

Global
Potato
Conclave 2020



Global Potato Conclave 2020

Roadmap for a
Better World

Mahatma Mandir,
Gandhinagar, Gujarat, India
28-31 January, 2020



Proceedings

Organizers



Indian Council of Agricultural Research
New Delhi



ICAR-Central Potato Research Institute
Shimla



Indian Potato Association
Shimla

Global Potato Conclave 2020

Roadmap for a Better World

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The Indian Potato Association (IPA) in collaboration with ICAR-Central Potato Research Institute, Shimla and Indian Council of Agricultural Research, New Delhi, has organized the Global Potato Conclave-2020 (GPC-2020) at Mahatma Mandir, Gandhinagar, Gujarat, India, during 28–31 January 2020. This mega event had three important components viz., Potato Conference, AgriExpo and Potato Field Day. International Potato Centre, Lima, Peru was the Co-organizer. The Official Partners for this conclave were The Netherlands, Mission for Integrated Development of Horticulture and The Directorate of Extension, Ministry of Agriculture and Farmers Welfare, Government of India (GOI), Sardar Krushinagar Dantiwada Agricultural University (SDAU), Directorate of Horticulture, Gujarat, Department of Science and Technology, GOI, National Bank for Agriculture and Rural Development (NABARD) and Agricultural and Processed Food Products Export Development Authority (APEDA). The conclave was sponsored by many prominent private industries working in the arena of potato processing. The major sponsors were Mahindra HZPC (platinum), Technico and Pepsico (diamond), Hyfun Foods, Simplot and McCain (Gold) and Sashanka technologies, ADAMA and SK Cold storage (Silver) and Bhatti Agritech, Corteva Agri Sciences, Sungro Seeds, Haldiram`s, Allround Vegetable Processing and ISCON Balaji (Bronze).

THE JOURNEY



The last two Global Conferences on Potato were held at New Delhi, the capital city of India. The primary reason for selecting that venue was the convenience of having infrastructure, relevant services and necessary manpower. In fact, New Delhi was our comfort zone where we could manage all the affairs with ease. However this time we decided to venture out of New Delhi thus sacrificing all our comfort and ease. The main driver behind this decision was that during the last decade potato sector in India has gradually transformed into more of an enterprise than a subsistence farm activity. Private sector participation in seed production, value chain

management and even in R&D of potato has become a discernible trend now. Keeping this in view, we thought of associating the private players in the potato sector in organizing the Global Potato Conclave in a bigger way. Initially we had brief discussion with some of the major private players in potato R&D and decided to hold a meeting at Chandigarh in the month of February 2019 with them to finalize the venue as well as themes of the Conclave. We got a very good response from them and the meeting was attended by 10 to 12 major potato producers, processors, seed producers and exporters etc. We had a lengthy deliberation on selection of venue. Initially we thought that Modipuram near Meerut



will be the appropriate venue because ICAR-CPRI has its own Regional Station there and things will be easier to manage. Besides, its proximity to New Delhi, the area was a major potato growing belt of the country. However, a suggestion came from one of the leading seed potato producing company for holding this conclave at Gujarat. There were several reasons behind this suggestion. The state of Gujarat has made tremendous progress during last two decades in terms of potato area, production and productivity. It has now become a major hub of potato production in the western part of country. In the last eleven years alone, while the area under potato in India has increased by 19%, in Gujarat, it has increased by around 170% (49.7 thousand ha in 2006-07 to 133 thousand ha in 2017-18). With a productivity of more than 30 t/ha, Gujarat is holding the top position in India for last one decade. The productivity of Gujarat is around 30% higher than the national productivity. Slightly warmer growing conditions as compared to conventional

potato producing Indo-Gangetic belt, are suitable for producing potato varieties with high dry matter content, which is the requirement for the export and processing industries.

All these factors got the attention of potato-based industries and this has led to their increased interest in establishing/extending their facilities there. As a result, major potato processing industries viz. McCain Foods, Hyfun Foods, ISCON Balaji, Bikaji, Simplot, Pepsico, Haldiram, Stragot Potato Products, Yellow Diamond etc. are based in Gujarat. Besides, most of the potato exporters are also based in Gujarat. Most of the potato in Gujarat is cultivated under the modern methods of irrigation; either under drip or sprinkler irrigation and is under mechanized cultivation. Highest number of cold stores, which are used for potato storage, are also in Gujarat state and some of these are equipped with world class facilities and meets the international standards. Keeping this in view, we decided to hold the Global Potato Conclave in Gujarat.

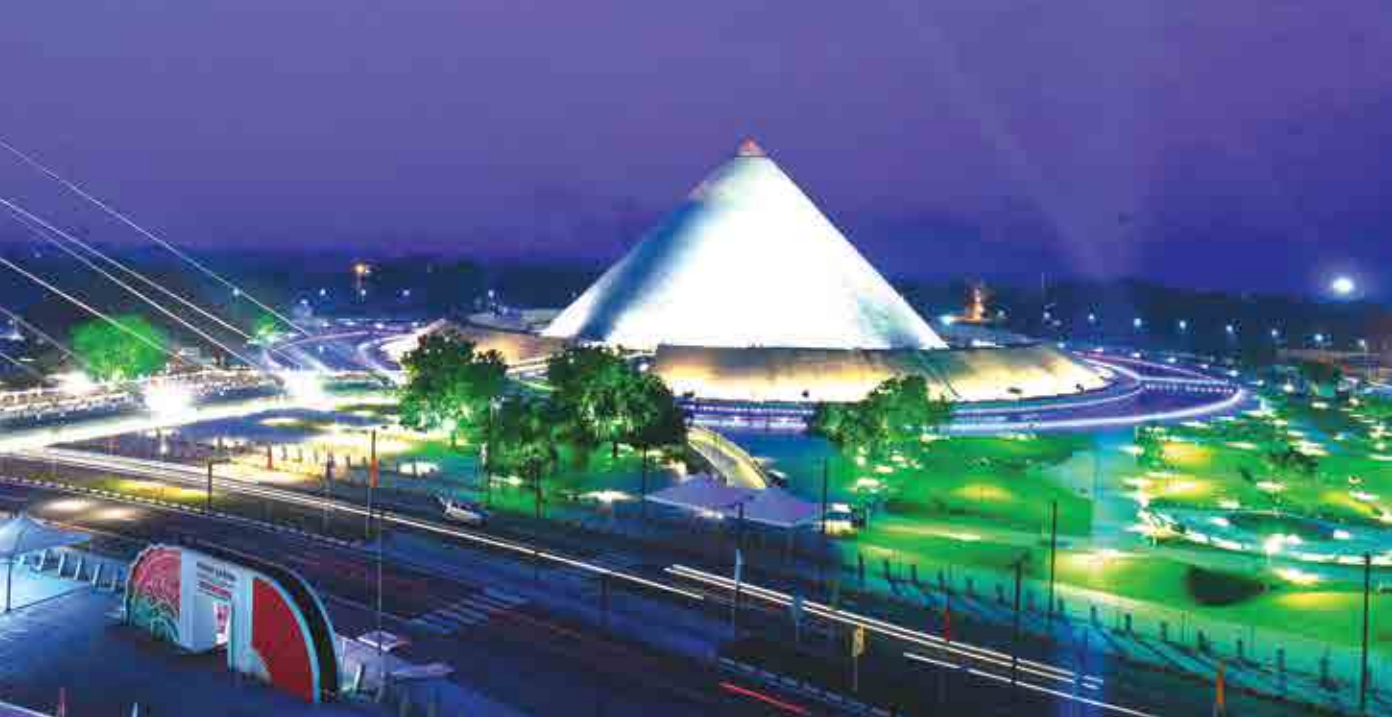
Looking at the need of the hour, it was also decided that we should not restrict ourselves only to the academics by holding the conference alone. As the IPA is the



association of the researchers, farmers, seed producers and processors alike, we thought of having three equal pillars of the Conclave, *i.e.* Conference, Exhibition and Field day, so that all the potato stakeholders can share their knowledge and benefit by sharing it among themselves and also their issues may be addressed. Thus, we decided to have 3 major components *i.e.* i) Potato Conference. ii) AgriExpo. iii) Potato Field Day. The objective was that the Conclave should

provide an opportunity for researchers to present their work and share their knowledge with national and international scientists and academicians; to trade and industries to showcase their products/technologies/ implements etc. and to the farming communities about the latest in potato technologies related to various components of potato value chain including seed, production technology, storage, marketing, value-addition etc.





The next challenge was to find a suitable location for the Conclave in Gujarat. Our team visited Ahmedabad/Gandhinagar and surveyed number of venues. We finally decided to hold this Conclave at Mahatma Mandir in Gandhinagar which is about 18 kilometers from Ahmedabad. Mahatma Mandir is a convention and exhibition centre. It is one of the biggest convention Centre in India spread over 34 acres. It is nearly 18 km away from Sardar Vallabhbhai Patel International Airport located in Ahmedabad, Gujarat, providing both domestic and international flights. Ahmedabad Railway Station in Ahmedabad is the nearest railway junction (25 km away) which provides connectivity with all the major cities and towns of India.

The next big challenge was to identify the location which is near to our convention Centre where we could organize the Farmer's Field day. Mr. Abinash Gupta from McCain, Mr. Tarun Gangwal from Simplot and Mr. Sandip

Thakkar from SK International helped us in identifying and finalizing the location for field day. The location for Potato Field Day was decided at Chandarala Village which is about 30 km from Mahatma Mandir. Approximately 5 hectare land was arranged there for the demonstration.

Initially, we had thought of organizing this conclave in the month of December, but we found the end of January most suitable as it is the time when the crop is in the active growth phase and the potato technologies pertaining from planting to harvesting and beyond could be easily demonstrated during those days. Once a decision on dates was made, we checked it with the Mahatma Mandir if the Convention Centre was available on said date. On their nod, we finalized the dates, booked the Halls and Exhibition Centre at Mahatma Mandir and we set the ball in motion. The pace was accelerated thereafter. The first Circular was brought out and the event was given wide

publicity. I think we became too ambitious when we thought of inviting the Hon'ble Prime Minister of India Sh. Narendra Modi ji for the inauguration. We discussed about it with the DG, ICAR and Secretary, DARE Dr. Trilochan Mohapatra. He suggested us about how to proceed. To our surprise, we got a query from the PMO (Prime Minister's Office) about the event sometimes in November 2019. They wanted to know about the event and some other details. It made our task easier. Later we learnt that the PMO got to know about the event through internet. We provided all the details about the Conclave and then started the official procedures for inviting the Prime Minister. Ultimately we succeeded, and the Prime Minister agreed for inaugurating the Conclave through video conferencing. That was a proud moment for us. It gave us a lot of encouragement

and we started making further preparation with much more enthusiasm and energy.

As expected, we faced a lot of problems initially. Gujarat was a new place, there was no ICAR Institute located in or around Gandhinagar who could help us on a day-to-day basis. We had to send different teams on regular basis for making the arrangements. Although we had a lot of support from our friends in Industry, who are located around Gandhinagar, still being the Organiser, we could not leave anything entirely in the hands of others. So with the help of the staff of the SDAU and our partners from trade and industries, we were able to manage all the preparation for the Conclave. After the initial hiccups, things started falling in place as the time went by and ultimately at the end, we



were satisfied with all the arrangements and we were ready for the big day.

The conference was attended by 450 delegates from more than 16 countries like UK, Australia, The Netherlands, Canada, Belgium, USA, Bangladesh, Kenya, Vietnam, Tasmania, Norway, Peru, Egypt, Denmark and France. The AgriExpo was held concurrently at Mahatma Mandir, Gujarat during 28-30 January 2020. In AgriExpo, more than 70 companies exhibited their products, which included farm implements, chemicals,

processing units, storage solutions etc. Besides, seed companies also exhibited their varieties. The State Departments, SAUs, ICAR Institutes, several PSUs etc also participated in the Expo and demonstrated their products, technologies and research and extension activities being undertaken by them. About 1,500-2,000 visitors attended the Agri-Expo during the three days. Potato Field day, which was held on 31st January 2020, was attended by about 3,000 farmers and other stakeholders.

– S.K. Chakrabarti & V.K. Dua



GPC PROCEEDINGS



Government of India Ministry of Agriculture & Farmers Welfare CPRI National Bureau of Aquaculture

WELCOME

Global Potato Conclave 2020



28 - 31 January, 2020
Mahatma Mandir, Gandhinagar,
Gujarat, India





Global Potato Conclave 2020

Roadmap for a Better World

28-31, January 2020

Gandhinagar, Gujarat, India



The Conclave was inaugurated by Shri Narendra Modi, Hon'ble Prime Minister of India through video conference on 28 January, 2020 in the presence of Chief Minister of Gujarat Sh. Vijay Rupani, Union Agriculture Minister Sh Narendra Singh Tomar, MOS for Agriculture Sh Parshottam Rupala, State Agriculture Minister Sh RC Faldu, Secretary (DARE) & Director General (ICAR), Dr. Trilochan Mohapatra, Secretary DAC&FW Sh Sanjay Agrawal, Deputy Director General (Horticultural Science) Dr Anand Kumar Singh and other dignitaries. It was attended by over 1,000 delegates including hundreds of farmers. The Hon'ble Prime minister congratulated the organizing team for organizing this mega

event in the state of Gujarat which is now a hub of potato export. He also elaborated various schemes of GOI targeted for holistic development of Indian farmers. Shri Vijaybhai Rupani highlighted various achievements of Gujarat state in potato production and export while Shri Narendra Singh Tomar stated that potato is the most important crop consumed by the masses across the length and breadth of the country. He further added that diversified use of potato is all the more important for enhancing the income of farmers. Shri Parshottam Rupala, MoS, Agriculture, Gol shared his views on importance of potato in food security and its role in the diet of Indian food. Two Padma awardee farmers



along with progressive potato growers and industrialists were honoured during the Inaugural program. Special editions of ICAR popular magazines viz., *Phal Phul* and *Indian Horticulture* dedicated to various aspects of potato processing, improvement, protection and marketing were released on the occasion.

Souvenir of GPC 2020 and the book titled 'Potato: Science and technology' were also released by the dignitaries. The inaugural programme was telecast live in all ICAR Institutes, Agricultural Universities and KVKs; the proceedings was also available live on youtube and ICAR website.

The Inaugural Programme was followed by the Key Note address, which was delivered by Dr Trilochan Mohapatra, Secretary, DARE and DG, ICAR, New Delhi where he highlighted the importance of potato under global climate change scenario. He emphasized on the role of precision agriculture for better management of potato crop. He further stressed on concerted research for identification of trait specific QTLs and further cloning of the genes. The identified genes may be suitably edited for trait improvement in potato.

The Conference

There were 9 technical sessions viz., (i) Germplasm Management and Next Generation Breeding (ii) Potato Biotechnology and Omics (iii) AI and ICT in Potato R&D (iv) Climate Change and Crop Management (v) Potato Disease Management (vi) Potato Pest Management (vii) Advances in Seed Technology (viii) Post-Harvest Management and Value Addition and (ix) Technology Transfer, Policy and Social Issues. In all, there were 89 invited lectures in different



sessions out of which 26 were from outside India. Besides, 145 research papers were presented as posters during the conclave. In addition, 24 young scientists presented their research works in a competitive oral presentation session under Dr. Mukhtar Singh Memorial Award Contest (Oral Presentation). Two exclusive Dutch potato seminars were conducted by the Dutch Embassy with The Netherlands as a partner country. An invited delegation of world leading businesses and innovators shared and gained knowledge on potato value chain in these seminars. A plenary session on value addition and Storage management of potato (Industry) was organized along with a panel discussion on potato policy issues and potato trade and industry. One plenary lecture was delivered by Dr Ian Baker, CIP, Peru where he highlighted the global R&D needs for potato.

Dr. Punjab Singh, Former Director General, ICAR chaired the Concluding session held at the evening of 30th January. Dr AK Singh, Deputy Director General (Horticultural Science) and Dr KV Peter, Former Vice-

Chancellor, Kerala Agricultural University, Thrissur were the Guests of Honour. The recommendations of different sessions were then presented by Convenors of the respective Session for discussion and concurrence. Few publications were released during the session. Certificates for best poster for different sessions and exhibitions stall were awarded. Besides, all the sponsors were honoured.

AgriExpo

AgriExpo was organized parallel to the Conference to showcase the technologies, products, activities, schemes, etc. by research institutes, government organizations, food processing industries, seed producing organizations, pesticides & fertilizers companies, export houses, cold storage solutions, farm mechanization companies, IT companies, etc. The AgriExpo was inaugurated by Hon'ble Agriculture and Farmers Welfare Minister Sh Narender Singh Tomar Ji along with other dignitaries of ICAR, DAC&FW, state Govt. etc.





This platform provided an excellent opportunity to different stakeholders to interact directly with each other and to witness the latest developments in the agriculture sector. The AgriExpo was organised in a huge covered space of around 6,000 sq m. About 70 exhibition stalls were put in the AgriExpo, besides, two Pavilions, one each by ICAR-CPRI and The Netherlands, were also organized. The best three stalls were adjudged along with three consolation prizes by the committee.

Potato Field Day

The Potato Field Day was organised at Village Chandarala, Gandhinagar, which is about 25 km from Gandhinagar, on 31st January 2020. The live demo of the potato technologies and farm machineries was arranged there in about 13 acres of land. More than 10 companies participated in live demo which included demo of the potato varieties, drip and sprinkler irrigation systems, drone technology, potato planter and digger, potato grading machines, potato processing machines, aeroponic unit





etc. Besides, more than 50 exhibition stalls were put up by different organizations to demonstrate their products/technologies /implements etc. Over 3,000 farmers and other stakeholders attended this one-day event.

