others** Deptt.of Fruit Science and Horticulture Technology, OUAT, and CHES (ICAR-IIHR), Bhubaneswar
6. Ultra High Density Planting of Potato by using Sprouted Eye pieces under Tropical Climate - **Suchitra. V. A. Bhagwan and B. Neeraja Prabhakar,** Horticultural Research Station Adilabad, Telangana
7. Effect of Gamma Irradiation on Induction of Novel Colour in Chrysanthemum (*Chrysanthemum morifolium*Ramat.) **Tarak Nath Saha** & Others, DFR, Pune, Maharashtra
8. Studies on evaluation of chilli (*Capsicum chinense*Jacq.) genotypes with high yield and capsaicin for industrial purpose**- H. Usha Nandhini Devi** and L. Pugalendhi,TNAU, Coimbatore
9. Breeding for improved yield in bottle gourd**- A. K. Singh** and P. Bhavana, FSRCHPR, Ranchi, Jharkhand
10. Effect of biofertilizers inoculation on onion yield, nutrient uptake and soil fertility status**-Vijay Mahajan** & Other, DOGR, Rajgurunagar, Pune, Rangaswami
11. Yield and quality status of aonla cv. NA-7 as influenced by integrated nutrient management**- V. K. Tripathi** & Others,CSAUA&T, Kanpur
12. Harnessing pesticidal efficacy of rhizospheric *Bacillus*spp against *Oligonychuscoffeae* of tea, *Camellias sinensis* **– Sukanya Gogoi** & Others, AAU, Jorhat, Assam

13. Performance of cucurbitaceous demonstrations in central plain zone of Uttar Pradesh India**- Rajiv,** CSAUA&T, Kanpur
14. Compositions of Anthocyanin's in Different Gladiolus Varieties- Ganesh B Kadam, and others ICAR-Directorate of Floricultural Research, Pune, Maharashtra
15. Sweet lime & orange peel: a source of mosquito repellent finish- **Archana Singh & Apoorva Gupta.** CSAUAT, Kanpur

5.3.2 Best Poster presentation

1. Doubling farmer's income through intercropping of garlic with sataver *(Asparagus racemosus)***- Dr. Mohd. Suhail** & Others, CSAUA&T, Kanpur (U.P.)
2. A brief on philatelic education in climate and global environment in connectivity with horticultural diversity**- Kalyan Chakraborti** & Others, [1]Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal [2]Vidyasagar University, Midnapore, West Bengal
3. A Comparative Study on Dietary Diversity and Consumption Pattern in Nutri-Smart and Non Nurti-Smart Villages in Kannauj (U.P) - **Poonam Singh and Others,** KVK, Kannauj

6. PROGRAMME

National Conference on Climate Resilient and Sustainable Development of Horticulture

28-31 May, 2022

CSAUA&T, Kanpur, Uttar Pradesh, India

Programme

Day Zero: Friday, 27th May, 2022

16.00-19.00 **Registration of the Delegates**

Day One: Saturday, 28th May, 2022

08.00-10.00 **Registration of Delegates**

10.00-12.00 **Inaugural Session**

10.00-10.05 Invocation & Floral Welcome of the Chief Guest and Guests

10.05-10.15 Welcome Address : **Dr.D. R. Singh**, VC, CSAUAT, Kanpur

10.15-10.20 Lighting of lamp and Tribute : **Chief Guest and Guests**

10.20-10.25 About Saheed Lt. Amit Singh : Mr Animaan Singh, Student, USA

10.25-10.30 **Conferment of CHAI Honoured Fellow-2022**: **Chairman CHAI**
Dr. A. K. Srivastava, Chairman, ASRB, DARE, MoA&FW, New Delhi

10.30-10.50 **Blessings of the Guests of Honour**
Dr. B. Neeraja Prabhakar, VC, SKLTSHU, Mulugu, Siddipet, Telangna
Dr. T. Janakiram, VC, Dr.YSRHU, Venkataramannagudem, A.P.
Dr V Praveen Rao, VC, PJTSAU, Hyderabad, Telangana
Prof. (Dr.) K. P. Singh, VC, MJPRU, Bareilly, U.P.
Dr P. Rethinam, Executive Chairman, APCC, Jakarta

11.50-.11.00 **Conferment of CHAI Awards-2022**
CHAI-Life Time Achievement Award-2022
Dr. T. Janakiram, VC, Dr.YSRHU, Venkataramannagudem, A.P.
CHAI- Life Time Recognition Award-2022
Dr. Anoop K. Srivastava, CCRI, Nagpur
CHAI-Honorary Fellow-2022
Dr. B. Neeraja Prabhakar, VC, SKLTSHU, Mulugu, Siddipet Dist
Dr. R. K. Singh, Former Director/VC, IVRI, Bareilly, U.P.
Dr. Narendra Kumar Gontia, VC, JAU, Junagadh, Gujarat
Prof. (Dr.) K. P. Singh, VC, MJPRU, Bareilly, U.P.

11.00-11.10 **Conferment of ASM Foundation Awards**
Amit Krishi Rishi Award
Dr. Ashok Dalwai, IAS, CEO, NRAA, MoA&FW, New Delhi
Amit Padma Jagriti Award
Sahyadri Farmers' Producer Company Ltd. Adgaon, Nashik, Maharashtra
Amit Prabudh Manishi Award
Prof. (Dr.) K. P. Singh, Vice-Chancellor, MJPRU, Bareilly, U.P.

11.10.-11.20	Address of the Chairman, CHAI	:	**Dr. H. P. Singh,** Ex-DDG & Chairman, CHAI
11.20-11.30	Release of Publications	:	**Chief Guest and Guests on the dais** Shodh Chintan-2022, Vol.XIV Book of Abstract-2022 Proceedings-2020-2021 CD of the Event
11.30-10.45	Address of the Chief Guest	:	**Dr. A. K. Srivastava,** Chairman, ASRB, DARE,MoA&FW, New Delhi
1145-11.50	Vote of Thanks	:	Dr. **Karam Hussain,** DR, CSAUA&T, Kanpur
11.50-12.00	**Networking Tea**		
12.00-13.00	***Plenary Session* -1(Hall No 1):**Paradigms in Climate Resilient and Sustainable Development of Horticulture - Challenges and Options		
	Chairman	:	Dr. T. Janakiram, VC, Dr.YSRHU, Venkataramannagudem, A.P.
	Co-chairman	:	Dr. K. K. Kumar, Former Director, NRC on Licthi
	Convener	:	Dr. K. Suresh,PS, IIOPR, West Godavari, A.P.