During inaugural function of the field day, Dr VK Dua, Convener of GPC 2020 welcomed Dr. Anand Kumar Singh, Deputy Director General (Horticultural Science), ICAR, Dr. PM Vaghasiya, Director of Horticulture, Government of Gujarat, Dr. Swarup Kumar Chakrabarti, Director, ICAR-CPRI, Shimla, Prof. (Dr.) S. M. Paul Khurana, Director, Amity Institute of Biotechnology, Amity University, Noida, Scientists of the ICAR-CPRI, Shimla, representatives of different companies, stakeholders, and officials from State Government departments of different states. Dr. Dua also stated that this meeting is an opportunity to discuss the issues and problems being faced by the potato farmers of the country and to frame an outline to work out their possible solutions.



Chief Guest of the function, Dr. Anand Kumar Singh highlighted the need of doubling the farmer's income through growing the high yielding potato varieties, getting high productivity with low inputs, adding value to the potato through quality products, use of mechanization, production of quality seed potato, developing a linkage between stakeholders, farmers and potato scientists. He emphasized the importance of potato in India to serve the large numbers of population as a regular food and to ensure livelihood of



the farmers in many states. He also stressed that despite good productivity of the potato in Gujarat, the farmers need to adopt new technologies for potato production. He urged the research fraternity to make available new generation potato technologies for the betterment of socio-economic condition of potato farmers. He wished that the field day would provide a forum for the stakeholders to examine in depth the major gaps in current potato research and to identify priorities and decide future research and extension in





potato crop for different regions for the next three years.

Dr. PM Vaghasiya in his presidential address said that potato field day provided a good opportunity to the potato growers of the Gujarat to have an idea about high

yielding varieties by seeing live on-farm demonstrations exhibited by seed potato producing companies and ICAR-CPRI, Shimla, modern drip irrigation techniques, mechanization in potato, organic pesticides etc. He thanked the organizers of potato field day to organize such a wonderful event in Gujarat that will help the potato growers of the state in many ways. He called for concerted efforts of CPRI Shimla, SAUs and state governments to ensure doubling of farmers' income through technological interventions, market linking and bringing together all the stakeholders, potato farmers, exporter and scientists.

The Guest of Honor Dr. Swarup Kumar Chakrabarti shared innovative technologies related to potato with fellow farmers and









stakeholders. He talked about productive innovations in potato taken by the ICAR-CPRI, Shimla during last ten years for upliftment of the potato farmers and to generate high income. He thanked the Government of Gujarat for providing all the support to organize the Potato Field Day.

The Guest of Honor, Prof. (Dr.) SM Paul Khurana shared his views about potato varieties developed by ICAR-CPRI, Shimla, food processing and integrated pest management in potato. He emphasized on production of high quality disease free seed potato to get high yield by the farmers. The inaugural session ended with vote of thanks by Dr NK Pandey, Co-Convener of GPC, 2020. Thereafter, scientists of ICAR-CPRI, Shimla and SAUs, Gujarat addressed the queries raised by farmers during the *Krishak Sangoshthi* related to their problems in potato cultivation and seed production.





INAUGURAL ADDRESS

(Through Video Conferencing)

SHRI NARENDER MODI

Hon'ble Prime Minister, Govt. of India





Gujarat Chief Minister Shri Vijay Rupani ji, my colleagues in Union Cabinet Ministry Shri Narendra Singh Tomar ji, Shri Parshottam Rupala ji, Gujarat's Agricultural Minister Shri RC Faldu ji, dignitaries on the podium, Scientific fraternity of Indian and Overseas Institutes, distinguished delegates from across the globe and my dear farmer sisters and brothers!

I welcome you all at the **'Abode of Mahatma and Mahatma Mandir'**.

It is a great pleasure to know that scientists from several countries are participating in the Global Potato Conclave (GPC). They have been joined by thousands of my farmer friends and other stakeholders in this GPC. In the next three days, all of you are going to discuss and find solution to the important issues regarding the global demand of food and nutrition. The most important aspects of

this Global Potato Conclave are that the three unique events **'Potato Conference, AgriExpo and Potato Field Day'**, are happening simultaneously here. I have been told that ~6,000 farmers are going to visit the potato farms of Gujarat state on the Field Day. I think that it itself is a very commendable effort.

Friends! The good thing here is that this year's Potato Conclave has been happening for the first time outside Delhi and in the midst of thousands of potato growers. The choice of Gujarat as a conclave is also important because this state is No. 1 in the nation in potato productivity.

Dear friends! In the last two decades, Gujarat has emerged as a hub of potato production and potato exports. While there has been around 20% increase in the country's potato production in the last 10-11 years, Gujarat has reported an increase

of ~170% during this period. The policy decisions along with modern and adequate irrigation facilities in the last two decades have contributed to this increase in the quantity and quality of potato in Gujarat. It is because of better policy decisions that Gujarat has not only sizable potato processing units but also most of the potato

exporters are based in Gujarat. There is a huge and modern network of cold storage in Gujarat. Most of them are equipped with world class facilities. Besides, programs like **Sujalam-Sufalam** and **Sauni-Plan**, have made irrigation possible in those areas of Gujarat which otherwise were used to be severely affected by droughts.

A huge tract of Gujarat has come under irrigation facility due to *Sardar Sarovar Dam*. To develop a wide network of irrigation canals in a short span of time is itself a great achievement in Gujarat. Improvements are being made in the scientific and technological approaches towards irrigation infrastructure & management and their implementations. The '*per drop more crop mantra*' is being effectively implemented by focusing on micro-irrigation systems and promoting drip/sprinkler irrigation systems.

Dear friends! Gujarat's such experiments and experiences in the last five years have been replicated in the country as well. We have made a steady progress and achieved

significantly in our mission towards doubling the farmers' income by the year 2022. Several important steps are being taken in this regard. It is because of the combination of farmers' efforts and government policies that today India is among the top three countries in the production of many cereals and other food items. At one point of time, we had a crisis of pulses. But today country's farmers are determined and India has scored a victory too in pulses self-reliance.

Friends! In order to make farming more profitable, the government's focus is to prepare a modern and holistic network from fields to food processing and distribution centres. Thousands of crores of rupees will





be spent on irrigation and farm-related infrastructure in the next five years. Not only this, the central government has taken several steps to promote sectors involved in food processing. Efforts are being made at all levels, whether it is the 100% foreign direct investment in the sector or help being extended for value addition and value chain development through *PM Kisan Sampada Scheme*. Under this scheme, projects worth several hundred crores of rupees have been completed in the country in a very short span of time.

Friends! It is the prime effort of the government to reduce the cost of cultivation and reduce the cost of the farmers. The government's *PM-Kisan Samman Nidhi* initiative has helped farmers meet a part of their expenses. So far, the scheme has benefited eight crore farmers. A new record has been created early this month by transferring about 12,000 crore (120 billion) rupees to the bank accounts of six crore (sixty million) farmers.

Friends! Our prime priority is to reduce the layers between farmers and consumers and the wastage of produce. State Governments should also work in this direction. In order to achieve this, traditional farming is being encouraged.

Farmer Producer Organizations (FPOs) are being promoted so that farmers may have easy access to loans, farm technology and farm markets. It is the priority of the









government to set up 10,000 new FPOs in the next five years. Not only this, a national agriculture market called e-NAM is becoming very popular among farmers.

Friends! Our government is also emphasizing to promote agro-technology based start-ups to create database for farmers to help them with smart-agriculture and precision-agriculture. It will be of valuable help to farmers regarding the efficient use of water, manure and pesticides and other farm inputs. It will not only bring down the input costs but will ensure Indian farmers' greater partnership in global market.

The government efforts will be successful when scientists and researchers would find affordable solutions to make perishable vegetables more sustainable. Keeping in view the incoming resources-, production-, and protection-vulnerabilities ahead in coming decades, we will need to find

solutions for productivity, affordability and fair price mechanism to farmers. For this we will need to prepare seeds which use less water and are also more nutritive and should have longer life and productivity. We should ensure that the cost of the seed is also low and the input cost associated with it is also not too high rather affordable by every farmer. Your suggestions and solutions for better utilization of modern bio-technology, Artificial Intelligence, Block Chain, Drone Technology, etc. will also be important in near future in farming sector.

Friends! Given the usefulness of potatoes, time has come to prepare a new policy and research agenda to promote potato sub-sector. At the core of this policy and agenda, there should be the fight against hunger and poverty and global food security. All of you are capable of doing this. It is because of your sincere efforts that the situation which arose in Europe and America during

19th century owing to potato diseases, did not re-occur in our nation, I can strongly say that.

A huge and collective responsibility rests on the shoulders of all, be it farmers, businessmen, farm scientists, progressive traders, or those working in the field of food processing to ensure that nobody should remain hungry and malnourished in the 21st century. I am hopeful that you will have serious discussions in the next three days' deliberations in Global Potato Conclave.

Once again, I am grateful to you for visiting India and Gujarat. I also thank the Union and State agricultural Ministries/Departments for holding this summit 'Global Potato Conclave' away from Delhi. I can visualize the success of this programme as you plan to take people not only from our country but different parts of the world for direct interaction with farmers. Once again, I welcome you all



to Gujarat and hope you have comfortable stay here during Global Potato Conclave. I once again express my gratitude to you with a desire that you enjoy the wonderful hospitality of Gujarat State and visit the places associated with our esteemed Gandhi ji, and take memories of the Statue of Unity with you as well.

JAI JAWAN! JAI KISAN!

Thank you!!!



PRESIDENTIAL ADDRESS

NARENDRA SINGH TOMAR

Hon'ble Minister of Agriculture and Farmers Welfare, Govt. of India





Chief Minister of Gujarat Hon'ble Shri Vijay Rupani ji, my colleague in Union Agriculture and Farmers Welfare Ministry Hon'ble Parshottam Rupala ji, Gujarat's Agriculture Minister Shri RC Faldu ji, Shri Sanjay Aggrawal ji, Pushpa ji, Mohapatra ji, Punam ji, AK Singh ji, distinguished delegates from across the globe, farmers, potato and agri-processors, agri-preneurs, agricultural scientists, other delegates present in the conclave, print & electronic media personnel, ladies & gentlemen!

I heartily welcome you all at the occasion of 3rd Global Potato Conclave. On this occasion, I am very happy to convey here that on one side our reverend, dynamic and popular Prime Minister Hon'ble Shri Narendra Ji Modi

will address the 3rd Global Potato Conclave (GPC) with magnanimous speech as the Chief Guest; while on the other side, Gujarat Chief Minister Hon'ble Shri Vijay Bhai Rupani ji is present here today to grace the occasion. On behalf of Ministry of Agriculture & Farmers' Welfare, Govt. of India as well as on behalf of all of you, I again heartily welcome and convey greetings to Shri Vijay Bhai ji to be here with us.

The very '1st Global Potato Conclave' was organized at New Delhi in the year 1989. After that, the '2nd Global Potato Conclave' was held during 2008 again at New Delhi. Now the '3rd Global Potato Conclave' is going to be held in the year 2020 here in Gujarat state, the 'Sacred Janam-sthali of Mahatma

Gandhi'. On this occasion, I welcome all the delegates present in the conclave. We all know that in order to excel and succeed in any technology/skill, the integrated conversation and discussion is highly important. In this direction, our Indian Council of Agricultural Research (ICAR) always keeps on trying while Central Potato Research Institute (CPRI), Shimla is also proficiently working on potato research and technology development. This '3rd Global Potato Conclave', going to be organized during 28–31 January, 2020, is another attempt in this direction where numerous distinguished delegates, researchers, agricultural scientists, students, businessmen, potato and agri-processors, agripreneurs and farmers will attend this Conclave and share their ideas, experiences, knowledge and technology which will be highly useful and fruitful, as I believe.



All of us know that potato is not a crop of India. Long back, this crop originated in Andes Mountains of South America. From there, potato moved ahead on its progressive journey and now we can say that it is a pride to every Indian home and every Indian family. When we talk about vegetables, we find that potato is the king of vegetables. It can be eaten alone and can be mixed with other vegetables as well. It is very tasty when cooked alone or when mixed with other vegetables as well. Thus, it finds equal importance as the major crops like rice and wheat do find in Indian agrarian scenario. I am happy that potato's journey is still in progression day-by-day in our country. When this conclave was organized

during 2008 in New Delhi, at that time, the potato production in our country was 34.7 MT. Now in 2020 when we are presently gathering here in this conclave, our potato production has gone up to 52.5 MT from an acreage of 2.18 m ha, grown by over 40 lakh Indian farmers involved in potato farming. Thus, this crop is providing the livelihood and employment to millions of Indian farmers.

In the past one decade, about 53% growth has been noticed in potato output which will grow by about 3% annually till the year 2050; hence we have estimated that it will grow by about 150% by 2050 in India. The production of potato in India rose by about 34 times

in last seven decades while the area under cultivation grew by about 9.3 times, and the productivity by 2.7 times. The contributions made by the Shimla-based Central Potato Research Institute (CPRI) for the growth of potato production in the country are highly remarkable and commendable; which enormously contributed to potato growth and development since its inception in 1949. The area under potato cultivation grew from 2.2 lakh ha in 1949 during CPRI inception to 2.18 M ha at present. This credit goes to our hardworking farmers and most importantly to highly competent and dedicated scientists of CPRI-Shimla whose research and development endeavors played a pivotal role in promoting potato farming. Also, its production went up from 1.54 MT in 1949 to 52.5 MT currently. The credit again goes to highly dedicated scientists

of CPRI-Shimla and CPRI itself. This institute has played an important role in potato research in south Asia. This is one of the oldest research Institutes of the world whose potato research and technology endeavors have brought cooperation in potato farming globally.

The Central Potato Research Institute-Shimla has the biggest gene bank in South-East Asia. It has a collection of 4,500 potato germplasm. It has developed 62 varieties of potatoes till date, out of which, 7 varieties are processing type. CPRI is producing 3000 t of nuclear seed of about 25 potato varieties at its farms. The pivotal role played by the ICAR-Central Potato Research Institute, Shimla in the journey of potato research and development is highly commendable. I congratulate all the scientists and the institute itself for these achievements. There are so many challenges



in the potato farming. Thus, organizing this conclave would prove highly beneficial to curtail such challenges in potato farming. I hope that this Conclave, to be held for next three days, would definitely resolve these issues.

Today, global warming has become a matter of concern globally, and more importantly the agriculture only which would be impaired or benefitted from global warming. Availability of high quality disease-free potato tubers, processing type varieties with high dry matter, high temperature resistant and low water requiring varieties, development of disease and pest diagnostic kits, to bring public & private research stakeholders at one platform, technology transfer from lab to farmers fields and feedback mechanism for bringing farmers' researchable issues to the labs and address these issues, especially to bring a balance in the annual increase and decrease in potato production by enhancing the potato processing by over 8% and to enhance the potato exports over 1%, and to bring down the potato losses below 16% etc.; are some of the challenging tasks which we need to address in near future. In addition, identifying new potato production areas as well as finding new ways for enhancing our potato exports, are some of the dire needs of the time where we need to work intensively.

Friends! Keeping all things in view, I believe all of you will discuss all these issues in this GPC. I am confident that your sincere deliberations and discussions on potato in this GPC would show a way with respect to potato farming to our country as well as all the potato growing countries across the globe

while resolving these challenges. Today, it is a matter of pride and happiness to all of us that our reverend prime minister is going to address this GPC. It is well known to all our countrymen and the people across the globe that Shri Modi ji is working hard with full devotion, positive attitude, full enthusiasm and vision from the day he joined the prime minister-ship, for the holistic development of the nation, development of the agriculture, development of the farm technology, to double the income of the farmers and reduce the poverty, to bring the changes in the lifestyle of the downtrodden, and to enhance the research activities on agriculture. So, that we may be able to help the humanity across the globe and may stand in front row in the global scenario, thereby fulfilling the dream of '*Ek Rashtra-Shreshth Rashtra*'. Our PM is working very hard in this direction day and night.

Agriculture is very important to all of us in our country as we are an agriculture dominated economy. We believe and know that with the strengthening of agriculture and rural economy only, it will be possible to face economic adversity and win over the financial constraints. Thus, our prime-minister has told that we need to think for doubling farmers' income. There was a time when the food production was a challenge, we were dependent on other countries for our food requirements, it was a great challenge at that time. But, with the painstaking research and development efforts of the farm scientists, besides hard work of our farmers, we became leaders in food production globally; we became self-reliant and sufficient in food production. Today we are the world leaders and self-

reliant in pulses production, milk production and horticultural production as well. For self-reliance in oilseed production we are working in a mission mode. We are also making efforts on *Khadi* mission to make progress in the field of *Khadi*. Thus, it is the need of the hour to concentrate our efforts on doubling farmers' income rather on enhancing the production alone. That's why, our central government has initiated many schemes for augmenting the income and welfare of Indian farmers in coordination with state governments, viz. *Pradhan Mantri Kisan Yojna, Pradhan Mantri Fasal Bima Yojna, Pradhan Mantri Kisan Pension Yojna, Rajya Krishi Vikas Yojna, Parampragat Kheti Yojna, Jevik Kheti avam Prakritik Kheti Protsahan Yojna*, and *Micro-irrigation scheme*, etc.

Today, we are gathered here mainly to talk on potato farming. I believe that our renowned agricultural scientists, distinguished delegates from across the globe, our farmers, farm policy makers, researchers, students, businessmen and corporations will definitely

display their products and machinery and more importantly will share their ideas and technology directly with the farmers. I hope, this GPC-2020 will prepare an effective roadmap for efficiently meeting the various challenges being posed in the field of potato cultivation and production, it will be highly useful and fruitful for continuing the journey of potato and transfer the same to farmers' fields.

I congratulate the ICAR-New Delhi, CPRI-Shimla and all of you present here for successful organization of this GPC-2020. I also assure that valuable recommendations coming out of the '*3rd Global Potato Conclave*' would be reviewed by the union government curriculum and the union government is highly committed to incorporate the same for the upliftment of potato farming. I again welcome and congratulate you all.

'THANK YOU ALL'

'JAI BHARAT'

KEYNOTE ADDRESS

DR. T. MOHAPATRA

Secretary, DARE & Director General, ICAR



Hon'ble Chairman, Dr. Gautam, my guide, philosopher and mentor, dignitaries on the dais, ladies and gentlemen. It's an honor for me to deliver a keynote address on the occasion of the inauguration of the Global Potato Conclave-2020 (GPC-2020).

Friends, GPC-2020 aims to address the global and national importance of potato as a food crop and the new developments in the area of potato research as well. It is a major staple food crop globally and the consumers' preferences also highlight its prime importance as a food crop. We have included this crop under the group of vegetables; however, it's utilized primarily for starch and energy supply besides other nutrients.

It was a remarkable step to start Central Potato Research Institute (CPRI) in 1949 keeping in view the global importance of

potato. As of now, our country has moved quite far in potato research as a result of our performances. Our systematic research primarily started in the form of this Institute. After independence, we were not able to produce enough food and were dependent upon the imports. We faced the ship to mouth kind of situation, borrowed the food and there were famines as well. India was not in a position to produce enough to feed its population in 1950s. Today, we are able to feed more than 1.3 billion population of the nation rather, we are exporting as well. Thus, we have done exceptionally well in food grain production with a 5.5 fold increase. In horticultural production, a 3-fold increase is noticed over last 30 years with current production of 350 mt, a landmark achievement surpassing the production of food grain as well which is around 285 mt. In milk production also, we have done



exceptionally well, which in 1950-51 was around 17 mt and has now increased more than 10 times due to white revolution. Cooperative systems were put in place, cross-breeding with exotic breeds and very importantly livestock health management was put in place in the form of vaccine and also in the form of effective diagnostics. All these supplemented by the new feed system and nutrient supplementation to certain extent enabled white revolution that resulted in producing more than 180 mt of milk, that is something which is unparalleled in world, more than 6% annual growth rate and number one producer globally. Similarly, in case of fish we have been able to produce more than 10 mt currently compared to ~0.7 mt in 1950-51. In case of eggs, we have



remarkably achieved the production of ~84-85 billion eggs, which is about ~46-47 times. When we look back, it can be realized that scientists, policy maker and the farmers all together have contributed tremendously to this agricultural development.

In case of pulses, we used to import 4 to 5 mt to meet our demands when the production level was 16-17 mt. But, with renewed efforts we could produce 6 mt extra now with our production level going up from 17 mt to around 23 to 25 mt. If you see these revolutions viz. green revolution, white revolution and the pulses revolution, there is common thread and theme, that we have technology in the form of high yielding varieties; improved animal breeds particularly cattle, and the seeds reaching the farmer. Green revolution was based on the imported technology but pulse revolution is purely indigenous technology, not often described and recognized as such. Besides technology, the policy has played a very significant role in case of pulses. Today we have a buffer stock of 2 mt where the minimum support price and procurement

enforcement has played a very significant role in ushering this revolution. The technology embedded with quality varieties and around 150 seed hubs that we created to enable seed availability significantly contributed to seed replacement and also varietal replacement thereby increasing pulse production and productivity tremendously contributing towards pulses revolution.

Sugar revolution in recent past again is another remarkable success story. Earlier we were producing around 25 mt. The domestic demand was more than what we were producing but with the new technologies like variety CO-238 with sugar recovery more than 12% has driven this revolution. Primarily this variety is being grown in Uttar Pradesh and other states in northern India. The yield of sugarcane increased by more than 20

t/ha, sugar recovery in Uttar Pradesh has gone beyond 10% compared to 8-9% earlier. Now, the sugar production has significantly achieved the level of 32 mt. That has led to the decision for diversion of sugarcane juice directly for the production of ethanol. So, the contribution of technology has enabled us with sugar revolution for meeting the domestic demand and ethanol substitution to petrol to a certain extent. It is important to mention here that we are spending more than 8 lakh crore (eight trillion) rupees on petrol and petroleum products import for our domestic use. So, substitution to the extent of 10 to 20% will be a huge savings. Thus, agriculture can play a very significant role in energy sector as well.

These indicators revealed technology as the driver of these changes and policy, institutional framework again contributing to these changes, bringing in much needed efficiency. But there is quite a number of challenges and certainly first one is climate change. The water footprint in the environment and greenhouse gas emission from agriculture has to be reduced, it is a big challenge. The

nutrient use efficiency has to increase. For instance in case of nitrogen, we are using urea with mere efficiency around 30–35% and its huge quantity contributing to environmental pollution and underground water pollution. At the same time, the new pathogens and insects, new races of existing pathogens which are emerging in more formidable way, all are posing greater formidable challenges to the production systems. The imbalanced use of nutrients, mining of the soils and nutrients are resulting in degraded soils with more than 15 nutrients being deficient in many soil systems in the country. The food habits are changing, the population is growing, and the calorie requirements primarily derived from the cereals, appearing to be a declining trend, a new challenge. Thus, the alternative uses, the industrial uses of agricultural produce, including potato, tapioca and sweet potato starch; so these are the kind of areas, where quite a bit of emphasis, enhanced research and in fact institutional frameworks are required.

As an apex agriculture body of this country, ICAR is taking into account all these challenges and the global scenario and planning and implementing very briefly while leveraging the developments happening globally. For instance, we have been trying to find opportunities in Nano-science based technology solutions in the field of agriculture. Likewise, use of sensor in agriculture automation, solarization of agriculture and all these combined together, bringing in much-needed energy efficiency, green technology in agriculture and providing rapid and timely solutions, an automated and mechanized solution to the problems and meeting the



farmers needs in time and reducing the input cost in the process, that's the emphasis we are focusing on.

We are also focusing on modern tools of biotechnology, particularly genome editing. For example, in case of animal system, artificial insemination is very important. But, our challenge is fertile bull identification that too among declining numbers. Our effort to identify good and fertile bull continues through progeny testing and embryo transfer technology, coupled with that, to increase in the number of good bulls. Now, we have also resorted to cloning and we are shortly going to have 7 to 10 copies of single bull in another one month of time. That's the kind of emphasis and efforts which have been put in place.

I wish, though we should strive for cloning efficient breed of bull, but we should not go for overemphasizing one particular individual and go for producing hundreds of clones of the same individual thus bringing in the diversity that we have in this country. So not more than 10 copies of the single bull, as a result of that we should be able to produce enough semen of good bull, that's one example. Similarly, vaccine developments have been taken advantage of available expertise, so that new vaccines which are thermostable and highly potent are being produced, along with the stereotyping and monitoring systems through appropriate diagnostics so that we move in the direction of producing enough milk and meat, that is required domestically and for meeting the global demands. In case of fisheries sector, we have actually diversified for 61 different species including 15 ornamental species. We have standardized breeding methods as well

as induced breeding. These systems are going to further revolutionize as we move along using newer tools and technologies.

We are creating new germplasm, genotypes and new varieties having multiple stress tolerance using genomics associated technologies. We sequenced genomes, rice genome to start with, tomato genome, subsequently wheat genome, partnering with the international community. When we published the rice genome, we never realized that this area would be paying such rich dividends in years to come. Thousands of genes today are cloned in case of rice and subsequently in many other crops and it is happening. Availability of complete genome sequence, the gold standard sequence, in case of rice, facilitated the cloning of particularly map-based cloning of gene, subsequently, those genes are enabling targeted mutagenesis using genome editing platforms. These are kind of technology interventions, and that has happened over the period of 20 years in case of rice and branch out to the other crops now.

Today, honorable Prime Minister himself emphasized that the artificial intelligence and the associated kind of technology be capitalized for various purposes. We have accumulated huge quantity of data in this country but we have not been able to take advantage of this data. So, we are now collecting all the information together at one place so that the 50 years old data from the AICRP system can be appropriately analyzed using data analytics, meaning is added and new information is derived. However, appropriate interpretation should be done so as to add the value to germplasm, to

create new information resources for the Global community. I am sure these platforms which are being created would provide much-needed impetus to the agricultural development, to meet the challenges.

As the climate is changing, we have also created world class facilities to study phenomics. Unless we understand phenome, the genome modification is difficult. Thus, precise non-destructive phenotyping with multiple platforms including hyper-spectral imaging and use of drones now, would enable us to dissect what is happening in the plants and use that information in association with genomic information to add value, derive deeper meanings and insights and dive deeper into genome functions, as a result, genetic manipulations, is greatly facilitated.

Speed breeding, that we have initiated now, as a network, would greatly accelerate the breeding process, shortening the cycles, enabling the selection in lesser period; thus reducing the total number of years required to develop new variety from 10–12 to 5–6 years. These are the kind of areas, where we are focusing on. I thought this is a broader perspective and would provide potato workers to think how to really move ahead.

Potato has its own challenges. Our productivity usually ranges around 20 to 24 t/ha. Based upon the duration, our per day productivity is almost double of Germany, USA and The Netherlands. Our crop duration is 80 to 90 days, whereas in European and North American countries it is much longer, if not double than at least 1.5 times. So, this is how I wanted to draw a parallel, taking per day productivity. Though, we are not really falling

short of the expectations, but, based on the per hectare productivity, we should not go for the narrative, though productivity is an indicator. Not only in case of potato, say for in case of wheat, per day productivity, what we have, is one of the highest in the globe.

We have to move further as average potato productivity is stagnating at 20-22 t/ha for more than 5 years now, a serious challenge in potato. Today, potato had 52 mt of production with 4 to 5 times increase in yield from a 9 to 10 times increase in area, but I think what is required in this point of time is very systematically focus on per se yield enhancement. It's a very serious challenge to work on and deliberate on. In other crops, we have seen that wild relatives play a very significant role. In potato, we do have these wild relatives, in tomato, for instance, *Solanum peruvianum* and other species, small-fruited ones, contributes genes for fruit size. The green fruited one contributed for higher lycopene content in cultivated tomato. So, there would be many genes hidden in the wild relatives. They are diploids, and the cultivated one are tetraploids, though we can have tetraploid from diploids using anther culture or ovary culture, they are being produced and there is a long way to go. Potato genome has been deciphered and the kind of lesson learnt from there, need to be really capitalized on. The advantage offered by wild species, not only for disease resistance but also for yield and particularly abiotic stress tolerance, this is the one area where we need deliberations.

Lot of work is going on globally and we have now three potato varieties developed by ICAR- CPRI having higher water use efficiency,

saving about 30% of water. But that is not really enough, if you compare water consumption of potato and rice, there is big difference. Rice requires about 3,000 liters of water per kg, but potato requires about 500 liters of water per kg of produce. But again, there is plenty of scopes to save on water, through micro-irrigation system and associated fertigation systems. We need to really save on the nitrogen. Saving on nitrogen through fertigation and development of varieties with high nitrogen use efficiency, that is very essential.

Phytophthora has been a great challenge for long we are trying to address. We have some tolerant varieties developed but certainly it still remains a constraint. Given this importance we have identified some genes from wild that have been transferred but we have not been able to really develop in this country a kind of variety which can be resistant to late blight using RB gene. We have again long way to go!

Climate change is impacting development of new races and *Phytophthora infestans* is no exception. Newer types are emerging in faster way and this needs to be really taken into account while we are deliberating and creating new research areas. The insect vectors, particularly in potato are spreading diseases and this is emerging as another area of concern. How do we actually address this issue in the context of climate change this is far more formidable. Whether it is Gemini virus, PVX, PVY and PLRV, all these complexes would challenge production system with regards to potato. Unless we see and study the insect population dynamics, in the context of climate change, we will not be able to address

this issue of vector borne, viral diseases of potato.

The host-resistance that we talked about, not that everything would be available here in wild species or within the range of crossing that we can utilize, but certainly the modern tools of genome editing should be utilized particularly for genes; genes for susceptibility, if we identify, using elaborate genome sequences, functional genomics tool, gene expression profiles and all that. We should be able to identify those genes and mutate them. There could be a set candidate gene, which can be targeted for mutation to understand first of all gene function, identify those specific targets and which can be actually altered so that we have a potato not only resistance to *Phytophthora infestans* but for various other diseases and even for abiotic stresses as well. We are targeting for instance some of the receptor of ABA biosynthesis, in case of rice, where we are targeting mutations and some of the QTLs. As, it is observed that loss of function or impairment in function leads to gain of trait, and that happens naturally in evolution, that provides very broad canvas for us to identify those QTLs and to clone them and in directed fashion mutate them using genome editing tool so that we can have gain in large number of traits.

Diploids can be made productive if you can actually target some of those traits, which make them unproductive and unsuitable for commercial cultivation. Climate change is a serious concern for all of us, but it is said that increase in carbon dioxide concentration in the environment is going to increase biomass production in potato. How much of that to be partitioned into the tubers and how much

we can harvest in the form of economic yield that need to be very critically analyzed. The pathways need to be understood, the genes concerned in that pathway in terms of 'carbon harvest', and also its utilization and partitioning and storage. If we can interfere them very strategically, we can very significantly increase yield and break the ceiling that we see.

Management is very crucial, to move further in potato. How the precision agriculture systems can be put in place. Mulching has also led to very significant yield increase in case of potato. Can you really go for your management practices where we can have this particular management intervention to go beyond yield ceiling that we have today? We have to move in the direction of processing; processing in various forms, biofortification, micronutrients, antioxidants, anthocyanin enrichment or other pigment forms and going beyond that. How do we utilize the starch for other purposes like energy and various other purposes where starch is actually utilized so that potato be effectively utilized and farmers' income not just doubled but quadrupled!

The potato area has increased; we have great varieties which are thermo-tolerant.

Temperature is further rising and we need to really capitalize on this work and move further. But while doing so, if we give attention to processing traits, the industrial need and various targeted uses like modified starch that can be produced out of it at reasonable price; probably that would be a pathway for all of us to think about and work on. Further, the enhanced tuberization! It is a long way to go, but interfering with tuberization to enhance productivity to have both above and below ground tuber, would be certainly advantageous.

There are plenty of opportunity to all of us to move in this direction and I am sure global potato community's research would be certainly deliberating on various other issue which I didn't really bring out here and ultimately guiding research and particularly inspiring youngsters, the young researchers to choose correctly the area of research so that we solve the problem and create new products for future. So, this is in brief that I wanted to say. Thank you very much for patient hearing. Thank you very much Dr Chakrabarti for giving me opportunity to be here and thank you Mr. Chairman to give me plenty of time to talk about.

MAJOR RECOMMENDATIONS OF TECHNICAL SESSIONS OF THE CONFERENCE



TECHNICAL SESSIONS



SESSION

01

Germplasm Management and Next Generation Breeding

In this session five presentations were made. The session began with the presentation of Dr Vinay Bhardwaj, ICAR-CPRI, Shimla, where he presented the present scenario and future prospects of Indian potato breeding and discussed adoption of new dimensions in the current breeding programme. Dr JE Bradshaw, Former Scientist, JHI, Scotland elaborated on breeding nutritionally rich high yielding potato varieties providing nutritional

security. He discussed the strategies to improve nutritional value of potatoes through conventional breeding and also highlighted the factors that can affect tuber chemical composition and bioavailability of nutrients. Dr Jai Gopal, Former Head, Division of Crop Improvement, ICAR-CPRI, Shimla presented the current status of potato germplasm repositories across the globe and particularly in India and the progress made in *in vitro* conservations including cryopreservation.



Dr Sanjeev Sharma, Scientist, JHI, Scotland, highlighted the pros and cons of conventional markers and genotyping approaches in potato genetic research particularly in gene discovery and applied research applications. Prospects and usage of high-throughput sequence-based genotyping that offers greater flexibility and scalability, and the capability to scan polymorphisms without prior knowledge were discussed. Dr Pim Lindhout, Head, Solynta discussed the advantages and progress made in diploid hybrid potato breeding at Solynta. An elite line, Solyntus developed by Solynta having *Sli* gene enabling repeated selfings has shown superiority in agronomic traits and is of particular interest for future diploid breeding programmes. The session was closed with the Chairman's remarks and following recommendations emerged from the session:-

- Potato is a potential staple food of developing countries and therefore India needs to develop nutrient rich potato varieties without compromising yield

to harvest the dual benefit of food and nutritional security.

- New dimensions are needed in potato improvement including speed breeding, diploid potato breeding, genomic selection and digitalization of breeding trials to shorten the breeding cycle and breeding efficiency so as to capitalize the genetic gain in potato.
- To efficiently use the genes and genotypes the effective management of germplasm is important. In germplasm rare alleles should be conserved as core collection followed by effective characterization, evaluation, documentation and digitalization.
- Short duration processing potato varieties should be fast developed which may fit well in various cropping systems.
- Inter institutional collaborations in public-private (PP) mode need to be worked out in the field of diploid potato breeding. In this regard,



collaboration with firms like Solynta may be considered so as to address the following:

- Evaluation of hybrid diploid TPS in non-traditional potato areas in the country.
- Initiation of long term project to develop diploid inbred parental lines from indigenous heat tolerant & adapted tetraploid varieties and parental lines to hasten the hybrid potato breeding.