1. Plenary Lecture

1.1.1 Climate resilient and sustainable development of horticulture-Options and Opportunities**- Dr. H. P. Singh,** Former DDG (Horti) & Chairman (CHAI)**,** New Delhi

Discussion and Resolutions

13.00-14.00 **Networking Lunch**

14.00-16.00 ***Plenary Session* -2(Hall No 1):Paradigms in Climate Resilient and Sustainable Development of Horticulture - Challenges and Options**

Chairman	:	**Dr.** Dr P. Rethinam**,** Former EC, APCC, Jakarta
Co-chairman	:	Dr. R. G. Somkuwar,NRC for Grapes, Pune, Maharashtra
Co-chairman	:	Dr. M. Feza,BAU, Sabour, Bhagalpur, Bihar
Convener	:	Dr. H. Usha Nandhini Devi,TAU, Coimbatore
Convener	:	Dr. Harshawardhan Choudhary,IARI, New Delhi

2. Plenary Lecture

2.2.1 Strategic development of horticulture in Telangana for resilience to climate change- **Dr. B. Neeraja Prabakar**, VC, SKLTSHU, Siddipet District, Telangana

2.2.2 Role of Integrated Aquaculture – Crop/Horticulture - Livestock systems (IACHLS) in improving family farm production and income and addressing food security- **Dr. Dilip Kumar**, Former Director, CIFE, Mumbai

Discussion and Resolutions

16.00-18.00 ***Plenary Session* -3 (Hall No. 1):** Paradigms in Climate Resilient and Sustainable Development of Horticulture - Challenges and Options

Chairman	:	Dr P. Rethinam**,** Former Executive Chairman, APCC, Jakarta
Co-chairperson	:	Dr. Babita Singh,Project Manager, GEF, Rainforest Alliance
Co-chairman	:	Dr. Karam Hussain,DR, CSAUA&T, Kanpur
Convener	:	Dr. V. Suchitra, HRS, Adilabad, Telangana
Convener	:	Dr. Babita Chaudhary,CPRI, RS, Modipuram, Meerut, U.P.

3. Plenary Lecture

3.1.1 Milk-Fruits Based Composite Products: Novel Approach for Harnessing the Therapeutic Virtues of Milk and Fruits - **Ashish K. Singh and A. K. Srivastava,** National Dairy Research Institute, Karnal

3.1.2 Strategic approaches for climate resilient and sustainable development of horticulture through technological changes- **Dr. V. Praveen Rao,** VC, PJTSAU, Rajendranagar, Hyderabad, Telangana

3.1.3 Complimenting Nutritional Needs of Horticulture Crops through the Use of Biostimulants as Supplements**- Sanjay Singh,** Slavs agro-tech Pvt. Ltd., Karnataka

Discussion and Resolutions

18.00- 19.30 AGCM of CHAI & Award Function

18.00-18.10 Welcome : Dr. Vishal Nath, OSD, IARI, Jharkhand

18.10-18.20 Report of CHAI: Dr. H. Choudhary, Managing Editor

18.20-19.20 Award & Citation presentation : Dr. V. P. Singh, Former, Director
Conferment of Awards 2022 - Chief Guest/ Chairman CHAI
Conferment of Fellowships - Chief Guest /Chairman CHAI

CHAI- Donor Patron : Jain Irrigation Systems Pvt., Jalgaon

1. **CHAI- Dr. R.S. Paroda Award**
   Dr. Dilip Ghosh,Director, CCRI, Nagpur, Maharashtra
1. **CHAI- Dr. B.H. Jain Award**
   Dr. Chandeshwar Tiwari, Director Extension, VCSGUUHF, Bharsar, Pauri, UA
   Dr. Babita Singh, Project Manager, GEF, Rainforest Alliance, New Delhi
3. **CHAI-Ramnandan Babu Award**
   Dr. Kariyanna**,** Hitkari Horticulture Foundation, Banglore
4. **CHAI- Kautilya Lokniti Award-22**
   Professor(Dr.) Rajiv Sharma (Absentia)
5. **CHAI Achievers' Award-2022**
   Prof. Tusar Kanti Behera**,**Director, IIVR, Jakhini, Shahanshapur, Varanasi, U.P.
   Dr. Prabhat Kumar, Horticulture Commissioner, GoI, MoA&FW, New Delhi (Absentia)
6. **CHAI-Appreciation Award**
   Dr. Vijay Mahajan, DOGR, Rajgurunagar, Pune, Maharashtra
7. **CHAI-JISL Fellowship Award**
   Dr. L. Pugalendhi, Dean, HC&RI, TNAU, Coimbatore
8. **CHAI Dr. Ray Best Dissertation Award-2022**
   Dr. Manish Kumar**,** IARI, PG Outreach Programme at IIHR, Bengaluru
   For his dissertation entitled "**Incorporation of phytophthora root rot resistance genes into cytoplasmic and genic male sterile (cgms) line through marker assisted selection in chilli (*Capsicum annuum* L.)"**
9. **CHAI- Dr. Kriti Singh Best Paper Award-2022**
   Narendra Chaudhary, S. S. Sindhu, Ramesh Kumar, T. N. Saha, D. V. S. Raju and Ajay Arora,National Research Centre on Seed Spices, Tabiji, Ajmer. For scientific paper entitled "**Effect of 5-sulfosalicylic acid on antioxidant activity during senescence in Oriental lily",** IJIH, 10(2)
10. **CHAI-Institutional Fellow Award-2022**
    Sri Konda Laxman Telangana State Horticultural University, VC, SKLTSHU, Siddipet, Telangana
    Mahatma Jyotiba Phule Rohilkhand University, Vice Chancellor, Bareilly, U.P.
11. **Conferment of Fellow of CHAI-2022**
    Dr. R. G. Somkuwar, NRC for Grapes, Pune, Maharashtra
    Dr. K. Suresh, PS, IIOPR, West Godavari, A.P.
    Dr. A. Subbiah, Asst. Professor, GRS, Anaimalayanpatty, Theni District
    Dr. Harikanth Porika, Scientist, FRS, Sangareddy,Israel's MASHAV Alumni
    Dr. Ravi Kumar Mathur, IIOPR, West Godavari District, A.P.

Prof. Tusar Kanti Behera, Director, IIVR, Jakhini, Shahanshapur, Varanasi, U.P.
Dr. H. Usha Nandhini Devi, Assistant Professor, DVSHC&RI, Coimbatore
Dr. V. Suchitra, HRS, Adilabad, Telangana

CHAI-Associate Fellow

Dr. Popy Bora, Scientist, AAU, Jorhat, Assam

19:20-19.30 **Remarks Guest of Honour**/ Co Chairman, CHAI Dr.P. Rethinam**,** Former Executive Chairman, APCC, Jakarta
Dr. D. R. Singh, Vice Chancellor, CSAUAT, Kanpur

19.30-19.40. Release of Publication: Chief Guest, Dr A K Srivastava, Chairman, ASRB, N Delhi

19.40-19:55. **Special Remarks and observations:**Dr A k Srivastava, Chairman, ASRB, N Delhi

19.55-20.10 **Concluding Remarks** : Dr. H. P. Singh, Founder and Chairman, CHAI

20.10-20.15 **Vote of Thanks.** : Dr. J. S. Parihar, Former Director, ISRO, Ahmedabad

20.15-21.30 **Networking Dinner Hosted by Honourable Vice chancellor, CSAUAT, Kanpur**

Day Two: Sunday, 29th May, 2022

9.00-11.00 ***Technical Session-2*** **(Hall No.1):Technological Challenges and Approaches for Climate Resilient Development of Horticulture**

Chairman : **Dr. Dilip Kumar**, Former Director, CIFE, Mumbai
Co-chairman : Dr.Major Singh, DOGR, Rajgurunagar, Pune
Co-chairman : Dr. Vijay K. Yadav, JDR, CSAUAT, Kanpur
Convener : Dr.A. K. Singh, FSRCHPR, Ranchi, Jharkhand
Convener : Dr. Swati Saha,IARI, RS, Pune, Maharashtra

2.1 Keynote Presentation

2.1.1 Approaches for Climate resilient and sustainability development of horticulture in Gujarat-**Dr. Veru, Dean**, JAU, Junagadh, Gujarat

2.1.2 Regenerative Agriculture including Horticulture for Resilience to Climate Change and Sustainability-**Babita Singh and H. P. Singh,** CHAI, New Delhi

2.1.3 Diversification of Alliums in view of present Climatic conditions in India -**Vijay Mahajan, and others, DOGR,** Rajgurunagar, Pune

2.2 Oral Presentation

2.2.1 Rainfall Variability and Probability Analysis for Identifying Planting Season at High Rainfall Tract of Northern Agro-Climatic Zone of Kerala- **K. Kandiannan**& Others, IISR, Kozhikode, Kerala

2.2.2 Cocoa (*Theobroma cacao* L.) the agro forestry crop and its resilience to palm based cropping system-**S. Elain Apshara,** CPCRI, Vittal, Karnataka

2.2.3 Seasonal variation (Summer and Rainy Season) in Oil Content and Fatty Acid Composition in Oil Palm Hybrids**- K. Suresh** & Others, IIOPR, Pedavegi, A.P.

2.2.4 Climate Change and its effects on horticulture and agriculture crops in Uttar Pradesh**- Ajay Kumar** & Others, CSAUA&T, Kanpur

9.00-13.00 ***Technical Session-3*** **(Hall No.2):Innovations in Production Systems Management of Perennial Horticulture for Climate Resilient and Sustainability**

Chairman : **Suresh K. Malhotra,** PD, ICAR-PD and Former AC Agriculture, MoA&FW, GoI, New Delhi
Co-chairman : Dr. R. K. Mathur,IIOPR, Pedavegi, West Godavari District, A.P.
Co chairperson : Dr. Anita Karun, Director, CPCRI, Kasararagod, Kerala
Convener : Dr. S. Elain Apshara**,** CPCRI, Vittal, Karnataka
Convenor : Dr. Kundan Kishore, PS, FIAHS, CHES, Bhubaneswar
Conveyor : Dr. Dhananjay N Gawande, scientist, NRCG Pune
Convenor : Dr. M D Ojha , Noor Sarai, Nalanda, Bihar

3.1 Keynote Presentation

3.1.1 Knowledge diffusion for sustainable development of horticulture- **Suresh K. Malhotra,** Project Director, ICAR-Directorate of Knowledge Management in Agriculture and Former Agriculture Commissioner, MoA&FW, GoI, New Delhi

3.1.2 Strategies and approaches for climate resilient and sustainable production of Litchi- **Vishal Nath** & Others**,** IARI, Jharkhand, Gauria Karma, Hazaribagh

3.1.3 Strategies for climate resilient and sustainable development of Oil Pal- **K.Manorama** and **R. K. Mathur,** IIOPR, Pedavegi, West Godavari District, A.P.

3.1.4 Strategic Approaches for Climate Resilient and Sustainable Production of Plantation crops in India- **P. Rethinam** & Others,Plantation Crops Specialist and Former Executive Chairman, APCC, Jakarta

3.1.5 Climate Resilient Approaches for Sustainable Coconut Production- **Anitha Karun,** and K. Muralidharan, Director, ICAR-CPCRI, Kasaragod

3.1.6 Post-Independence Scenario of Table Grape Cultivation in India- **Dr. R. G. Somkuwar,** Director, NRC for Grapes, Pune, Maharashtra

3.1 7 Phenophase based interventions for enhanced physiological activity parameters contributing towards productivity of horticultural crops - **Dr. R. H. Laxman,** Kempapura, Bengaluru

3.1.8 Emerging fruit crops for Domestic and International markets- **Dr. Kundan Kishore,** PS, FIAHS, CHES, Bhubaneswar

3.2 Oral Presentation

3.2.1 Gross return maximization through inclusion of vegetables crops as intercrops and application of bio agents in sole crop of banana in district Lakhimpur-Kheri of U.P.- **Pradeep Kumar Bisen**& Others, KVK-I, Lakhimpur –Kheri, CSAUA&T, Kanpur

3.2.2 Viticultural practices to prevent bunch compactness and improvement in quality and colour development in grapes cv. Red Globe **H.K. Porika and others ,** Scientist, Fruit Research Station, SKLTSHU, Sangareddy, Telangana

3.2.3 Influence of Gamma irradiation on germination, growth and physiological traits of Dragon fruit. **Kuldeep K Shukla and others** Deptt.of Fruit Science and Horticulture Technology, OUAT, and CHES (ICAR-IIHR), Bhubaneswar

3.2.4 Cultivation of Perennial Vegetables: Climate Resilience Approaches for Sustainable Production- **Krishna Prakash and Others -**ICAR-IARI, Gauria Karma, Hazaribagh

Discussion and Resolution

9.00-13.00 ***Technical Session-4*** **(Hall No.3):Innovations in Production System Management for Vegetables, Tubers, Spices and Flowers for Climate Resilience and Sustainability**

Chairman : **Dr. B. Neeraja Prabhakar,** VC, SKLTSHU, Mulugu, Siddipet Dist-Telangana