SESSION 02

Potato Biotechnology and Omics



In this session, total six presentations were made. In first presentation, Dr. JK Tiwari, Senior Scientist, ICAR-CPRI (on behalf of Dr. SK Chakrabarti, Director, ICAR-CPRI, Shimla) gave an overview of potato biotechnology work at ICAR-CPRI, Shimla in the area of genome sequencing of potato, potato-pathogens, transgenics, molecular markers, genetic diversity, germplasm characterization,

transgenics, QTL mapping, genetic fidelity study, diagnostics etc. He also mentioned that ICAR-CPRI was potato genome sequencing consortium (PGSC) partner for sequencing of the potato genome deciphered in 2011. Dr. Donald Macenzee, Donald Danforth Plant Science Center, USA highlighted the CRISPR technology as a new tool box for better crops. Dr. Anjan Banerjee, IISER, Pune talked about functional genomics for understanding the tuberization events in potato. It is known that tuberization is very important process in potato and also tuber are the most economically important part of potato. Dr. Jagesh Kumar Tiwari, Senior Scientist, ICAR-CPRI, Shimla highlighted the uses of functional genomics by RNA-sequencing and agro-physiological approaches for improving nitrogen use efficiency in potato, given that the potato needs high dose of N fertilizers for high tuber yield, nearly half of which goes waste in the environments and also increases



cost of production. Hence, to save the N input, such technology would be useful to develop N-use efficient potato. Dr. Ravi M., IISER, Thiruvananthapuram discussed about the biotechnological approaches for producing *in vivo* haploids in potato. Being a clonally propagated and polyploidy nature of this crop, this technique is important for genetic and haploid biology study in potato and further to develop homozygous lines and hybrid potato. At the end, Dr. A Kushalappa, McGill University, Canada discussed on the application of cis-gene editing using CRISPR-Cas9 system to enhance disease resistance in potato. Besides,

the session had in depth discussion on the use of biotechnological tools for potato improvement. More specifically CRISPR technology, a cutting edge technology that facilitates targeted insertion, replacement, or disruption of genetic elements in plants. This provides unique research advancements in genome engineering due to precise DNA manipulation. Genome-editing is being widely applied in plants and has revolutionized crop improvement including potato. Thus, there is an immense potential to apply these new techniques and genomics in potato to meet the sustainable development goals and ensure





food and nutritional security of the world. The session ended with Chairman's remarks and following recommendations emerged:

- There are many challenges in potato research like nitrogen fixation in root zone of potato, increasing photosynthetic efficiency of plant, investigating root system architecture, enhancing biofortification specially micronutrients, and mass scale production of biofuel as well as starch for industry. Besides breeding and agronomic interventions, inclusion of various biotechnological tools is imperative to achieve these stupendous goals in future especially

abiotic stress (heat and drought) and biotic stress (late blight, viruses, bacterial wilt etc.) resistance/tolerance, and quality traits in potato under changing climate change scenario.

- Enhancing input use efficiency of the crop, like water and fertilizer resources needs special attention. Improving fertilizers like nitrogen use efficiency of plants necessitates urgent focus to minimize cost of production and save the environment from N loss without compromising the yield of potato. Also increasing knowledge of N biology, associated genes and precise





measurement of genetic variation in the potato germplasm is very crucial for enhancing N use efficiency.

- Tuberization is the most important biological phenomenon in potato biology. Hence, understanding of tuberization processes and association involving genes and regulatory elements (microRNAs and transcription factors) is vital to manipulate plants through novel biotechnological tools like genome editing and/or transgenics approaches.
- Safe application of modern genomics tools of next-generation sequencing & genome editing will play very significant roles in potato improvement for biotic/abiotic, quality & yield-attributing traits. Since potato is a tetraploid and highly heterozygous crop, development of haploids could be an important attempt to develop homozygous potatoes. So that true-to-type botanical seeds can be developed in future by which seed potato production programme would be easy in the country.

SESSION

03

AI and ICT in Potato R & D



The session was chaired by Dr TA Gonsalves, Director, IIT, Mandi and Co-chaired by Dr Bimal Bhattacharya, Space Application Centre (SAC), Indian Space Research Organisation (ISRO), Ahmedabad, Gujarat. In this session, total four presentations were made. The session began with the presentation of the

session's chairman Dr TA Gonsalves. He made a presentation on FarmerZone project and gave a brief overview of ongoing activities. Dr Shashi Rawat, Principal Scientist, ICAR-CPRI highlighted the ICT activities of ICAR-CPRI with respect to Potato R&D. He briefed about various DSS developed, Late Blight forecasting System, databases, remote sensing & GIS activities, e-books, etc. developed by ICAR-CPRI. Mr Routray from Sourcetrace System Ltd, made presentation on the use of data driven mechanisms for making potato as a sustainable commodity. He discussed the major challenges with respect to data utilization in farm management inputs, farmer advisories services, certification, traceability etc., lastly he gave practical approaches with the help of technologies such as Blockchain, AI and Machine learning etc. to overcome these challenges. Dr Madhu from Agrometrics System Ltd., elaborated



the utility of hyperspectral imageries in the precision agriculture system such as crop health monitoring, yield prediction etc. for North America. He emphasize that India should also adopt the technology of remote sensing and UAV technology in agriculture for crop production at mass scale. The main recommendation of the session were:

- Remote sensing technology, especially Hyperspectral remote sensing is gaining popularity in the precision agriculture studies. The input intensive commodities like potato can be managed for disease identification, nutrient deficiencies and health management with the help

of such technologies. Future research should be focused on these aspects.

- Decision support system (DSS) are gaining popularity across the globe in optimizing the production inputs and getting alertness for the potato production chain to achieve maximum production from limited area under cultivation, thus proving usefulness among the potato farming community. However, for increasing visibility of DSS based on potato there should be a feedback system from users after transfer of technologies with respect to DSS and mobile apps.







- Precision Agriculture (PA) is desired to maximise input use efficiency. Effective use of Bigdata is required for PA through Artificial Intelligence (AI) and Machine learning.
- Potato diseases such as Late Blight, Bacterial wilt and viruses such as potato virus S, X and Y etc. incur significant losses in the farmers' field. For early detection and management of these diseases, remote sensing based forecasting technologies should be developed.

SESSION 04

Climate Change and Crop Management

The Session was Chaired by Dr. Gurbachan Singh and Co-chaired by Dr. PL Saroj. Six presentations were made during the session on various aspects of likely impacts of future climatic scenarios on potato crop and management strategies to deal with the challenges. The session began with the presentation of Dr Jagdev Sharma from ICAR-CPRI, Shimla where he gave an overview of present status of potato production technologies in India in relation to readiness for dealing with the likely challenges under future climatic scenarios. Dr. VK Dua from ICAR-CPRI, Shimla, India, delivered lecture on "Potato farming - present scenario and potential future", where he highlighted the major potato production scenarios in different continents/countries and the problems of these regions vis-à-vis productivity stagnation. Dr. PL Soman from Jain irrigation systems Ltd., India delivered a talk on 'Precision irrigation

in Potato'. He highlighted the importance of micro irrigation scheduling and emphasised on adoption of micro-irrigation and drip in particular for improved water use efficiency and higher economic returns. Dr. PL Saroj from ICAR-Central Institute for Arid Research Institute, Bikaner, India gave presentation on 'Potato growing in non- traditional areas' and shared the results of studies on successful





cultivation of potato in non- traditional area (Rajasthan) in India. His studies revealed that there is a very good scope for producing potatoes with high dry matter in Rajasthan. Dr SP Singh from ICL Fertilisers Ltd. India presented benefits of 'Polysulphate-a multi nutrient natural fertiliser' in different crops and its potential use in Potato. Dr. Manish Pandey from QCI India, in his talk on "Good Agriculture practices their certification scheme" emphasised on the need for protecting interest of the consumers and ensure quality of products by enforcing quality check so that producers and sellers are forced to supply quality products with better performance leading to better economy growth of India in the coming years.

The session was closed by the Chairman's remarks. Following recommendations emerged:-

- Compared to cereal crops, potato price is subjected to high fluctuation within a year owing to its seasonal production, semi-perishability and limited storage facility. Thus, emphasis should be given to develop technologies for sustainable year round potato production for price stability where seasonal variability is available within region or across the region within a country.
- Potato is high water requiring crop. Studies have suggested that by adopting modern methods of irrigation,





requirement can be reduced by even upto 50%. However, despite the technological advancement, rate of adoption of micro-irrigation is slower in potato crop, so more efforts should be put for popularizing this technology particularly in water deficit areas.

- Globally, the availability of land for agriculture is decreasing, particularly in developing countries. Scope for increasing area under potato crop is limited, therefore avenues for increasing cropping intensity may be explored through intercropping with new crops, mainly in those countries where holdings are small and man-power is abundant.
- Consumers are becoming more health conscious nowadays. They prefer healthy, organic produce. Though much work has been done on organic potato production, still there is a need to strengthen development of organic potato production technology, especially in the area of disease and pest management and development of varieties suitable for organic production.
- Under the changing climate scenario, climate variability in terms of high fluctuation in day and night temperature in high altitudes/latitudes is causing greater events of frost. Potato is highly





sensitive to frost. In order to address this newly emerging threat, focus should be

given to develop frost tolerant potato varieties.

In this session, total seven presentations were made. The session began with the presentation of Dr Vinay Sagar where he gave an “Overview of potato disease management in India”. Dr. Jan Kreuze, CIP, Lima, Peru presented the importance of Barcoding of life (BOL), which enables the identification of species based on a DNA sequence ‘barcode’

as an efficient mechanism to identify potato pest and diseases. Dr David Cooke from the James Hutton Institute, UK delivered a talk on “Improved late blight management through understanding European and global population change in *Phytophthora infestans*”. He presented the global scenario of *Phytophthora infestans* with special reference to new insights of pathogen diversity under changing climate. The presentation of Dr Mathuresh Singh, Agricultural Certification Services Inc (ACS), Canada mainly focused on potato viruses with special reference to Potato virus Y. He also emphasized on how their experience with PVY as a model can help in managing potato viruses around the world. Dr MC Ranganath from Indofil Industries Ltd. Mumbai in his presentation talked about new chemistry molecules for management of potato diseases. Dr. Mamadou Kane, Mboup DuPont De Nemours,





France in his talk on “Fungicide resistance and its management” highlighted the new challenges of crop protection industry in bringing new molecules to market due to regulatory constraints. He also discussed the key principles influencing fungicide resistance development and key recommendations for protecting oxathiapiprolin performance over time. A talk on “Microchip based real time PCR as portable devices for plant pathogen diagnosis: Progress, issues and challenges” was delivered by Dr Sikander Gill, Lumex Instruments, Canada. In his presentation, he showed the demand for accurate, early, and rapid on-site diagnosis of single or multiple

phyto-pathogens using portable devices. He also talked about the recent development of a novel ready-to-run microchip-based real-time PCR technology which provide cost-effective, sensitive, rapid, and easy-to-use detection of phytopathogens. The session was closed by the remarks of Chairman Dr BP Singh Former Director, ICAR-CPRI, Shimla. Following recommendations emerged from this session:

- Potato crop is affected by a number of pathogens worldwide many of which are listed as quarantined in our country. Besides, new pathogens and races are reported every year from different parts







of the world. To prevent the introduction of these quarantined and new emerging pathogens into our country, there is a need to develop sensitive and rapid chip-based multiplex molecular diagnostic assays for detection of all the pathogens of potato in one-go and also to develop Barcoding of life (Q-BOL) which enables the identification and characterization of species of pests and pathogens based on a DNA sequence.

- Most of the pathogens are highly variable in nature and are capable of evolving

themselves with change in climate/continuous indiscriminate exposure to pesticides i.e. they evolve themselves to adapt to the changed climatic conditions/develop strains that are resistant to pesticides. Therefore, it was recommended to develop sustainable management strategies with holistic approach rather than mere dependence on pesticides. Also, the efforts should continue to explore new fungicide molecules with different mode of action to avoid development of resistant strains of the pathogens.

SESSION 06

Potato Pest Management

In this session, a total of six presentations were made. The session began with the presentation by Dr. Anuj Bhatnagar, ICAR-CPRI-RS, Modipuram where he gave an “Overview of the potato pests in India”. He mentioned that the sub-tropicalisation of potato has led to a set of unique pest problems including the sweet-potato whitefly, *Bemisia tabaci* and the begomovirus it transmits. The peach-potato aphid, *Myzus*





persicae continues to be the major constraint for quality seed potato production along with a cascade of non-colonizing aphid species in India. It was followed by the presentation on vector-virus relationship with special reference to vectors of potato by Dr. S Subramanian, ICAR-IARI, New Delhi. He emphasized that understanding the vectors associated with the virus, and management of the vectors by adopting an integrated approach of cultural mechanical and clean cultivation practices would help to manage the virus diseases of potato in an effective manner. Dr. PD Kamala Jyanti, ICAR-IIHR, Bengaluru made presentation on ecological chemistry of insect-plant interactions from pest management perspective and

emphasized on how the work done on fruit fly could be used for the management of potato pests. Dr. RS Chandel, CSKHPAU, Palampur talked about the integrated control of potato tuber moth (PTM), *Phthorimaea operculella* (Zeller) in India. He discussed the host range, endemic area, lifecycle and IPM strategies to reduce the damage of PTM under store and field conditions. It was followed by two presentations on the management of nematode pests of potato. Dr M Nagesh, ICAR-NBAIR, Bengaluru presented an "Overview of the management of nematodes in potato with success achieved and way forward". He stressed upon the need to develop eco-friendly integrated management packages for farmers. Dr S Balaji, Coromondal,





Hyderabad made a presentation on effective bio-pesticide for the control of potato cyst nematode. The following recommended were made during the session:

- Potato psyllid (*Bactericera cockerelli*) and South American tomato worm



(*Tuta absoluta*) are likely to invade potato crops in India, therefore these pests should be kept under constant surveillance.

- Seed plot technique, which was developed in India in late 1960's to produce disease-free potato seed in northern plains by delineating vector-free period, should be revisited in the light of latest trends in the vector dynamics. New areas for seed potato production should be identified based on vector pressure.
- The nematodes cause considerable damage to potato crop in major potato producing countries. Synthetic analogues of root semiochemicals and hatching inhibitors should be explored







for the management of potato cyst nematodes (PCN) and the saprophytic nematodes should be evaluated for the management of cysts nematodes.

- Certification procedure should be toned to the field level like the Netherlands so that farmer can register and produce seed potato in their field if found free of the PCN instead of blanket ban on the seed production in large areas or states on the whole.

SESSION 07

Advances in Seed Technology

In the opening of the session, the Chairpersons Dr Kirti Singh, Former Chairman, ASRB and Dr HP Singh, Former DDG (Hort. Sciences) ICAR, Co-Chairman Dr BP Singh, Former Director, ICAR-CPRI, Shimla highlighted the importance

of healthy seeds in potato cultivation. The everlasting shortage of seed potatoes in the country was emphasized and role played by ICAR-CPRI in producing the Basic and healthy seed materials of potato was greatly applauded. Dr. RK Singh, PS & Head, CPRI,





Shimla delivered lecture on “Seed Potato System in India –An Overview” where he outlined the potato seed systems followed in India and ICAR-CPRI in particular. Large scale integration of Hi-tech means of seed potato production along with conventional means was suggested as a measure to overcome the shortage of seed potatoes in the country. Dr BP Singh delivered lecture on “Potato Seed Production Systems-then and now”. In his deliberation, Seed Systems of potato followed in the country during the past and in present times was presented along with the Seed Certification Schemes followed national and internationally. A comparison of Seed Potato Production and Certification systems followed in major seed potato

producing countries viz. The Netherlands, UK, USA, China was made with the one followed in India. He also emphasized to modify the Seed Certification Scheme for the Seed developed through Aeroponics/micro-propagation. Keeping the importance of hill seed in India there is a need to follow field certification system to produce seed potatoes in the PCN infested area as per the models being followed in other European countries like The Netherlands instead of blanket ban on the seed movement through domestic quarantine. Er. Sukhwinder Singh, Scientist-SG, CPRS- Jalandhar during his talk on “Present Scenario and Future Prospects of Aeroponic technique for Seed Potato Multiplication”; elaborated the present







status of seed potato production through aeroponics in the country. It was highlighted by him that aeroponics is the way to make available the healthy seed potatoes in non-traditional seed areas where, seed potato production is not possible due to one or other reasons. Ms. Monica Parker, Scientist, CIP made a presentation on “Apical Root Cutting: A novel technique for seed potato multiplication”. The main recommendations of the session were:

- Aeroponic based seed potato production technology has come as a boon for

countries where seed multiplication rate is very low and slow. This technology shows promise for those areas and should be refined and popularised in non-traditional potato growing areas to augment seed supply.

- Existing Seed Certification Scheme and standards should be modified for seed potatoes produced through micro-propagation/aeroponics. This will give a boost to supply of quality planting material, free from viruses and other tuber borne disease.



An overview of potato storage and processing scenario in India was shared by Dr. Brajesh Singh. The present storage capacity expected infrastructural investments in coming 3-4 years were detailed. For processing, the current trends, capacities, industries and products were discussed. Besides, varietal requirement, capacity enhancement and future projections were shown. Dr Mark Heap, Bioscience Manager Simplot Australia highlighted the challenges for storage of

processing potatoes, major diseases during storage with special emphasis on dry rot in warmer climate, new grading, transportation and storage solution which might help in reducing losses at harvest, storage and processing. He emphasized on cost and quality losses due to these issues in case of frozen processing industry and suggested plans that involve changes in tuber lift, shift to mechanical grading and replacement of 50kg bags with large box for storage to



reduce the losses. The talk on 'The genetic control of sprout growth in potato tubers during storage' was delivered by Dr. Mark A Taylor from The James Hutton Institute, UK who discussed about the problems in use of sprout inhibitors due to their residual levels. He suggested genetic control of tuber sprouting to avoid premature sprouting of tubers. The molecular mechanisms involved behind these processes were shown and possibilities of exploring molecular



mechanisms for control of dormancy and sprouting were suggested. Dr. Jiwan Palta, Wisconsin University discussed about quality improvement with calcium nutrition. He emphasized on the role of targeted calcium application in the tuber area during tuber

bulking period to increasing tuber calcium concentration. Tuber calcium concentration in the range of 200 to 250 ppm was reported to be most effective in controlling diseases such as soft rot and hollow heart. Paul Oosterlaken, CEO & Director, Kiremko B.V., The





Netherlands, delivered talk on Opportunities and Challenges of Potato Processing in India". He discussed about economical challenges such as steady supply of product with constant quality. Influence of mechanized production and opportunities in India due to rapid growth of processing industry were detailed. He elaborated on potential of India to become huge supplier of processed potato products for rest of the world. Total five presentations were delivered during this session. Major Recommendations from this session were:

- Calcium plays a major role in improving tuber quality and disease control. However, not much work has been done on these aspects. There is a need to explore effect of calcium application, particularly through soluble calcium fertigation, on tuber quality, colour, storability, control of diseases e.g. soft rot, hollow heart, cracking and processing quality.
- The demand for processing potato is increasing in India. However, presently processing potato production is limited to certain pockets, e. g. Gujarat and Madhya Pradesh. Keeping this in view it is important that new suitable areas for producing processing potato beyond already identified areas should be identified to meet the growing demands of processing sector as well as to save on the cost of transportation to large distance.