Co-chairman : Dr. Tusar Kanti Behera,IIVR, Varanasi

Co-chairman : Dr. K. V. Prasad, Director, DFR, CoAC, Pune, Maharashtra

Convener : Dr. D. C. Manjunatha Gowda and others, DOGR, Rajgurunagar, Pune

Convener : Dr. P. K. Singh, Head Vegetable Section, CSAUAT Kanpur

4.1 Keynote Presentation

4.1.1 Impact & Improvement Strategies for Climate Resilience and Sustainability in Onion & Garlic**- Major Singh**, Vijay Mahajan and A. Thangasamy, DOGR, Rajgurunagar, Pune

4.1.2 Strategies approaches for climate resilient and sustainable production of Seed spices**- Dr. Gopal Lal**, Member (Agriculture)**,** CWMA and Formerly Director NRC on Seed Spices, Ajmer, Rajasthan

4.1.3 Strategies approaches for climate resilient and sustainable production of potato- **Dr. Manoj Kumar,** Director, CPRI, Shimla, H.P.

4.1.4 Strategies approaches for climate resilient and sustainable production of Onion and Garlic- **Dr. P. K. Gupta**, Director, NHRDF, New Delhi

4.1.5 Strategies approaches for climate resilient and sustainable development of ornamental Horticulture- **Dr. K. V. Prasad,** Director, DFR, CoAC, Pune, Maharashtra

4.1.6 Strategies approaches for climate resilient and sustainable production of Spices- **Dr. K. Kandiannan**& Others, IISR, Kozhikode, Kerala

4.1.7 Recent progress in vegetable grafting - a tool to combat biotic stress- **L. Pugalendhi** and H. Usha Nandhini Devi, TNAU, Coimbatore

4.2 Oral Presentation

4.2.1 Identification of CMS-S male-sterile cytoplasm among the Bunching onion (*Allium fistulosum* L.) collections – **D. C. Manjunatha Gowda** and others, DOGR, Rajgurunagar, Pune

4.2.2 Underutilized vegetables for nutritional security – **Nimisha Awasthi**& Others, CSAUA&T, Kanpur

4.2.3 Effect of weather parameters on yield and YVMV incidence in Okra- **Dr. C. Sarada** & Others, HRS, Lam Farm, Guntur, DrYSRHU, Lam

4.2.4 Performance of Tomato (*Solanum lycopersicum* L.) var. *Arka rakshak* for Growth and Yield under Polyhouse in Tehri Garhwal, Uttarakhand**- Aalok G. Yewale, C. Tiwari** & Others, [1] Scientist/Subject Matter, KVK VCSG UUHF, Ranichauri, Tehri Garhwal

4.2.5 Assessment of yield of okra [*Abelmoschus esculentus* (L.)] variety VL Bhindi- 2 under improved agronomic practices in Western Himalaya of Uttarakhand- **Shikha & Others,** KVK, Ranichauri, VCSG UUHF, Tehri Garhwal, Uttarakhand, [2]V.C.S.G. Uttarakhand University of Horticulture and Forestry, Bharsar, Pauri Garhwal, Uttarakhand

4.2.6 *Kharif* Chickpea: A New Crop for theVegetable Purpose**- Gurumurthy S.** & Others,ICAR-National Institute of Abiotic Stress Management, Baramati, Pune, Maharashtra

4.2.7 Orchid based multi-cropping/ Vertical farming.-**Rakesh Kumar Singh,R. H. Ch. Sangma and D.R. Singh,** *ICAR-National research centre for Orchids Pakyong East Sikkim*

4.2.8 UltraHigh Density Planting of Potato by using Sprouted Eye pieces under Tropical Climate- **Suchitra. V, A. Bhagwan and B.Neeraja Prabhakar,** Horticultural Research Station Adilabad Telangana

Discussion and Resolution

11.00-13.00 ***Technical Session-5*** **(Hall No.1):Innovations for Climate Smart Production Systems in Horticulture for Resilience to Climate Change**

Chairman : Dr. Gopal Lal, Member (Agriculture)**,** CWMA
Co-chairman : Dr. Salil Tiwari, Professor, GBPUA&T, Pant Nagar
Co-chairman : Dr. Arvind Kumar Singh, DE, CSAUAT, Kanpur
Convener : Dr. Krishna Prakash, Scientist, ICAR-IARI, Jharkhand
Convener : Dr. Mahak Singh, Prof., CSAUAT, Kanpur

5.1 Keynote Presentation

5.1.1 An experience in vegetable nursery for sustainable development of horticulture – Case study Haryana**- Dr. Manoj Kumar**, Joint Director Horticulture and Dr. Sudhir Kumar, Deputy Director Horticulture, Center of Excellence for Vegetables, Gharaunda, Karnal, Haryana.

5.1.2 Protected Cultivation Technologies: Play A Key Role for Climate Resilient and Sustainable Development of Horticultural Crops**- Dr. Awani Kumar Singh** and Dr. Indra Mani,PS, CPCT, IARI, New Delhi

5.1.3 Strategies approaches for climate resilient and sustainable production of potato seeds- **Dr. Bir Pal Singh**, Ex. Director, CPRI. Shimla, H.P.

Discussion and Resolution

5.2 Oral Presentation

5.2.1 Performance of Apple ber on different training systems**- P. H. Nikumbhe** & Others, NRC for Grapes, Pune; CAZRI, Jodhpur; Rajasthan

5.2.2 Scientific nursery raising of directly sown cucurbitaceous crops: A way to enhancing income- **Sudhir Kumar** and Ashraf Ali Khan;National Agriculture Research Centre, Kalai, Aligarh & KVK, Aligarh, CSAUA&T, Kanpur

5.2.3 Effect of Gamma Irradiation on Induction of Novel Colour in Chrysanthemum (*Chrysanthemum morifolium*Ramat.)- **Tarak Nath Saha** & Others, DFR, Pune, Maharashtra

5.2.4 Strategies for uniform colour development in grapes under tropical conditions- **Ajay Kumar Sharma** & Others,NRC for Grapes, Pune

5.2.5 Efficacy of Agro Charger as yield enhancer in cumin and coriander- **N. Chaudhary**& Others, NRC on Seed Spices, Tabiji, Ajmer, Rajasthan

5.2.6 Light Emitting Diodes: A new reality in Horticulture- **Meikam Ichancha** & Others,Bidhan Chandra Krishi Viswavidyalaya, West Bengal

Discussion and Resolution

13.00-14.00 **Networking Lunch**

14.00-16.00 ***Technical Session-6*** **(Hall No.1):Varietal Improvement for Resilience to Climate Change and Sustainability in Production**

Chairman : Dr. Suresh K. Malhotra, Project Director, DKMA&FAC, MoA&FW, GoI, New Delhi

Co-chairman : Dr. Vishal Nath, OSD, ICAR-IARI, Jharkhand

Co-chairman : Dr. C.L. Maurya, Registrar, CSAUAT, Kanpur

Convener : Dr. K. Kandiannan, IISR, Kozhikode, Kerala

Convener : Kausha Kumar K suresh

6.1 Keynote Presentation

6.1.1 Biotechnological Approaches for Climate Resilient Vegetable Crops Development - **Prof. T. K. Behera,** Director**,** IIVR, Varanasi

6.1.2 Innovations in Vegetable Breeding for Improving Resilience towards Climate Change - **Harshawardhan Choudhary** and B. S. Tomar,IARI, New Delhi

6.1.3 Biotechnological approaches for improving horticulture productivity- **M. Feza Ahamad**[1] and Rajni Rajan[2,] BAU, Sabour, Bhagalpur, Bihar

Discussion and Resolution

6.2 Oral Presentation

6.2.1 Performance of F1C3 Potato clones in West-Central Plain- **Babita Chaudhary** & Others,CPRI, RS, Modipuram, Meerut, U.P.

6.2.2 Evaluation of Papaya lines for PRSV Tolerance and Horticultural Traits - **Swati Saha** & Others,IARI, RS, Pune, Maharashtra

6.2.3 Studies on evaluation of chilli (*Capsicum chinense*Jacq.) genotypes with high yield and capsaicin for industrial purpose- **H. Usha Nandhini Devi** and L. Pugalendhi,TNAU, Coimbatore

6.2.4 Breeding for improved yield in bottle gourd- **A. K. Singh** and P. Bhavana, FSRCHPR, Ranchi, Jharkhand

6.2.5 Biotechnological interventions for oil palm (*Elaeisguineensis*Jacq.) crop improvement- **B. Kalyana Babu** & Others,IIOPR, Pedavegi, West Godavari, Andhra Pradesh

6.2.6 Marker assisted selection of dwarf traits in oil palm (*Elaeisguineensis*Jacq.)- **H. P. Bhagya** & Others,IIOPR, Pedavegi, Andhra Pradesh

6.2.7 Mapping of Quantitative trait loci (QTLs) for bunch traits using SSRs in African Oil Palm (*Elaeisguineensis*Jacq.)- **Anitha Pedapati** & Others**,** IIOPR, Pedavegi, Andhra Pradesh

6.2.8 Performance of ajwain (*Trachyspermumammi* L.) genotypes for growth and seed yield in different locations across the country- **S. S. Meena** & Others,NRC on Seed Spices, Tabiji, Ajmer, Rajasthan

Discussion and Resolution

14.00- 16.00 ***Technical session-7*** **(Hall No.2):Water Management for Enhancing Resilience to Climate Change**

Chairman : Dr. Arjun Singh Saini, Director General Horticulture, Haryana
Co-chairman : Dr. Manoj Kumar,FormerDirector, CPRI, Shimla, H.P.
Co-chairman : Dr. Babita Singh, Director CHAI
Convener : Dr. S. R. Singh, CISH, Rehmankhera, Lucknow
Convener : Dr. Vijay Mahajan, DOGR, Rajgurunagar, Pune

7.1 Keynote Presentation

7.1.1 Enhancing Water Productivity for Resilient and Sustainable Development of Horticulture**- H. P. Singh and Babita Singh,** Confederation of Horticulture Associations of India (CHAI), New Delh

7.1.2 New Paradigms in micro irrigation for enhancing water productivity and achieving nutritional security**- Dr. N. K. Gontia**, VC, JAU, Junagadh

7'1.3 Micro Irrigation – An Option for Sustainable Use of Water for Horticulture Development- **Dr. C.B. Harinatha Reddy,** Project Officer, APMIP/Addl. Director of Horticulture, Govt. of A.P.

Discussion and Resolution

7.2 Oral Presentation

7.2.1 Effect of dosage and frequency of fertigation on production, productivity and quality of mango (*Mangiferaindica* L.) cv. Banganpalli**- J. Ravi Kanth** & PJTSAU, Rajendranagar, Hyderabad, Telangana Bhagwan

7.2.2 Fertigation practices in the scenario of climate change- **Dr. Anil Kumar Nair**, Yelahanka, Bangalore, Karnataka

7.2.3 Impact of land configurations, moisture regimes and integrated nutrient supply systems on dry matter accumulation, yield and water use efficiency of French bean (*Phaseolus vulgaris* L.).-**Binod Kumar & Others,** KVK Kannauj and CSAUA&T, Kanpur, U.P.

7.2.4 Application of drip fertigation to guava trees enhanced soil enzymatic and microbial activity in orchard- **Manpreet Singh Preet,** CSAUA&T, Kanpur

Discussion and Resolution

16.00-18.00 ***Technical Session-8*** **(Hall No.1):Nutrient Management for Enhancing Resilience to Climate Change**

Chairman : Dr. Vishal Nath, OSD,IARI, Jharkhand, Hazaribagh
Co-chairman : Dr. L. Pugalendhi, TNAU, Coimbatore
Co-chairman : Dr. A. K. Srivastava, PS, CCRI, Nagpur, Maharashtra
Convener : Dr. Awadh Ram, Principal Scientist, CISH, Lucknow
Convener : Dr. Dhananjay Singh, Head, KVK Etawah, CSAUAT, Kanpur

8.1 Keynote Presentation

8.1.1 Climate Smart Nutrient Management in Fruit crops**- A. K. Srivastava,** PS, CCRI, Nagpur, Maharashtra

8.1.2 Organic farming a way forward for climate resilient and sustainable horticulture- **R. A. Ram**, PS, CISH, Rehmankhera, Lucknow

8.1.3 Drip-Fertigation Technology Assisted Precision farming-Future of Horticultural Crop Production-**Dr. P. Soman,** Chief Agronomist, Jain Irrigation Systems, Ltd., India

8.2 Oral Presentation

8.2.1 Effect of biofertilizers inoculation on onion yield, nutrient uptake and soil fertility status**-Vijay Mahajan**& Other, DOGR, Rajgurunagar, Pune, Rangaswami

8.2.2 Effect of major nutrients (nitrogen, phosphorus and potassium) on yield and quality of rainy season onion (*Allium cepa L.*) raised from seedling**- Ram Batuk Singh** & Others,CSAUA&T, Kanpur,