SESSION 09

Technology Transfer and Social Issues

Total six presentations were made in the session on technology transfer and social issues. Dr NK Pandey, Principal Scientist & Head, Division

of Social Sciences, ICAR-CPRI, Shimla presented an overview of present status of social issues and on-going activities for technology transfer in the Indian context. He highlighted that the roadmap to address issue of technology transfer should involve stakeholders' workshop in line with state departments at various levels. The investment in potato R&D along with variety and technology wise impact may also be analyzed. Dr Samarendu Mohanty the regional Director for Asia, CIP, Vietnam presented the model of Small Farmers Large Farms (SFLF). In his talk, he elaborated the socio-economic opportunities and strengths of SFLF for sustainability. This model can be instrumental in enhancing





the farmers' income. Dr KD Kokate, former Deputy Director General (Agriculture extension), ICAR, New Delhi delivered a talk on Technology transfer and adoption for

food security and doubling farmers' income. He highlighted the issue of food security, challenges for increasing production and productivity and trends in technology transfer. Dr Sanjeev Saxena, Additional Director General (Intellectual Property & Technology Management) presented the current scenario of commercialization of agricultural technologies in India. He also presented various issues for commercialization of technologies by ICAR and elaborated different IPR issues. Dr Shantanu Kumar Dubey, Principal Scientist, ATARI Kanpur, Uttar Pradesh delivered a talk on Geo-spatial experiences in front line extension of potato production technologies in India. He mentioned about FLDs in north-





eastern region and potato based cropping systems. Dr RN Padaria, professor, Division of agriculture extension at ICAR-IARI, New Delhi spoke on convergence in extension, network analysis of organizations, initiatives for convergences and its challenges. He briefed about the convergence model for adaptation in Gaya, Bihar and described about the *Pusa mkrishi* model. The major recommendations from this session are:-

- Information and communication technology is gaining wide

popularity among the Indian farmers. Dissemination of information via mobile Apps, SMS, Web-based applications is rapid and extensive. In Indian Potato Industry there is need to strengthen and wider use of IoT tools for transfer of information.

- The mindset of consumers is changing towards nutritive food. The market of nutrient rich food is expanding rapidly. In such scenario, there is need to popularize potato varieties which are rich in phyto-nutrients like Zinc, Iron, antitoxins etc.

Panel Discussion : Potato Trade and Industry



The Session was Chaired by Sh. Minhaj Alam, Joint Secretary, Ministry of Food Processing Industries, Gol. In his presentation, Sh. Alam explained the new government scheme for the development of TOP (Tomato, onion and potato) value chain “Operation Greens”. The details of the government scheme, its objectives in solving the problems of farmers regarding cold storage and processing agri-logistics etc. and the incentives to



be given by the government, were also provided.

In India, potato processing is very less as compared to European countries. Nischint Bhatia, Asia Head, Pepsico and Mr Abinash Gupta, McCain Foods, panelists from the processing industries emphasized the need to encourage processing in India for profitability of farmers. They further stated that there is a need for developing/introducing more processing varieties. The need for producing better seed by policy issues like defined seed blocks/districts were also suggested.

In India there is limited supply of healthy seed as compared to its requirement, Dr. Mohinder Kadian, CIP emphasized for

decentralization of seed production and to work in government-private collaborative mode for further progress in this sector. Davinder Dosanjh, Mahindra & Mahindra, panelist from the seed sector discussed the issues of gaps in infrastructure and need of new geography for potato seed production. He also highlighted the need of increasing healthy seed production in the country by allowing/incorporating tissue culture based technology in seed production. It was also emphasized that government should promote the development of seed villages.

Dr Herman Vereld from HZPC mentioned that India has great export potential but to harness this potential, much emphasis has to be given to quality of produce.





Post-harvest potato losses are more in India as compared to European countries due to lack of proper handling. Mr. Abhishek Singh, MD Grimme India Pvt. Ltd., panelist from the mechanization sector emphasized the need of increasing the mechanization in potato cultivation in the country as it is negligible. Mr Jihan Shah, Advait Agrotech Pvt. Ltd., Ahmedabad raised the issues regarding the unavailability of refrigerated transport vehicles and the need of timely transport of the produce to the cold store. Encouragement of proper grading and packing before sale is required for better supply chain.

The concerns related to the seed production in Bangladesh regarding the limited healthy



seed availability, availability of good varieties, lack of storage and meagre value addition were highlighted by the panelist Mr Sudhir Chandra from Advanced Chemical Industries, Dhaka, Bangladesh. The session ended with the comments of chairs and experts emphasizing that private sectors should contribute funding for further research and development in India aimed at promoting potato trade. Export from India should be increased so as to ensure that farmers get better prices for their produce.

Following recommendations emerged from the session:-

- India should try and get access to the Far East, South East and Middle Eastern countries for export of commercial potatoes







- and seed, specially minitubers as they are disease free. This requires Government to Government interaction and alignment of phytosanitary requirements.
- India should identify the high potential export markets amongst the above and target them one by one through marketing campaigns and sponsored visits like is being done by US for Washington apples, California almonds. APEDA and Ministry of Agriculture should join hands to drive this.
 - The internal freight cost and out of India are very expensive and to offset this as well as other higher costs of operating in India, potatoes and seed potatoes fetching an export price of above Rs. 15/- per kg FOB should be included in the export incentive schemes. A near term potential i.e. 3/5 years after opening up of export is projected to be above 1 million MT of potatoes valued at around Rs 1,500 crore per annum.

Panel Discussion : Potato Policy Issues

In this session, total six panelists expressed their views. The session began with the remarks of Dr Sanjeev Sharma where he gave a brief account of "Various issues in potato value chains". Dr. CB Singh, APEDA, New Delhi spoke on "Potato export: opportunities and challenges in new agri export policy 2018". He highlighted the activities being undertaken by APEDA for

enhancing the export of potato from India. He stressed upon the need to export potato as 'product free' not as a 'pest free'. Prof. Satyabrata Mukherjee, Kolkata University, West Bengal emphasized the need of public-private partnership to develop tailor made products. He further added that ICAR should introduce course on processing at graduation level. The discussion of Dr KV Raman,





Cornell University, USA mainly focused on commercialization of technologies for industries. He also emphasized on shelf-life extension technology as alternative to

reduce the post-harvest losses and to feed the world. Dr JS Minhas, CIP Consultant, Assam, India highlighted the policy issues related to tissue culture based seed production. Dr Vibha Ahuja, BCIL, New Delhi discussed about communication gap between policy makers and technology developers. The discussion of Dr PK Gupta, NAFED, New Delhi mainly focused on policy to manage gluts in the market and he emphasized on development of variety-wise clusters for export purposes. The session was closed by the Chairman's remarks where he recommended the following:

- There is a need for constitution of potato promotion council to get all







information related to potato from a single window.

- The requirements of destination countries should be taken into account for export of table, seed and processed potatoes and accordingly dossier

should be prepared and made available to the producers and exporters by APEDA.

- There is a need to create potato seed production society to regulate the quality and seed chain supply in the country.

Value Addition and Storage Management of Potato (Industry)

In this session, total three presentations were made. The session began with the presentation of Shri Chandubhai Virani, Founder and Managing Director, Balaji wafers, Rajkot, Gujarat on ambient potato snacks, his journey of making chips at home scale and selling it to streets of Gujarat and becoming India's second largest potato processor having turnover of more than 1,200 crores. He credited this success to his persistence despite several ebbs and flows in his business and doing business with human face. He expressed need of developing more varieties suitable for processing. Mr. Sachid

Madan CEO, Technico Agri Sciences Ltd, an ITC subsidiary, presented the Indian journey of Fresh market potatoes to processing potatoes like making chips, flakes and French fries. He emphasized to take this success of potato processing to other states where the processing is still low. He also requested government agencies to relax the tax structure on processed products and felt that there is need of better marketability strategy of Indian processing potato varieties. He expressed his concern on storage losses of fresh and chip stock potatoes. Harish Karamchandani, CEO, Hyfun Foods in his







presentation deliberated upon export of frozen potato snacks and possibility of future demand. He expressed need of developing more varieties for French fries and various frozen products. He informed house that at present Indian potato varieties contribute about 20% in production of French fries. The following recommendations were proposed in the session:-

- Fast growth of potato processing industry necessitates developing more varieties suitable for processing (chips, French fries and flakes) with good storage life.
- There is need of better marketability strategy of Indian potato processing varieties.



Thereafter, **Panel Discussion** on “Improving consumer, nutritionist and doctors understanding of nutritional facts of potatoes” was held. Panelists were Dr. AK Singh, Deputy Director General (Horticultural Science), ICAR, New Delhi; Mr Nischint Bhatia, Vice President and Head Agronomy, AMEA; Mr. Nikhil Tandon, Country Head, Simplot; Ms. Claire Hodge, Senior KE Manager Arable at AHDB, Edinburgh, United Kingdom; Dr Manoj Kumar, Principal Scientist and Joint Director, CPRI RS, Modipuram; Dr Brajesh Singh, Principal Scientist and Head, PHT, CPRI, Shimla and Dr VK Gupta, Principal Scientist, CPRI RS, Modipuram.

Each panelist shared his views and after thorough discussion, it was emphasized that potato is a very healthy food and some of the misconceptions associated with

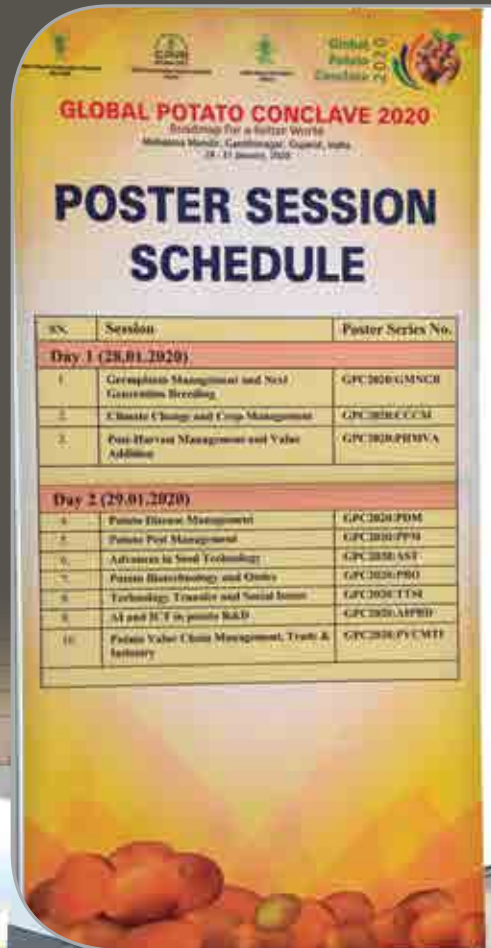


potato consumption (probably that it causes diabetes or obesity) are to be removed from the consumers point of view. For this, help of print and electronic media may be taken and institute or stakeholders should make efforts in this direction.

The session was closed by the remarks of Chairman's where he recommended the following:

- More and more publicity should be given to food and nutritional significance of potatoes using print and electronic media.
- Possibilities of using potatoes in mid-day meal programme of Government school may be explored particularly in the states where cold stores are available for supply of potatoes to nearby area.

AWARDS CONFERRED DURING GPC2020



GLOBAL POTATO CONCLAVE 2020
 Building For a Better World
 Mahatma Mandir, Gandhinagar, Gurgaon, India
 28 - 29 January, 2020

POSTER SESSION SCHEDULE

SN.	Session	Poster Series No.
Day 1 (28.01.2020)		
1.	Genoplasm Management and New Genotypes Breeding	GPC200/GMNCB
2.	Climate Change and Crop Management	GPC200/CCCM
3.	GPC200/PHMVA	
Day 2 (29.01.2020)		
4.	Potato Harvest Management	GPC200/FHM
5.	Potato Pest Management	GPC200/PPM
6.	Advances in Seed Technology	GPC200/AST
7.	Potato Distribution and Outlook	GPC200/PDO
8.	Technology Transfer and Social Issues	GPC200/TTSI
9.	M and B.T in potato R&D	GPC200/MBTD
10.	Potato Value Chain Management, Trade & Industry	GPC200/PVCMTHI



BEST POSTER AWARDS



Theme: Germplasm Management and Next Generation Breeding

First: Selection and evaluation of advanced heat tolerant clones and TPS crosses in tropical coastal region of India by VK Gupta, S. Sunitha, A. Sherly and S.K. Chakrabarti.

Second: Collection, characterization, nutritional profiling and ploidy analysis of baby-potato genotypes of North-eastern region of India by Bapi Das, P. Hazra, A. Chattopadhyay, A. K. Chakraborty, Hemant B. Kardile and S.K. Chakrabarti.

Third: Indian potato gene bank: Present status and its utilization by Vinod kumar, Vinay Bhardwaj and Dalamu.

Theme: Potato Biotechnology and Omics

First: Application of High-throughput Plant Phenomics technique for potato by Sushil S. Changan, Brajesh Singh, Som Dutt, Pinky Raigond, Dharmendra Kumar and Milan Kumar Lal

Second: Amelioration in potato tuberization under light emitting diode (LED) on invitro tuberization of potato (*Solanum tuberosum*)

L.) by Abhishek Pathak, Robin Kumar Pundir, Swapnil Agrawal and Chandrama Prakash Upadhyaya

Third: CRISPR editing of potato phytoene desaturase (PDS) gene as a proof of concept

for genome editing in potato by Sundaresha S, Himani Sharma, Salej Sood, Vinay Bhardwaj, Ashwani Kumar, Shruti Pathania, Ravi Muruthachallam, Kashmir Singh, Rakesh Tuli and S.K.Chakrabarti

Theme: AI and ICT in Potato R&D

First: Real time knowledge based resource information system for potato (RT-KRISP) by Shashi Rawat, V.K. Dua, R.K. Singh, Manoj Kumar, Jagdev Sharma, N.K. Pandey, Sanjay Rawal, Dhruv Kumar, Vinay Singh and S.K. Chakrabarti

Second: Studies on development of single row potato digger for hill terrain farming by Faizur Rahman A, E.P. Venkatsalam, Sam Chelladurai, Narayanan J K, Aarti Bairwa and Priyank HM

Theme: Climate Change and Crop Management

First: Development of potato genotypes from heat tolerant true potato seed (TPS) crosses for combating climate emergency by VK Gupta, Shirly Raichal Anil, S. Sunitha and S.K. Chakrabarti

Second: Perception of potato growers on climate change and their adaptation strategies: evidence of field level study in Agra district, Uttar Pradesh by Paresh Chaukhande, Pynbianlang Kharumnuid, Sanjay Rawal, V.K. Dua, Sushil Kumar, Ashok Kumar, Jagdev Sharma, C.A. Rama Rao and S.K. Chakrabarti

Third: Potato (*Solanum tuberosum* L.) clones exhibited differences for frost tolerance associated leaf morpho-anatomical traits by Dechen Angmo, Sat Pal Sharma, Anu Kalia and Vinay Bhardwaj

Theme: Potato Disease Management

First: Development of RT-LAMP assay: a novel diagnostic technique for detection of Groundnut bud necrosis virus causing potato stem necrosis disease by Baswaraj Raigond, Shruti Pathania, Gaurav Verma, Pooja Bhardwaj, Tarvinder Kochhar and S.K. Chakrabarti

Second: First report of Candidatus *Phytoplasma fragariae* associated with purple top, tubers' hairy sprouts and Candidatus *Phytoplasma ziziphi* with inward rolling of leaves of potato in India by Vinay Sagar, Sanjeev Sharma, Ravinder Kumar, Priyanka Kaundal, S. Sundaresha and Usha Sharma

Third: Standardization of protocol for *Chaetomium globosum* mediated synthesis of nano silver and evaluation of its antifungal properties by Rahul Tiwari, Sanjeev Sharma, Aarti Bairwa, Vinay Sagar, Ravinder Kumar, Milan Kumar Lal, Kumar Nishant Chourasia, K. C. Naga and S.K. Chakrabarti

Theme: Potato Pest Management

First: Survey of Aphids Infesting Potato Crops in Punjab by Mohd Abas Shah, Subhash S., Raghavendra K.V. and Sanjeev Sharma

Second: Management of Hopper Burn in North Gujarat Condition by JK Patel, RN Patel and DM Zapadiya

Third: Comparative susceptibility of *Brahmina coriacea* (Hope) grubs to local isolates of *Beauveria brongniartii* (Saccardo) Petchin Himachal Pradesh by RS Chandel, Monika Kalia, PK Mehta and Suman Sanjta.

Theme: Advances in Seed Technology

First: Studies on production behavior of aerial vs. normal aeroponic tubers under protected conditions by Ashwani K Sharma, Tanuja Buckseth, R.K. Singh and Kapil K Sharma

Second: Varietal differences in development of clones in nucleus seed production (Stage-I) of potato by Dhruv Kumar, Vinay Singh, Manoj Kumar and Murari Lal

Third: Optimization of inter & intra row spacing and canopy management for production of seed size tubers in potato by Raj Kumar, Prince Kumar, Dhruv Kumar, R.K. Singh and Ashwani Sharma

Theme: Post-Harvest Management and Value Addition

First: Potato as a bioenergy crop for fuel ethanol production: perspectives and challenges by Dharmendra Kumar, Som Dutt, Pinky Raigond, Sushil Sudhakar Changan, Milan Kumar Lal, Kumar Nishant Chourasia, Rahul Kumar Tiwari, Preeti Singh, Subhash S and Brajesh Singh

Second: Influence of cooking methods on in-vitro bio accessibility of individual and total phenols in potato by Nitasha Thakur, Pinky Raigond, Milan Kumar Lal and Brajesh Singh

Theme: Technology Transfer, Policy and Social Issues

First: Consumers' preferences for potato attributes in Jalandhar and Ludhiana districts of Punjab by Pynbianglang Kharumnuid, N.K. Pandey and Dhiraj K Singh







Best Stall Awards (AgriExpo)

First: M/s Mahindra HZPC Pvt. Ltd

Second: M/s Pepsico India Holdings Ltd.