8.2.3 Yield and quality status of aonla cv. NA-7 as influenced by integrated nutrient management- **V. K. Tripathi** & Others,CSAUA&T, Kanpur

Discussion and Resolution

14.00-18.00 ***Technical Session-9*** **(Hall No.3): Plant Health Management for Resilience to Climate Change and Sustainability in production**

Chairman : Dr. Ajeet Singh, Tomar, Dhanuka Agritech Ltd. Gurgaon
Panelist's : Dr. Bir Pal Singh, Ex. Director, CPRI. Shimla, H.P.
Dr. Dilip K. Ghosh, CCRI, Amravati Road, Nagpu
Dr. Dharm Raj Singh, Dean Co Agriculture, CSAUAT, Kanpur
Dr. Ahmed Sabeer**,** ICAR-NRC Grapes, Pune
Dr. H. S. Singh, CISH, Rehmankhera, Lucknow
Convenor : Dr. P. K. Shukla, PS, CISH, Rehmankhera, Lucknow
Convener : Dr. Popy Bora, Assam Agricultural University, Jorhat, Assam
Convener : Dr. A. K. Chakravart**hy,** EMPRI, Bangalore

9.1 Keynote Presentation

9.1.1 Strategies crop solutions for climate resilient and sustainable production in Horticulture- **Mr. R. G. Agarwal,** M/s Dhanuka Agritech Ltd. Gurugram, Haryana

9.1.2 Bio-intensive management of insect pest in horticulture crops- **Dr. H. S. Singh,** CHES, Aiginia, Bhubaneswar, Odisha

9.1.3 Recent trends in Developing Molecular Diagnostics for Virus/ Virus-like pathogens infecting Horticultural crops and their Novel Management Strategy- **Dilip K. Ghosh**, CCRI, Amravati Road, Nagpur

9.1.4 Effective Management of Insect Pests for sustainable development of Horticulture- **A. K. Chakravarthy,** EMPRI, Bangalore

9.1.5 The role NRL, ICAR-NRC for Grapes is playing in managing pesticide residues in fruits and vegetables- Ahammed Shabeer T.P. and **Kaushik Banerjee,** ICAR-NRC Grapes, Pune

9.1.6 Diagnostic and Sustainable management of disease sub-tropical fruits - **P. K. Shukla**, PS, CISH, Rehmankhera, Lucknow

9.1.7 Harnessing Plant Microbiome for disease management of horticultural crops : Changing paradigms- **Popy Bora**, Assam Agricultural University, Jorhat, Assam

9.2 Oral Presentation

9.2.1 Harnessing pesticidal efficacy of rhizospheric *Bacillus*spp against *Oligonychuscoffeae* of tea, *Camellia sinensis* **– Sukanya Gogoi** & Others,AAU, Jorhat, Assam

9.2.2 The potential habitat of onion thrips, *Thripstabaci* Lindeman in India under CMIP6 projections- **V. Karuppaiah** & Others,DOGR, Pune, Maharashtra and CCARI, Ela, Old Goa

9.2.3 Impact of climate change on potato cultivars against late blight disease in subtropical plains of India- **Mehi Lal** & Others, CPRI, RS, Modipuram, Meerut

9.2.4 Application of Silver Nanoparticles for the Management of Fusarium Wilt of Tomato Caused by *Fusarium oxysporum* f. sp. *Lycopersici*-**Saurabh Kumar**& Others, CSAUA&T, Kanpur

9.2.5 Efficacy of Some Plant Extract Against Banana Pseudostem Weevil, *Odoiporus longicollis* Oliver- **Annabhatula Sasidhar, Inee Gogoi and Jabanika Hazarika,** Department of Entomology, AAU, Jorhat, Assam

9.2.6 Seasonal Abundance of Banana Leaf and Fruit Scarring Beetle *Basilepta subcostatum*, Jacoby- **Karanika Gogoi and Inee Gogoi,** Department of Entomology, AAU, Jorhat, Assam

Discussion and Resolution

16.00-18.00 ***Technical session-10*** **(Hall No.2):Human Resource Development and Diffusion of Knowledge for Technological Changes for Climate Resilient and Sustainable Development of Horticulture**

Chairman : Dr. Mathura Rai, Former Director, IIVR Varanasi
Co-chairman : Dr. Sudheer Bhongre, Editor, JISL, Jalgaon
: Dr. K.B. Patil, Sr Vice President, JSIL, Jalgaon
Convener : Dr. Babita Singh, DIrector, CHAI, New Delhi
Convener : Dr. Awani Kumar Singh, CPCT, IARI, New Delhi

10.1 Keynote Presentation

10.1.1. Engaging the Multi Stakeholders for empowered Human Resources at Grassroots to address Challenges of Climate change sustainably - **Binod Anand**[1] and **Om Prakash,** Dhanuka Agritech Ltd, Gurugram

10.2 Oral Presentation

10.2.1 Performance of cucurbitaceous demonstrations in central plain zone of Uttar Pradesh, India**- Rajiv,** CSAUA&T, Kanpur

10.2.2 Knowledge and Attitude of Farmers towards Organic Farming: A Study of Aligarh District of Uttar Pradesh**- Netrapal Malik** & Others, KVK, CSAUAT, Kanpur

10.2.3 Message Designing for Agricultural Information Sharing through Social Media**- Netrapal Malik** & Others,KVK CSAUA&T, Kanpur

10.2.4 On-Farm crop response to plant nutrients in predominant cropping systems and their impact on crop-livestock-human continuum**- U. S. Tiwari** & Others,CSAUA&T, Kanpur

10.2.5 Role of Women in Safe Seed Storage by Domestic Method**- Sadhana Vaish** and Others, KVK*, Thariaon, Fatehpur*

10.2.6 Nutri Garden – A Way Forward for Enhancing Farmer's Income and Household Nutritional Security **- Dr. Priya Vashishtha**, KVK, Hardoi, CSAUA&T, Kanpur

Discussion and Resolution

Day Three: Monday, 30th May, 2022

9.00-11.00 ***Technical Session-11*** **(Hall No.2):** ***National Workshop on*** **Digital Horticulture for Resilience to Climate Change and Sustainability**

Chairman : **Dr. H.P. Singh,** FormerDDG and Chairman, CHAI 0r
Panelist: Dr S K Malhotra, DKMA&FAC, MoA&FW, GoI, New Delhi
Dr. Jai Singh Parihar,Former Director, ISRO, Ahmedabad
Dr. Indermani Mishra, JD, Head& PS, IARI, New Delhi
Dr. A. K. Srivastava, PS, CCRI, Nagpur, Maharashtra
Dr. H. Chaudhary, IARI, New Delhi
Dr. Vishal Nath, OSD, IARI,
Convener : Dr. Awani Kumar Singh, CPCT, IARI, New Delhi