Third: M/s Osaw Agro Industries Pvt. Ltd.

Consolation (first): M/s Natural Storage Solutions Pvt. Ltd.

Consolation (second): M/s Sashanka Agro Tech. Pvt. Ltd.

Consolation (third): M/s Hyun Foods

Best Stall Awards (Potato Field Day)

First: M/s Bhatti Agritech

Second: M/s ADAMA India Pvt. Ltd.

Third: M/s Indofil Industries Ltd.

Consolation (first): M/s UPL Ltd.

Consolation (second): M/s Bharat Krushicare Pvt. Ltd.

Consolation (third): M/s Gharda Chemical Ltd.



LIST OF FARMERS AND ENTREPRENEURS FELICITATED DURING GPC2020

a) List of awardee farmers

1. **Shri Randher Singh Yadav**
(Gwalior, MP)
2. **Shri Sita Ram Singh**
(Patna, Bihar)
3. **Shri Pawan Jot Singh**
(Jalandhar, Punjab)
4. **Mr Nongkhlaw**
(Shillong, Meghalaya)
5. **Mr Sujit Das**
(Jalpaigudi, West Bengal)
6. **Shri Sanatan Malik**
(Midnapur, West Bengal)
7. **Shri Ranjan Das**
(Hooghly, West Bengal)
8. **Shri Arun Sarkar**
(Darjeeling, West Bengal).
9. **Shri Ramesh Chand**
(Kangra, Himachal Pradesh)
10. **Shri Ramesh Bhai Ambalalbai Patel**
(SabarKantha, Gujarat)
11. **Shri Jashubhai Patel**
(Gandhinagar, Gujarat)

12. **Shri Jitesh Kumar Chandubhai Patel**
(Aravalli, Gujarat)
13. **Shri Vinod Kumar Tyagi**
(Meerut, Uttar Pradesh)
14. **Shri Yuvraj Singh**
(Agra, Uttar Pradesh)
15. **Shri Om Dutt Yadav**
(Baghpat, Uttar Pradesh)
16. **Shri Bhanwar Pal Singh**
(Kanpur, Uttar Pradesh)
17. **Shri Debi Prasard Sarma**
(Biswanath, Assam)

b) Padamshree Awardee

- **Padamshri Shri Genabhai Dargabhai Patel** a progressive pomegranate farmer from Banaskantha, Gujarat is being awarded for spreading pomegranate cultivation and help to all farmers of nearby villages for increasing their income.
- **Padamshri Shri vallabhbhai Vasrambhai Marvaniya** a carrot farmers of Junagarh Disttm, Gujarat is being awarded to develop and introduce carrot variety named as Madhuban Carrot.

c) List of entrepreneurs (Potato achievers Awards)

- **Mr Baldev Singh Sandhu**, Sandhu Farm in recognition of his outstanding contributions in Entrepreneurship Development in Potato.
- **Mr Jyotirmoy Guha**, GMS Agritech Pvt. Ltd. in recognition of his outstanding contributions in Potato Entrepreneurship Development.
- **Mr Sukhjit Singh Bhatti**, Bhatti Farms in recognition of his outstanding contributions in Potato Entrepreneurship Development.
- **Mr Devendra Kumar** (Posthumously), McCains in recognition of his outstanding contributions in Agronomy for processing potatoes.
- **Mr Jitesh Patel**, Ronak Agro Foods in recognition of his outstanding contributions in Production of processing potatoes
- **Mr Rahul Chaturvedi**, PepsiCo International in recognition of his outstanding contributions in agronomy for processing potatoes
- **Mr Rudra Pratap Singh**, Fresh-O-Veg in recognition of his outstanding contributions in Innovations in cold storage of processing potatoes
- **Mr Sandip Thakkar**, SK International in recognition of his outstanding contributions in Production and export of processing potatoes
- **Mr S.P. Singh**, Technico Agri Sciences Ltd. in recognition of his outstanding contributions in Agronomy for seed potatoes

IPA-Chandra Prabha Singh Young Scientist Award

- Dr. A Jeevalatha (2015-2016)
- Dr. S. Sundaresha (2017-2018)

IPA Fellows

- Dr. Ashis Chakraborty (2017)
- Dr. Vijai Kishor Gupta (2017)
- Dr. Sanjeev Sharma (2018)
- Dr. RS Chandel (2019)

IPA-Kaushalya Sikka Memorial Award for the year 2013-2017

- Drs. Bir Pal Singh, PM Govindakrishnan, VK Dua, Shashi Rawat, Sanjeev Sharma, Islam Ahmad, SK Chakrabarti and SS Lal for "Decision Support Tools for Potato Research & Development."

IPA – Best Paper Award

Vol. No. 44, 2017

- Drs. Anuj Bhatnagar, Shridhar Jandrajupalli, Vallepu Venkateswarlu, Kamlesh Malik, Mohamad Abas Shah and BP Singh for the paper titled "Mapping of aphid species associated with potato in India using morphological and molecular taxonomic approaches."

Vol. No. 45, 2018

- Drs. SK Luthra, JK Tiwari, Dalamu, Bandana Kaundal, Pinky Riagond, Jagdev Sharma, Brajesh Singh, VK Dua, Vinod Kumar and VK Gupta for the paper titled Breeding for coloured flesh potatoes: Molecular, agronomical and nutritional profiling."

PUBLICATIONS RELEASED DURING GPC2020



- Potato Science and Technology for Sub-Tropics (Edited book)
- Book of Abstract of GPC 2020
- Souvenir of GPC 2020
- IPA Hand Book
- Indian Horticulture
- Phal Phool (Hindi)
- Good Agricultural Practices (GAP) for Production of Potato Crop (Tech. Bull. 108)
- Biotechnology in Potato Improvement (Tech. Bull. No. 109)
- Potato Biotechnology Protocols (Tech. Bull. No. 110)
- Potatoes: A source of Food & Nutrition (Tech. Bull. No. 111)
- Package of Practices for Potato Production in Gujarat, West Bengal, Bihar, Madhya Pradesh, Himachal Pradesh and Punjab (English and Hindi)
- Package of Practices for Potato Production in Uttar Pradesh (English)
- Organic Potato Cultivation (English and Hindi Ext. Folder)
- Aeroponic: A Novel System of Seed Potato Production (English and Hindi Ext. Folder)
- Farm Implements for Potato Production (English and Hindi Ext. Folder)





- Package of Practices for Hi-tech Seed Potato Production (English Ext. Folder)
- Value-added Products from Potatoes (Ext. Folder)
- Potatoes for food and Nutritional Security (English and Hindi Ext. Folder)

- Dipsticks: A Simple Method for Glucose Estimation in Potato (English Ext. Folder)
- Good Agricultural Practices (GAP) (English and Hindi Ext. Folder)

Global Potato Conclave 2020

Roadmap for a Better World

28-31, January 2020

Gandhinagar, Gujarat, India

TECHNICAL PROGRAMME

Overview

Day 1 (28 January, 2020)

10.00-12.00	Inaugural function	
12.30-13.00	Key note address: Dr T Mohapatra Secretary, DARE & DG, ICAR, New Delhi	
13.00-14.00	Lunch	
	Poster session: GMNGB, CCCM, PHMVA (14.00-18.00)	
14.00-16.00	Value addition and storage management of potato (Industry)	
	Hall A	Hall B
16.00-18.00	Germplasm management and next generation breeding (GMNGB)	Climate change and crop management (CCCM)
18.00-19.00	Plenary lecture: Dr Ashok Dalwai	
19.00-20.00	Cultural programme	
20.00 onwards	Dinner	

Day 2 (29 January, 2020)

	Poster session: PBO, AIPRD, PDM, PPM, TTISI, PVCMTI, AST (09.00-18.00)	
09.00-11.00	Potato biotechnology & omics (PBO)	AI and ICT in potato R&D (AIPRD)
11.00-11.15	Tea break	
11.15-13.00	Potato disease management (PDM)	Post-harvest management and value addition (PHMVA)
13.00-14.00	Lunch	

14.00-16.00	Potato pest management (PPM)	Technology transfer and social issues (TTSI)
16.00-16.15	Tea break	
16.15-18.00	Advances in seed technology (AST)	Dutch potato seminar I
18.00-19.00	General body meeting-IPA	

Day 3 (30 January, 2020)

09.00-10.00	Plenary lecture: Ian Barker , CIP, Peru	
10.00-10.15	Tea break	
10.15-13.00	Panel discussion on potato policy issues	Dr Mukhtar Singh memorial award contest (oral presentations)
13.00-14.00	Lunch	
14.00-16.00	Panel discussion on potato trade & industry	
16.00-17.00	Dutch potato seminar II	
17.00-19.00	Concluding session	

AgriExpo: Day 1, 2 & 3

Day 4 (31 January, 2020): Field day

Inaugural Function

28 January, 2020

09.30-12.00 hrs

09.30-10.00	Inauguration of AgriExpo	
10.00-12.00	Inaugural function	
12.30-13.00	Key note address : Dr Trilochan Mohaptra Secretary, DARE & DG, ICAR, New Delhi	

Plenary session: Value Addition and Storage Management of Potato (Industry)

28 January, 2020 (Hall A)
14.00-16.00 hrs

Chair	Sh. Sanjay Agarwal Secretary, Department of Agriculture Cooperation & Farmers Welfare	
Co-chair	Mr Nischint Bhatia Asia Head, Pepsico	
Convener	Manoj Kumar Joint Director, ICAR-CPRI, RS, Modipuram	
Co-conveners	Brajesh Singh PS & Head, CBP&PHT, ICAR-CPRI, Shimla	
	VK Gupta PS, ICAR-CPRI, RS, Modipuram	
Speakers	Name and Affiliation	Tentative topic
	Chandubhai Virani Balaji Wafers	Ambient potato snacks
	Vikas Mittal CEO, McCain, India	Frozen potato snacks
	Sachid Madan Chief Executive Fresh F&V & Frozen Business, ITC	Fresh market potatoes
	Haresh Karamchandani CEO, HyFun Foods, Ahmedabad	Export of frozen potato snacks
	T Ananthan Scientist, NIN, Hyderabad	Potato nutrition-myths & reality

Panel discussion: Improving consumer, nutritionists & doctors understanding of nutritional facts of potatoes by

T Ananthan, Sachid Madan, Vikas Mittal, Nikhil Tandon, Claire Hodge

Session: Germplasm Management and Next Generation Breeding

28 January, 2020 (Hall A)
16.00-18.00 hrs

Chair	Dr PL Gautam Former Chairman, PPV&FRA, New Delhi
Co-chair	Dr SK Pandey Former Director, ICAR-CPRI, Shimla
Convener	Vinay Bhardwaj PS & Actg. Head, Crop Improvement, ICAR-CPRI, Shimla
Co-conveners	Vinod Kumar PS & In-charge PC, AICRP(P), ICAR-CPRI, Shimla
	Dalamu Scientist, ICAR-CPRI, RS, Kufri

Invited talks

Time	Topic code	Name and Affiliation	Tentative topic
16.00-16.10	GMNGB 1	Vinay Bhardwaj ICAR-CPRI, Shimla	Indian potato breeding: present & future prospects
16.10-16.30	GMNGB 2	JE Bradshaw Edinburgh, EH3 9GF, UK	Nutritional enrichment of potatoes by conventional breeding and biotechnology
16.30-16.50	GMNGB 3	Jai Gopal Pro-VC, LNMU, Darbhanga, Bihar & Ex-Director, ICAR-DOGR, Rajgurunagar	Management of potato germplasm advances and constraints
16.50-17.10	GMNGB 4	Sanjeev Sharma The James Hutton Institute, Scotland, UK	Sequence-based genotyping and genetic analysis in potato
17.10-17.30	GMNGB 5	Pim Lindhout Head of R&D, Solynta, hybrid potato breeding	Diploid breeding: paradigm shift in potato breeding
17.30-17.50	GMNGB 6	SR Vidyasagar Oregon State University, USA	Genomics assisted breeding: developing new russet potatoes for the processing industry
17.50-18.00	Q & A session		

Session: Climate Change and Crop Management

28 January, 2020 (Hall B)
16.00-18.00 hrs

Chair	Dr Gurbachan Singh Former Chairman, ASRB, New Delhi
Co-chair	Dr T Janakiram ADG, Hort. Sci.-I, ICAR, New Delhi
Convener	Jagdev Sharma PS, ICAR-CPRI, Shimla
Co-conveners	Manoj Kumar PS & Joint Director, ICAR-CPRI, RS, Modipuram
	Sanjay Rawal PS, ICAR-CPRI, RS, Modipuram

Invited talks

Time	Topic code	Name and Affiliation	Tentative topic
16.00-16.10	CCCM1	Jagdev Sharma ICAR-CPRI, Shimla	Climate change and potato production- Indian overview
16.10-16.30	CCCM 2	VK Dua ICAR-CPRI, Shimla	Potato farming - present scenario and potential future
16.30-16.50	CCCM3	P Soman Jain irrigation systems, Jalgaon	Water management in potato: new perceptive
16.50-17.10	CCCM4	PL Saroj Director, ICAR-Central Institute for Arid Horticulture, Bikaner	Potato cultivation in non-traditional areas of India
17.10-17.30	CCCM5	Manish Pande Quality Council of India	Good agricultural practices (GAP) & their certification scheme
17.30-17.50	CCCM6	Shailendra Pratap Singh ICL Fertilizers, India	Polysulphate a unique multi-nutrient natural fertilizer for potato crop
17.50-18.00	Q & A session		

28 January, 2020 (Hall A)
18.00-19.00 hrs

Plenary lecture:

Doubling the farmers income: strategies for accelerated growth

Dr Ashok Dalwai

CEO, NRAA, Department of Agriculture, Cooperation & Farmers Welfare, New Delhi

Session: Potato Biotechnology & Omics

29 January, 2020 (Hall A)
09.00-11.00 hrs

Chairs	Dr G Kalloo Ex-Vice Chancellor, JNKVV, Jabalpur
	Dr AK Singh DDG, Horti. Sci., ICAR, New Delhi
Co-chair	Dr Major Singh Director, ICAR-DOGR, Rajgurunagar
Convener	Jagesh Kumar Tiwari Senior Scientist, ICAR-CPRI, Shimla
Co-conveners	VU Patil Senior Scientist, ICAR-CPRI, Shimla
	Hemant Kadile Scientist, ICAR-CPRI, Shimla

Invited talks

Time	Topic code	Name and Affiliation	Tentative topic
09.00-09.10	PB01	SK Chakrabarti ICAR-CPRI, Shimla	Overview of potato biotechnology in India
09.10-09.30	PB02	D MacKenzie Donald Danforth Plant Science Center, USA	CRISPR: A new toolbox for better crops
09.30-09.50	PB03	Anjan Banerjee IISER, Pune	Functional genomics for understanding the tuberization events in potato
09.50-10.10	PB04	Jagesh Kumar Tiwari ICAR-CPRI, Shimla	Genomics and agro-physiological approaches for improving nitrogen use efficiency in potato
10.10-10.30	PB05	Ravi Maruthachalam IISER, Thiruvananthapuram	Biotechnological approaches for producing <i>in vivo</i> haploids in potato
10.30-10.50	PB06	A Kushalappa McGill University, Canada	Cis gene editing using CRISPER-Cas9 system to enhance multiple disease resistance in potato
10.50-11.00	Q & A session		

Session: AI and ICT in Potato R&D

29 January, 2020 (Hall B)
09.00-11.00 hrs

Chairs	Dr RV Vyas Vice Chancellor (I/c), AAU, Anand, Gujarat
	Dr TA Gonsalves Director, Indian Institute of Technology (IIT), Mandi, Himachal Pradesh
Co-chair	Dr Bimal Bhattacharya Space Application Centre (SAC), Indian Space Research Organisation (ISRO), Ahmedabad, Gujarat
Convener	Shashi Rawat PS, Division of Social Science, ICAR-CPRI, Shimla
Co-conveners	Brajesh Nare Scientist, Division of Crop Production, ICAR-CPRI, RS, Jalandhar
	Paresh Chaukhande Scientist, Division of Crop Production, ICAR-CPRI, Shimla

Invited talks

Time	Topic code	Name and Affiliation	Tentative topic
09.00-09.10	AIPRD1	Shashi Rawat ICAR-CPRI, Shimla	Overview of progress in ICT in potato: Indian prospective
09.10-09.30	AIPRD2	Egbert Bakker MD, Solentum BV, The Netherlands	Precision farming in potato
09.30-09.50	AIPRD3	Om Prakash Routray Vice President, Marketing source trace systems India Pvt. Ltd.	AI and ICT in potato R & D
10.10-10.30	AIPRD4	SK Singh Project Director (DKMA), KAB-I, Pusa, New Delhi	ICT initiatives in ICAR/ Directorate of Knowledge Management in Agriculture (DKMA)
10.30-10.50	AIPRD5	Madhu Jamallamudi CEO, Agrometrics	Potato centric technology solutions
10.50-11.00	Q & A session		

Session: Potato Disease Management

29 January, 2020 (Hall A)
11.15-13.15 hrs

Chair	Dr BP Singh Former Director, ICAR-CPRI, Shimla
Co-chair	Dr US Singh South Asia regional coordinator & India country manager at CIP, New Delhi
Convener	Vinay Sagar PS, ICAR-CPRI, Shimla
Co-conveners	Baswaraj Raigond Senior Scientist, ICAR-CPRI, Shimla
	Sundresha S Scientist, ICAR-CPRI, Shimla

Invited talks

Time	Topic code	Name and Affiliation	Tentative topic
11.15-11.25	PDM1	Vinay Sagar ICAR-CPRI, Shimla	Overview of potato disease management in india
11.25-11.40	PDM2	Jan Kreuze CIP, Peru	Q-BOL for potato pests and pathogens
11.40-11.55	PDM3	David Cooke The James Hutton Institute, Dundee, UK	Global potential distribution of <i>Phytophthora infestans</i> under current and climate change scenario
11.55-12.10	PDM4	Mathuresh Singh Agricultural Certification Services Inc (ACS), Canada	Potato viruses: Distribution, epidemiology and management with emphasis on PVY
12.10-12.25	PDM5	AN Chandrani Indofil industries Ltd. Mumbai	New chemistry molecules for management of potato diseases
12.25-12.40	PDM6	Mamadou Kane DuPont De Nemours, France	Fungicide resistance and its management
12.40-12.55	PDM7	Sikander S. Gill Lumex Instruments, Canada	Microchipbased realtimePCRas portable devices for plant pathogen diagnosis: progress, issues and challenges
12.55-13.00	Q & A session		

Session: Post-harvest Management and Value Addition

29 January, 2020 (Hall B)
11.15-13.15 hrs

Chair	Dr VP Chovatia Vice Chancellor (I/c), Junagadh, Gujarat
Co-chair	Dr Sai Prasad ITC, LSTC, Bangaluru
Convener	Brajesh Singh PS & Head, CPB-PHT Division, ICAR-CPRI, Shimla
Co-conveners	Pinky Raigond Scientist, ICAR-CPRI, Shimla
	Arvind Jaiswal Scientist, ICAR-CPRI, RS, Jalandhar

Invited talks

Time	Topic code	Name and Affiliation	Tentative topic
11.15-11.25	PHM1	Brajesh Singh ICAR-CPRI, Shimla	An overview of potato storage and processing scenario in India
11.25-11.45	PHM2	Mark Heap Bioscience manager Simplot, Australia	Potato harvest, handling, grading, and storage management in India
11.45-12.05	PHM3	Mark A Taylor The James Hutton Institute, Dundee, UK	The genetic control of sprout growth in potato tubers during storage
12.05-12.25	PHM4	Jiwan Palta University of Wisconsin, Medison	Potato tuber quality and calcium nutrition
12.25-12.45	PHM5	Rahul Chaturvedi Pepsico	Post-harvest handling and storage of processing potatoes in tropical countries: challenges & perspectives
12.45-13.05	PHM6	Sunil Pareek NIFTEM, Sonipat	Post harvest physiological disorders
13.05-1.15	Q & A session		

Session: Potato Pest Management

29 January, 2020 (Hall A)
14.00-16.00 hrs

Chairs	Dr NK Krishna Kumar Regional representative, Bioversity International, Delhi
	Dr Prakash S Patel ADR, SDAU, Dantiwada, Gujarat
Co-chairs	Dr CA Jayaprakash Head, Division of Plant Protection, ICAR-CTCRI, Thiruvananthapuram, Kerala
	Dr BK Pandey PS, Horticultural Science Division, ICAR, New Delhi
Convener	Anuj Bhatnagar PS, ICAR-CPRI, RS, Modipuram
Co-conveners	Aarti Bairwa Scientist, ICAR-CPRI, Shimla
	Mohd Abas Shah Scientist, ICAR-CPRI, RS, Jalandhar

Invited talks

Time	Topic code	Name and Affiliation	Tentative topic
14.00-14.10	PPM1	Anuj Bhatnagar ICAR-CPRI, RS, Modipuram	Potato pests in India: an overview
14.10-14.25	PPM2	S Subramanian ICAR-IARI, New Delhi	Virus-vectors relationship with special reference to vectors of potato
14.25-14.40	PPM3	PD Kamala Jayanthi ICAR-IIHR, Bengaluru	Ecological chemistry of insect-plant interactions from pest management perspective
14.40-14.55	PPM4	RS Chandel CSK Himachal Pradesh Agriculture University, Palampur (HP)	Integrated control of potato tuber moth, <i>Phthorimaea operculella</i> (Zeller) in India
14.55-15.15	PPM5	M Nagesh ICAR-NBAIR, Bengaluru	Management of cyst nematodes in potato: an overview of status, success and way forward

Time	Topic code	Name and Affiliation	Tentative topic
15.15-15.30	PPM5	S Balaji Coromandel, Hyderabad	Effective biopesticide for the control of potato cyst nematode
15.30-16.00	Q & A session		

Session: Technology Transfer and Social Issues

29 January, 2020 (Hall B)
14.00-16.00 hrs

Chairs	Dr AK Singh DDG (Agril. Extension), ICAR, New Delhi
	Dr Bijendra Singh Director General, UPCAR, Lucknow
Co-chair	Dr Samarendu Mohanty Regional Director, Asia, CIP, Peru
Convener	NK Pandey PS & Head, Division of Social Sciences, ICAR-CPRI, Shimla
Co-conveners	SP Singh PS & acting Head, ICAR- CPRI RS, Gwalior, Madhya Pradesh
	Pooja Mankar Scientist, Division of Crop Production, ICAR-CPRI, Shimla

Invited talks

Time	Topic code	Name and Affiliation	Tentative topic
14.00-14.10	TPSI1	NK Pandey ICAR-CPRI, Shimla	Overview of potato technology transfer in India
14.10-14.25	TPSI2	Samarendu Mohanty Regional Director, Asia, CIP, Peru	Small Farmer Large Farms (SFLF) model : an overview
14.25-14.40	TPSI3	KD Kokate Former DDG (Agril. Extn.) ICAR, New Delhi	Technology transfer and adoption for food security and doubling farmers' income
14.40-14.55	TPSI4	Sanjeev Saxena ADG (Intellectual Property & Technology Management), ICAR, New Delhi	Commercialization of agricultural technologies
14.55-15.10	TPSI5	Shantanu Kumar Dubey PS, ICAR-ATARI, Kanpur, Uttar Pradesh	Geo-spatial experiences in front line extension of potato production technologies in India
15.10-15.25	TPSI6	RN Padaria Division of Agril. Extension, ICAR-IARI, New Delhi	Transferring technologies for climate change adaption-social and institutional perspective
15.25-16.00	Q & A session		

Session: Advances in Seed Technology

29 January, 2020 (Hall A)
16.15-18.00 hrs

Chairs	Dr Kirti Singh Ex-Chairman, ASRB, New Delhi
	Dr HP Singh Former DDG (Hort. Sci.), ICAR, New Delhi, India
Co-chair	Dr AS Saini DG (Horticulture), Haryana
Convener	RK Singh PS & Head, Division of Seed Technology, ICAR-CPRI, Shimla
Co-conveners	Ashwani K Sharma PS, ICAR-CPRI, RS, Kufri, HP
	EP Venkatasalam PS, ICAR-CPRI, RS, Ooty, TN

Invited talks

Time	Topic code	Name and Affiliation	Tentative topic
16.15-16.25	AST1	RK Singh ICAR-CPRI, Shimla	Seed potato system scenario in India: an overview
16.25-16.40	AST2	BP Singh Ex-Director, ICAR-CPRI, Shimla	Potato seed production systems - then and now
16.40-16.55	AST3	Md Jahangir Hossain Director, Tuber Crops Research Centre Joydebpur, Gazipur, Bangladesh	Seed production system in Bangladesh
16.55-17.10	AST4	Er. Sukhwinder Singh ICAR-CPRI, RS, Jalandhar, Punjab	Present scenario and future prospects of aeroponic technique for seed potato multiplication
17.10-17.25	AST5	Monica L Parker International Potato Center (CIP) Nairobi, Kenya	Apical root cutting: a novel technique for seed potato production
17.25-17.40	AST6	CIP representatives	Seed issues related to the respective countries
17.40-18.00	Q & A session		

Dutch Potato Seminar I

29 January, 2020 (Hall B)
16.15-18.00 hrs

16.15-16.20	Mr Amlan Bora Trade & Investment Commissioner, Netherlands Business Support Office (NBSO)	Welcome address
16.20-16.30	Mr Siebe Schuur Agriculture Counsellor Embassy of the Netherlands in India	Overview on the Netherlands potato sector
16.30-16.55	Mr Errol van Groenewoud COO, Omnivent Techniek B.V.	Trends and opportunities in the Indian potato sector
16.55-17.15	Mr Hemant Gaur Managing Dir., S.V. Agri Technology Representatives of MooijAgro, Agrico Seeds, Kuipers Food Processing of the Netherlands	Mapping Dutch technology to Indian potato needs.
17.15-17.35	Mr PJ Oosterlaken CEO, Kiremko B.V.	Opportunities and challenges of potato processing in India to achieve the farm to fork co-ordination
17.35-17.55	Rabobank India	Financing options in the Indian potato value chain
17.55-18.00	Mr Amlan Bora T & I Commissioner, NBSO	Concluding remarks

30 January, 2020 (Hall A)
09.00-10.00 hrs

Plenary lecture: Global R&D priorities for potato	Dr Ian Barker Program Leader, Global Potato Agrifood Systems, CIP, Lima, Peru
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Panel discussion: Potato Policy Issues

30 January, 2020 (Hall A)
10.15-13.00 hrs

Chairs	Dr KV Prabhu Chairperson, PPV&FRA, New Delhi	
	Sh. Ashwani Kumar Joint Secretary (Seed)	
Co-chair	Dr S K Malhotra Commissioner of Agriculture, Gol	
Conveners	Dr Sanjeev Sharma PS & Head, Plant Protection, ICAR-CPRI, Shimla	
	Dr Vikramaditya Pandey PS (HS), ICAR, New Delhi	
	Dr Shambu Kumar PS & Head, ICAR-CPRI, RS, Patna	
Co-conveners	Dr VK Gupta PS, ICAR-CPRI, RS, Modipuram	
	Dr Puneet Luthra Mahindra HZPC	
Experts	Dr BNS Murthy Horti. Commissioner, Gol	
	Dr BP Singh Ex-Director, ICAR-CPRI, Shimla	
	Dr Rajendra Barwale MD, Mahyco, Jalna	
	Dr Manoj Kumar PS & Joint Director, ICAR-CPRI, RS, Modipuram	
Panelists	Name and Affiliation	Tentative topic
	Sh. Atish Chandra Joint Secretary (Extension & PP), New Delhi	Quarantine and pesticide issues
	Sh. Rajbir Singh JS, MIDH	Policy issues related to MIDH

Panelists	Name and Affiliation	Tentative topic
	Ms. Reema Prakash JS, MOFPI	Issues of processing industries
	Dr CB Singh Assistant General Manager, APEDA	Potato export: opportunities and challenges in new agri export policy 2018
	Prof. Satyabrata Mukherjee Kolkata University	Issues related to post production management of potato
	Dr KV Raman Cornell University, USA	Public private partnership- an essential link
	Dr JS Minhas CIP Consultant, Assam	Policy issues related to tissue culture based seed production
	Dr Vibha Ahuja BCIL, New Delhi	Biosafety issues in transgenic crops
Q & A session		

Dr Mukhtar Singh Memorial Award Contest (Oral Presentations)

30 January, 2020 (Hall B)
10.15-13.00 hrs

Chairs	Dr SM Paul Khurana Ex-Director, ICAR-CPRI, Shimla
	Dr KR Dhiman Ex-Vice Chancellor, UHF, Nauri, HP
Co-chair	Dr VA Parthasarathy Former Director, Indian Institute of Spices Research, Calicut
Convener	Dr Devender Kumar PS, ICAR-CPRI, RS, Modipuram
Co-conveners	Dr SK Luthra PS, ICAR-CPRI, RS, Modipuram
	Dr Som Dutt PS, ICAR-CPRI, Shimla

Panel discussion: Potato Trade and Industry

30 January, 2020 (Hall A)
14.00-16.00 hrs

Chair	Dr K Alagusundaram DDG (Agril. Engineering), ICAR, New Delhi	
Co-chair	Mr Sachid Madan CEO, TechnicoAgri Sciences Pvt. Ltd., Delhi	
Conveners	Dr Vinay Bhardwaj PS & Head, Crop Improvement, ICAR-CPRI, Shimla	
	Dr Manish Das PS (HS), ICAR, New Delhi	
	Dr Raj Kumar PS, ICAR-CPRI, RS, Jalandhar	
Co-conveners	Dr Puneet Luthra Mahindra-HZPC	
	Mr Hemant Kardile Scientist, ICAR-CPRI, Shimla	
Experts	Dr Mohinder Kadian CIP, New Delhi	
	Dr PS Naik Former Director, ICAR-IIVR, Varanasi	
	Sh K Vijayaraghvan Sathguru Management Consultants India Ltd., Hyderabad	
	Dr SK Chakrabarti Director, ICAR-CPRI, Shimla	
Panelists	Name and Affiliation	Tentative topic
	Mr Nischint Bhatia Asia Head, Pepsico	Potato processing for chips: issues and future prospects
	Mr Davinder Dosanjh CEO, Mahindra HZPC Pvt. Ltd.	Issues related to seed production and distribution
	Mr Herman Verveld Commercial Manager, HZPC, The Netherlands	Commercialization of potato varieties at global level: issues and future prospect
	Mr Abinash Gupta Director Agriculture, McCain Foods Pvt. Ltd., India	Potato processing for French fries: exploring the possibilities to increase the market share

Panelists	Name and Affiliation	Tentative topic
	Mr Abhishek Singh MD & CEO, Grimme India Pvt. Ltd.	Potato mechanization: issues and future prospects
	Mr Jihan Shah Director, Advait Agrotech Pvt. Ltd., Ahmedabad	Cold-store chain development: issues and future prospects
	Dr Sudha Mysore CEO, Agrinnovate India Ltd.	Commercialization of agriculture technologies: issues and future prospects
	Dr Sudhir Chandra Nath Business Director ACI Seed Advanced Chemical Industries Limited, Bangladesh	Present status of production and marketing of tissue culture (TC) based potato planting materials in private sector

Dutch Potato Seminar II

30 January, 2020 (Hall B)
16.00-17.00 hrs

16.00-16.05	Mr Jolly Joseph Dy. Trade & Investment Commissioner, NBSO	Welcome & introduction
16.05-16.25	Mr MD Sharma CEO, Allround India	Innovations in pre & post-harvest technologies
16.25-16.40	Mr Egbert Bakker Managing Director, Solentum B.V.	Precision farming in potato
16.40-16.55	Dr Indira Dhumne Tissue culture specialist, MHZPC	Transforming potato value chain scenario in India with Indo-Dutch partnership
16.55-17.00	Mr Siebe Schuur Agriculture Counsellor, Embassy of the Netherlands in India	Concluding remarks

Concluding Session

30 January, 2020 (Hall A)
17.00-19.00 hrs

Chief guest	Dr Panjab Singh , Former DG, ICAR, New Delhi
Guest of honours	Dr AK Singh , DDG (Horti. Sci.), ICAR, New Delhi Dr KV Peter , Former VC, Kerala Agricultural University, Thrissur
Preside over	Dr SK Chakraborti , Director, ICAR-CPRI, Shimla
Convenor	Dr VK Dua , PS & Head, ICAR-CPRI, Shimla
Co-convenors	Dr NK Pandey , PS & Head, ICAR-CPRI, Shimla Dr Salej Sood , Scientist, ICAR-CPRI, Shimla
Anchor	Dr Pooja Mankar , Scientist, ICAR-CPRI, Shimla
Presenters	Convenors of all 10 sessions Award ceremony Concluding remarks by chief guest Vote of thanks by Dr VK Dua

LIST OF REGISTERED PARTICIPANTS

Indian Participants

S. No.	Name	Place
1.	A Faizru Rahaman	Ooty
2.	A N Chandrani	Mumbai
3.	Aarti Bairwa	Shimla
4.	Abhijit D Chaudhary	Navasari
5.	Abhishek Pathak	Sagar
6.	Abhishek Rana	Palampur
7.	Abhishek Singh	Ahmedabad
8.	Abinash Gupta	Ahmedabad
9.	Ajay Kumar	Noida
10.	Ajay Singh	Karnal
11.	AK Singh	New Delhi
12.	AK Singh	New Delhi
13.	Akshay Kumar	Ambala
14.	Akthar Ali	Hyderabad
15.	Amarananjundeswara H	Hassan
16.	Amlan Bora	Ahmedabad
17.	Amul Patel	Palampur
18.	AN Chandrani	Mumbai
19.	Anil B Patil	Bambhori
20.	Anil Sharma	New Delhi
21.	Anirban Sarkar	Kalyani

S. No.	Name	Place
22.	Anjan Banerjee	Pune
23.	Ankit Maheshwari	Pune
24.	Ansul Sharma Manjul	Solan
25.	Anuj Bhatnagar	Modipuram
26.	Anuj Kumar Singh	Bambhori
27.	Aprana Jyoti	Junagadh
28.	Archit Agrawal	Agra
29.	Archna V. Mahida	Navasari
30.	Arminder Singh	Jalandhar
31.	Arvind Jaiswal	Jalandhar
32.	Ashis Chakraborty	Kalyani
33.	Ashish Dwivedi	Modipuram
34.	Ashok Dalwai	New Delhi
35.	Ashok Kumar	Mandi
36.	Ashwani Kumar	New Delhi
37.	Ashwani Kumar	Shimla
38.	Ashwani Kumar Sharma	Kufri
39.	Ashwin Verma	Gurugram
40.	AS Saini	Haryana
41.	Atish Chandra	New Delhi
42.	Austin Edwin	Bangalore