11.1 Keynote Presentation

11.1.1 Digital horticulture for sustainability – a way forward- **Dr. H. P. Singh,** Chairman, CHAI, New Delhi

11.1.2 Current and Future Climate Suitability prediction for Plantation Crops (Coconut and Arecanut) Using Maxent and Adaptation Strategies for Sustainable Production- **K. B. Hebbar** & Others, CPCRI, Kasaragod

11.1.3 Integration of horticulture and Engineering for climate resilience and sustainability development of Horticulture **-Dr. Indermani Mishra,** Head & PS, IARI, New Delhi

11.1.4 Geomatics application for climate resilience in horticulture**- Dr. Jai Singh Parihar,** Former Director, ISRO, Ahmedabad

9.00-11.00 ***Technical Session-12*** **(Hall No.3): Post harvest management Access to Market and Value Chain Management for Sustainable Production of Horticulture Crops**

Chairman : Dr. Suresh K. Malhotra, Project Director, DKMA&FAC, MoA&FW, GoI, New Delhi
Co-chairperson : Dr. K. Muralidharan, Head, Social ScienceCPCRI, Kasaragod
Co-chairman : Dr. Y.P. Malik, Director Admin, CSAUAT, Kanpur
Convener : Dr. Bandana, CPRICampus, Modipuram, Meerut, UP

12. Keynote Presentation

12.1.1 Branding, Labelling and Certification for maximising profits in Horticulture Produce - **Babita Singh** and Dr. Madhuri Nanda,Rainforest Alliance, India

12.1.2 Innovations in Coconut Production System: Role of Kalpa® Agri-Business Incubator- **K. Muralidharan,** Head, Social Sciences Division, ICAR-CPCRI, Kasaragod

12.1.3 Recent Advances in Post-harvest Management of Mangos- **Sunil Pareek,** NIFTEM, Kundli, Sonipat, Haryana

12.2 Oral Presentation

12.2.1 A Study on Organoleptic and Biochemical Evaluation of Mango-Papaya-Ginger based RTS Beverage- **Setu Kumar** & Others, CSAUA&T, Kanpur

12.2.2 Sun Dried Oyster Mushrooms for Food Fortification to Enhance Its Consumption in Rural Community- **Chandra Kala Yadav** & Others, KVK Kannauj, Coordinator, DOE, Scientist (Agril. Extension) KVK Farukhabad, CSAUA&T, Kanpur

12.2.3 Sweet lime & orange peel: a source of mosquito repellent finish- **Archana Singh& Apoorva Gupta.** CSAUAT, Kanpur

12.2.4 Compositions of Anthocyanin's in Different Gladiolus Varieties- Ganesh B Kadam, and others ICAR-Directorate of Floricultural Research, Pune, Maharashtra

Discussion and Resolution

10.00-1200 ***Technical Session 13*** **(Hall No.1):Farmers' Participatory Discussion for Climate Resilient and Sustainable Development of Horticulture**

Chairman : **Dr. D. R. Singh,** VC, CSAUA&T, Kanpur, U.P.
Co-chairman : Dr. Manoj Kumar, Joint Director, CPRI Modipuram Campus
Co-chairman : Dr. Arul Raj, Former Director, IIOPR, Pegabadi, Andhra Pradesh
Co Chairman : Dr. A. K. Singh, Director, Ext. CAPsAUAT, Kanpur
Co chairman : Dr. A. K. Tomar, Vice President, Dhanuka Agritech, Delhi
Convener : Dr. Tarak Nath Saha, IIFR, DFR, CoAC, Pune, Maharashtra
Convenor : Dr. Dhananjay Singh, Head, KVK Etawah, CSAUA&T, Kanpur

13. Keynote Presentation

13.1.1 Three decades of horticulture research and development in Haryana**- Dr. Arjun Singh Saini**, Director General Horticulture, Haryana

13.1.2 Growing Banana in Subtropics -Farmers' Perspective - Mr K B Patil, Sr Vice President , JSIL, Jalgaon

Conferment of Udyan Ratan Award on 7 selected Farmers

Opinion of 5 farmers

Remarks of Panelist

Concluding Remarks of the Charman

12.00-13.00 ***Technical Session-14*** **(Hall No.1): Knowledge Empowerment of Farmers through Quiz**

Chairman : **Dr. D. R. Singh,** VC, CSAUA&T, Kanpur, U.P.
Panelist's : Dr. Jai Singh Parihar,Former Director, ISRO, Ahmedabad
: Dr. Arul Raj, Former Director, IIOPR, Pegabadi, Andhra Pradesh
: Dr Anil B Patil, Sr Vice President, JISL, Jalgaon
: Dr. P. K. Gupta, Director, NHRDF, New Delhi

	Moderator	:	Dr. Babita Singh, Dirctor, CHAI, New Delhi Mr. K. B. Patil, Sr VP, JISL, Jalgaon
13.00-14.00	**Networking Lunch**		
14.30-16.00	**Valedictory and National Award Function**		
14.30-14.35	Flower Welcome of guest and chief guest then Floral Tribute to Lt Amit Singh		
14.35-14.40	Welcome	:	**Dr. Karam Hussain**, DR, CSAUAT
14.40-14.45	About Podcast war Hero	:	Asmit Singh
14.45-14.50	Release of Publication	:	Chief Guest, Dr. D.R. Singh, VC, CSAUA&T
14.50-15.10	Conferment of Awards to Farmers	:	Chief Guest and Dignitaries
15.10-15.20	Remarks of Guest of Honour	:	Dr. S. K. Malhotra, Former Ag Commissioner, GOI
15.20-15.30	Award of Best Paper	:	Chief Guest and Dignitaries & Others Awards
15.30-15.50	Valedictory Address of Chief Guest	:	**Dr. D. R. Singh, V**C, CSAUAT, Kanpur
15.50- 16.05	Remarks of Chairman CHAI	:	Dr. H. P. Singh, Former, DDG, Hort., ICAR
16.05- 16.10	Vote of Thanks from Lt Amit Family		Dr. Babita Singh
16.05 -16.15	Votes of Thanks on conference	:	Dr. B. P. Singh, Former Director, CPRI, Shimla
16.15- 17.00	**Appreciation Meeting for Organisers**		
	Welcome	:	**Dr. K. K. Kumar,** Former Director, NRCL, Muz
	Conferment of Certificate of Appreciation to Volunteers	:	All Guests
	Chairman Organising Committee	:	**Dr. D. R. Singh**, VC, CSAUAT, Kanpur
	Remarks of Organising Secretary	:	**Mrs. Bimala Sing**h, Managing Trustee,
	Remarks of Dr S k Malhotra for ASM Foundation		
	Remarks of. the Chairman	:	**Dr. H. P. Singh,** Chairman, CHAI and Advisory Committee of Conference
	Vote of Thanks	:	**Mr. K. B. Patil** Sr Vice President, JISL, Jalgon

ABOUT THE FOUNDATION

Lt. Amit Singh Memorial (ASM) Foundation, since its inception in 2001, has grown in its outreach and the spectrum of activities carried out to fulfill its commitments, within the ambit of its stated aims and objectives to develop a patriotic society, through education, secured health, economic development and inculcation of ethics and values among the masses, in general and youth in particular. To begin with, the Foundation started its activities with the distribution of books and school bags amongst the poor and needy children to support their education; organising health camps to improve the health status of poor and needy; scientific exhibitions and workshop to disseminate the knowledge of newly developed technologies, particularly in the field of agriculture and horticulture to empower the farmers with updated knowledge and inspirational discourse by spiritual leaders to inculcate social ethics and values, especially among youth.

Striving to achieve its aim and objectives, the Foundation organised its first Swadesh Prem Jagriti Sangosthi (SPJS) 2009, a national level mega event in the year 2009, to commemorate the birthday of the Martyr Lt. Amit Singh, at his birth place, Mahamada, Pusa, Bihar. The village Mahamada is known to have brought modern agriculture, since the Imperial Agricultural Research Institute (IARI) was established at Pusa in the year 1905, now known as Indian Agricultural Research Institute (IARI), (commonly known as Pusa Institute) in Delhi. This Sangosthi, which included the activities like inauguration of Amit Smriti Bhawan, essay/ elocution competition and talent search for students of secondary and higher secondary schools from different states, health camps, national conference on horticulture, national exhibition, farmers quiz, distribution of quality seeds and planting materials of the agricultural and horticultural crops, diversity shows, litchi/mango eating competition and spiritual discourse to inculcate ethics and values has moved forward in its journey. Besides farmers, students and scientists, some prominent political personalities also attended the event. With the overwhelming response and encouraging feedback of participants of the first Sangosthi, the organisers were encouraged to make this event as an annual feature as the activities of the Foundation. Since then, the Foundation organized this mega event on May, 28-31, every year. The 2nd SPJS was organized in the year 2010 at Bangalore, Karnataka, 3rd SPJS in the year 2011 at Dehradun, Uttarakhand, 4th SPJS in the year, 2012 at Bhubaneshwar, Odisha, 5th SPJS at JISL, Jalgaon, Maharashtra in the year 2013, 6th SPJS in the year 2014 at NAU, Navsari, Gujarat, 7th SPJS in the year 2015 at MGCGV, Chitrakoot, Madhya Pradesh, 8th SPJS, 2016, once again, at JISL, Jalgaon, Maharashtra, 9th SPJS, in 2017 at JAU, Junagadh, 10th SPJS, 2018 at DRPCAU, Pusa, Bihar, 11th SPJS-2019 was organized at GBPUA&T, Pantnagar, in 2019. The year 2020 was affected by the Pandemic Corona Virus and there was lockdown, the conference was done in virtual mode on 28 May, 2020, In the year conference was done on 16-19 September, 2021 at PJTSAU, Hyderabad. The conference have touched on topical issues. All these events had a great success in fulfilling the aim and objectives of the Foundation. The recommendation of the conference have been by and large, very useful for policy makers and have been adopted by various stakeholders.

To inculcate the spirit of healthy and fair competitiveness, for catalyzing the minds of the people and encourage them to serve the society better, ASM Foundation has instituted many rewards and awards. The awards include the cash prizes to the winners of national debates/elocution in National Talent Search at University level. Various awards have also been instituted by the Foundation to recognize the outstanding contributions made by the stakeholders in Agriculture/Horticulture and allied sectors in their specialised sectors for the welfare of the society at large. These awards include **Amit Krishi Rishi Award, Amit Padma Jagriti Award, Amit Prabudh Manishi Award.** The innovative farmers from across the country are Honoured with **Udyan Ratna Award.** Besides, Amit Agrani Award**,** National Talent Award in Horticulture, Best All Rounder Award (for school students), Lt. Amit Singh Memorial Best Performing Centre of AICRP on

Vegetables, Lt. Amit Singh Memorial Best Performing Centre of AICRP on Palms. Junagadh Agriculture University has started Amit Gold Medal for the best students in Horticulture, from 2019, which is conferred on best student of horticulture on merit. The recipients of awards include leading and distinguished educationists, corporate sectors, scientists, entrepreneurs, farmers, students and leading research institutes, which act as a great driving and inspirational force for the participants and stakeholders to work harder with full zeal in their respective fields to be among the recipient of such awards. The activities of the Foundation carried so far have been very successful as is evident have impact on impressionable tender minds of youth to instill patriotism and building nationalistic character in them; economic empowerment of the poor farmers through innovative technologies and current knowledge disseminated through conferences and exhibitions on agriculture and horticulture. The services of the Foundation were recognised by AIASA, New Delhi, 2017, in recognition of outstanding contribution in reconstruction of rural India by involving youth in Agriculture. The Foundation has also institute an award by endorsement in DRYSRHU, Venkataramannagudem, West Godavari, Andhra Pradesh.

The Foundation has expanded its activities over these years with its major focus on improving the health of children and empowerment of women. The emphasis is also on improving the income of farmers through distribution of quality seeds and planting material, dissemination of modern technologies and techniques, knowledge and imparting training and awareness. The Foundation also implemented programmes in collaboration with Biodiversity International and International Rice Research Institute for new technologies and cultivars. ASM Foundation is registered under section 12A & 80G of Income Tax Act, 1961 and also; registered for FCRA, Ministry of Home Affairs and has been certified for ISO 9001:2015. The Foundation has many publications to its credit, which has benefitted the stakeholders. Now the Foundation is looking forward to extend its services to community for livelihood security through networking with organisation committed to the cause of humanity. In pursuant to achieve the objectives, the Foundation has established Amit Memorial Institute for Rural Development, (AMIRD) at Mahamada (Pusa), Samastipur, Bihar, which is aimed for knowledge empowerment for rural Development. The contributions of the Foundation has been recognised across the country.


14th Swadesh Prem Jagriti Sangosthi–2022

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