S. No.	Name	Place
43.	Ayush Kumar Singh	Junagarh
44.	Babubhai A Patel	Palanpur
45.	Baljeet Singh	Shimla
46.	Bapi Das	Shillong
47.	Basavaraj N	Hassan
48.	Baswaraj Raigond	Shimla
49.	Bharti Sharma	Shimla
50.	Bhavesh Dhayabhai Patel	Dhansura,
51.	Bhawna Dipta	Shimla
52.	Bhupendra Kumar Singh	Kanpur
53.	Bhura Choudhari	Navasari
54.	Bijal Solanki	Navasari
55.	Bijendra Singh	Lucknow
56.	Bimal Bhattacharya	Ahmedabad
57.	Binay K Singh	Ranchi
58.	Binod Kumar	Maroth
59.	BK Pandey	New Delhi
60.	BL Nagar	Kota
61.	BNS Murthy	New Delhi
62.	BP Singh	Shimla
63.	Brajesh Nare	Jalandhar
64.	Brajesh Singh	Shimla
65.	Brijesh Singh	New Delhi
66.	BU Dupare	Indore
67.	CB Singh	New Delhi
68.	CA Jayaprakash	Thiruvananthapuram

S. No.	Name	Place
69.	Chadrama Prakash Upadhyay	Sagar
70.	Chaudhari Babu	Deesa
71.	Chandubhai Virani	Balaji Wafers
72.	Clarissa Challam	Shillong
73.	Dalamu	Kufri
74.	David Besse	Mumbai
75.	Davinder Dosanjh	Mohali
76.	Dechen Angmo	Ludhiana
77.	Deepak N Nandekar	Chhindwada
78.	Devendra Kumar	Modipuram
79.	Devesh Pathak	Faizabad
80.	Devi Prasad	Assam
81.	DG Patel	Dantiwada
82.	Dharamveer Duhan	Hisar
83.	Dharmendra Shantilal Patel	Dhansura
84.	Dharmendra Gaur	Gwalior
85.	Dharmendra Kumar	Shimla
86.	Dhaval Bhanderi	Junagadh
87.	Dhruv Kumar	Modipuram
88.	Dipak Kumar	Shimla
89.	DL Yadav	Kota
90.	DM Zapadiya	Deesa
91.	DP Singh	Kanpur
92.	EP Venkatasalam	Ooty
93.	Fuljibhai G Chaudhary	Palanpur
94.	G Kalloo	New Delhi

S. No.	Name	Place
95.	Gaurav Verma	Shimla
96.	Geeta Singh	New Delhi
97.	GK Patel	Dantiwada
98.	Gopal Lal	Ajmer
99.	Gurbachan Singh	New Delhi
100.	Gurmit Singh	Ludhiana
101.	Gurpreet Singh Sekhon	Rupnagar
102.	Hanuman Ram	Almora
103.	Haresh Karanchandani	Ahmedabad
104.	Heena Rathod	Mumbai
105.	Hemant B Kardile	Shimla
106.	Hemant Gaur	Pune
107.	Himani Sharma	Shimla
108.	HP Singh	New Delhi
109.	Indira Dhumne	Mohali
110.	Imaan Singh	Jalandhar
111.	IN Patel	Dantiwada
112.	Jagadeesh	Chennai
113.	Jagdev Sharma	Shimla
114.	Jagpreet Singh Mastana	Baroda
115.	Jai Gopal	Panchkula
116.	Jaideep Bhatia	Mumbai
117.	Janani P	Shillong
118.	Jangbahadur Singh Sanga	Jalandhar
119.	Jeevalatha A	Calicut
120.	Jihan Shah	Ahmedabad
121.	JK Patel	Deesa

S. No.	Name	Place
122.	JK Tiwari	Shimla
123.	Joe Johnson	IIT, Mandi
124.	Jolly Joseph	Ahmedabad
125.	JS Minhas	Shimla
126.	Jyoti Prakash Mohanty	Gurugram
127.	Jyotirmoy Guha	Kolkata
128.	K D Kokate	New Delhi
129.	K Vijayaraghvan,	Hyderabad
130.	Kailash Naga	Shimla
131.	Kajal Thakur	Jalandhar
132.	Kamal Jagdishbhai Patel	Bhudasan
133.	Kanika Thakur	Shimla
134.	Kaushik Ghosh	Gurugram
135.	Kaushik Malpani	Pune
136.	Khiromani Nagarand	Raipur
137.	Kirti Singh	New Delhi
138.	Kishor U Trinhuvan	Ranchi
139.	KP Singh	Kanpur
140.	Krishan Kumar	Mandi
141.	Krishna Mohania	Talwandi
142.	Kuldeep S Verma	Palampur
143.	Kumar Nishant Chaurassia	Shimla
144.	Kunal M Saini	Junagadh
145.	Kushagra Joshi	Almora
146.	KV Peter	Thrissur
147.	KV Prabhu	New Delhi
148.	Lakshay Kumar	Ambala

S. No.	Name	Place
149.	LM Yadav	Dholi
150.	MD Sharma	Ambala
151.	M R Deshmukh	Pune
152.	Madhu Jamallamudi	Hyderabad
153.	Mahavishnan Karuppan	Bengaluru
154.	Mahfuz Ahmad Mullah	Siliguri
155.	Mandeep Hunjan	Ludhiana
156.	Manish Das	New Delhi
157.	Manish Pande	New Delhi
158.	Major Singh	Rajgurunagar
159.	Manoj Kumar	Modipuram
160.	Mattys Patrick Delporte	Noida
161.	MB Patel	Jaguda
162.	Mehi Lal	Modipuram
163.	Mital P. Dudhat	Gandhinagar
164.	Mitul G Patel	Dantiwada
165.	Mohammad Nasir Kadiver	Junagarh
166.	Mohd Abas Shah	Jalandhar
167.	Mohinder Kadian	New Delhi
168.	MR Dabbas	Kanpur
169.	Mrityunjaya Shiddharam	Dharwad
170.	Murlidhar D Meena	Ajmer
171.	Murlidhar Sadawarti	Gwalior
172.	Muthuraj R	Thiruvananthapuram
173.	N Sailo	Shillong
174.	NK Krishna Kumar	New Delhi

S. No.	Name	Place
175.	M Nagesh	Bengaluru
176.	Name Singh	Modipuram
177.	Namita D. Oza	Ahmedabad
178.	Nandhkumar N	Shillong
179.	Narendra Kumar Kata	Dhanaura
180.	Narendra Singh	Leh
181.	Narsih Gurjar	Palanpur
182.	Naveev Labana	Ambala
183.	Neeraj K Singh	Gandhinagar
184.	Neha Salaria	Jalandhar
185.	Nidhi Paneliya	Junagarh
186.	Nikhil Tandon	Gurugram
187.	Nilesh Deora	Gurugram
188.	Nimita Umrdiya	Navasari
189.	Nischint Bhatia	Gurugram
190.	Nisha	New Delhi
191.	Nitasha Thakur	Shimla
192.	NK Jha	Chandigarh
193.	NK Pandey	Shimla
194.	Om Prakash Routray	Cuttack
195.	Omdutta Yadav	Agra
196.	Orun Sarkar	Nadia
197.	P K Agarwal	Ajmer
198.	PD Kamala Jayanthi	Bengaluru
199.	P Soman	Jalgaon
200.	Panjab Singh,	New Delhi
201.	Paratpara Rao M	West Godavari

S. No.	Name	Place
202.	Paresh Chaukhande	Shimla
203.	Paresh Khodabhai Patel	Gandhinagar
204.	Parth Traugadiya	Junagarh
205.	Parul Sharma	New Delhi
206.	Pawan Kumar Jha	Vile Parle
207.	Pinky Raigond	Shimla
208.	Piyush Verma	Dantiwada
209.	PK Gupta	New Delhi
210.	PL Bhutani	Mumbai
211.	PL Gautam	New Delhi
212.	Pooja Bhardwaj	CPRI, Shimla
213.	Pooja Chaukhande Mankar	Shimla
214.	PP Choudhary	Dantiwada
215.	Praful Sondarva	Junagarh
216.	Prakash M Panchabhaye	Bambhori
217.	Prakash S Patel	Dantiwada
218.	Prasad Pura Somachary	Hassan
219.	Praye Lal Saroj	Bikaner
220.	Preeti Singh	Shimla
221.	Prerak R Gondatya	Gandhinagar
222.	Prince Kumar	Jalandhar
223.	Priyadarshan S	Mandi
224.	P Soman	Jalgaon
225.	PL Saroj	Bikaner
226.	Puneet Luthra	Mohali
227.	PushpaSubrahmanyam	New Delhi
228.	RA Gami	Deesa

S. No.	Name	Place
229.	Rahul Chaturvedi	Gurugram
230.	Rahul Kumar Tiwari	Shimla
231.	Rahul Rameshrao Bakade	Patna
232.	Rajbir Singh	New Delhi
233.	Raj Kumar	Jalandhar
234.	Raj Kumar	Shimla
235.	Rajan Salalia	Jammu
236.	Rajankumar Manaharlal Patel	Himmatnagar
237.	Rajender Singh	Shimla
238.	Rajendra Barwale	Jalna
239.	Rajendra Kumar Saigal	Palanpur
240.	Rajesh K Singh	Shimla
241.	Rajiv	Kanpur
242.	Rajkumar	Faizabad
243.	Ramachandra Venkata Kolluru	Noida
244.	Rameshwar Singh Rattan	Mumbai
245.	Ranjan Das	West Bengal
246.	Ratna Preeti Kaur	Jalandhar
247.	Ravi Maruthachalam	Thiruvananthapuram
248.	Ravi Mohan Srivastava	Pantnagar
249.	Ravinder Kumar Chauhan	Shimla
250.	Reema Prakash	New Delhi
251.	Renu Yadav	Hisar
252.	Richa Verma	Pune

S. No.	Name	Place
253.	Rinkesh Satija	Gurugram
254.	Ritesh Sharma	Dholpur
255.	Ritish Bhojani	Junagarh
256.	RK Arora	Jalandhar
257.	RK Singh	Patna
258.	RN Padaria	New Delhi
259.	RN Patel	Deesa
260.	RN Singh	Dantiwada
261.	Robin Gurang	Gangtok
262.	Robin Kumar Pundir	Sagar
263.	Rohit Bhandari	Gandhinagar
264.	RR Acharya	Anand
265.	RS Chandel	Palampur
266.	Ruchi Chhodavadiya	Junagarh
267.	RV Singh	New Delhi
268.	RV Vyas	Anand
269.	S Balaji	Hyderabad
270.	S Subramanian	New Delhi
271.	Sachid Madan,	Chandigarh
272.	Sai Prasad GVS	Bengaluru
273.	Salej Sood	Shimla
274.	Salyndra Yadav	New Delhi
275.	Samar Singh	Karnal
276.	Samar Vijay Singh	Indore
277.	Sameep K Das	Bangalore
278.	Sandeep Jain	New Delhi
279.	Sandhya GC	Hassan
280.	Sandip Kantilal Thakker	Ahmedabad

S. No.	Name	Place
281.	Sangram Singh	Bengaluru
282.	Sanjai Kumar	Dhanaura
283.	Sanjay Deshpande	New Delhi
284.	Sanjay Agarwal	New Delhi
285.	Sanjay K Agarwal	Gurugram
286.	Sanjay Kumar	New Delhi
287.	Sanjay Rawal	Modipuram
288.	Sanjeev Saxena	New Delhi
289.	Sanjeev Sharma	Shimla
290.	Sanjib Kumar Das	Kalyani
291.	Santosh Tiwari	Gurugram
292.	Sat Pal Sharma	Ludhiana
293.	Satpal Sharma	Ludhiana
294.	Satyabrata Mukherjee	Kolkata
295.	Satyavan Chauhan	Jalandhar
296.	Saurabh Soni	Palampur
297.	Saurav Singh	Bengaluru
298.	Seema Bharda	Junagarh
299.	Minhaj Alam	New Delhi
300.	Shafali Sood	Shimla
301.	Shailbala Sharma	Pantnagar
302.	Shailendra Pratap Singh	Gurgaon
303.	Shakti Ranjan Panigrahy	Meerut
304.	Shambhu Kumar	Patna
305.	Shankar Verma	Kandivali East
306.	Shantanu Kumar Dubey	Kanpur
307.	Sharddha Sojitra	Junagarh

S. No.	Name	Place
308.	Shashi Rawat	Shimla
309.	Shashidhar TR	Dharwad
310.	Shirly Raichal Anil	Thiruvananthapuram
311.	Shiv Partap Singh	Gwalior
312.	Shruthila Kakade	Bengaluru
313.	Shubhrajyoti Singharoy	Hoogly
314.	SI Patel	Vijapur
315.	Simrandeep Kaur	Ludhiana
316.	SJ Vaghela	Deesa
317.	SK Chakrabarti	Shimla
318.	SK Dey	New Delhi
319.	SK Joshi	New Delhi
320.	SK Luthra	Modipuram
321.	SK Pandey	Lucknow
322.	SK Singh	New Delhi
323.	SK Tyagi	New Delhi
324.	Skalzang Youdol	Leh
325.	SM Ganesh	Gurugram
326.	SM Paul Khurana,	Gurugram
327.	Som Dutt	Shimla
328.	Soumya Shetty	Hassan
329.	SP Singh	Chandigarh
330.	Sridhar Janrajupalli	Raipur
331.	Srikant Srinivasan	Mandi
332.	Srikanth Babu V	Nelamangala
333.	SS Meena	Ajmer
334.	Subarta K Roy	Kolkata

S. No.	Name	Place
335.	Subash Katare	Gwalior
336.	Subhash S	Shimla
337.	Sudha Mysore	Bengaluru
338.	Sugani Devi	Jalandhar
339.	Sujit Das	Jal Paiguri
340.	Sukhwinder Singh	Jalandhar
341.	Suman Sanjta	Palampur
342.	Suman Tiga	Leh
343.	Sunayan Saha	Jalandhar
344.	Sundaresha S	Shimla
345.	Sundeep Malhotra	Noida
346.	Sunil Gulati	Jalandhar
347.	Sunil Pareek	Sonipat
348.	Sunita Johri	Dharwad
349.	Sunitha S	Thiruvananthapuram
350.	Sushil Kumar	Shimla
351.	Sushil Sudhakar Chagan	Shimla
352.	Sushma Arya	New Delhi
353.	SV Halakatti	Dharwad
354.	Swaminathan B	Junagarh
355.	T Ananthan	Hyderabad
356.	T Mohapatra	New Delhi
357.	TA Gonsalves	Mandi
358.	Tanvir Singh Bhatti	Jalandhar
359.	Tarun Dhandhukiya	Junagarh
340.	Tarun Gangwal	New Delhi
341.	Tasso Yatung	Pashighat

S. No.	Name	Place
342.	Tejas Borkhatariya	Junagarh
343.	Uday Pratap Shahi	Modipuram
344.	Umang Patel	Navasari
345.	Urvi Jakasaniya	Junagarh
346.	Usha Barwale Zehr	Jalna
347.	US Singh	New Delhi
348.	Utsav Patel	Jagudan
349.	V Nataraj	Indore
350.	VA Parthasarathy	Calicut
351.	Vaibhav Garg	Gandhinagar
352.	Vanishree G	Shimla
353.	Varsha Choudhari	Navasari
354.	Varunjit Singh Bhatti	Jalandhar
355.	Veeresh Hatti	Dantiwada
356.	Venkata Reddy T	Bengaluru
357.	Venkateswaralu Vallepu	Rajahmundry
358.	VH Kanbi	Dantiwada
359.	Vibha Ahuja	New Delhi
360.	Vijai Kishore Gupta	Modipuram
361.	Vijay Bahadur Jaiswal	Kanpur
362.	Vijay Kumar Paradkar	Chhindwada
363.	Vijaypal Singh Panghal	Hisar

S. No.	Name	Place
364.	Vikas Mittal	New Delhi
365.	Vikramaditya Pandey	New Delhi
366.	Vimal Desai	Ahmedabad
367.	Vinay Bhardwaj	Shimla
368.	Vinay Kumar Rachappanavar	Solan
369.	Vinay Sagar	Shimla
370.	Vinay Singh	Modipuram
371.	Vinod Bhat	Bengaluru
372.	Vinod Kumar	Shimla
373.	Vinod Kumar Singh	New Delhi
374.	Vishal Upadhyay	Lucknow
375.	Vishnuvardhana H	Hassan
376.	Viswas Yadav	Chennai
377.	VK Dua	Shimla
378.	VP Chovatia	Junagarh
379.	VS Pundhir	Mathura
380.	VU Dupare	Indore
381.	VU Patil	Shimla
382.	Yagnik Solanki	Junagarh
383.	YK Sharma	Ajmer
384.	Yogesh Sharma	Gangtok
385.	Zinzala Paresh	Navasari

Foreign Participants

S. No.	Name	Country
1.	A Kushalappa	Canada
2.	Bilal Yasim	Egypt
3.	Claire Hodge	UK
4.	D. MacKenzie	USA
5.	David Cooke	UK
6.	Egbert Bakker	The Netherlands
7.	Errol van Groenewoud	The Netherlands
8.	Filip Wallay	Belgium
9.	Francois Serneels	Belgium
10.	Herman Verveld	The Netherlands
11.	Ian Barker	Peru
12.	J E Bradshaw	UK
13.	Jan Kreuze	Peru
14.	Jiwan Palta	USA
15.	Jochem Rovers	Belgium
16.	John A Immaraju	USA
17.	Joost Rovers	The Netherlands
18.	KV Raman	USA
19.	Kehs Annalyre	USA
20.	Lars Naested	Denmark
21.	Madhu Jamallamudi	USA
22.	Mamadou Kane Mboup	France

S. No.	Name	Country
23.	Mark A Taylor	UK
24.	Mark Heap	Australia
25.	Martin Pot	The Netherlands
26.	Mathuresh Singh	Canada
27.	Maurice La Lau	The Netherlands
28.	Maxime Bonnave	Belgium
29.	Mc Closkey Peter	USA
30.	Md Jahangir Hossain	Bangladesh
31.	Monica L. Parker	Kenya
32.	Pim Lindhout	The Netherlands
33.	PJ Oosterlaken	The Netherlands
34.	Rajwant Gill	Canada
35.	S R. Vidyasagar	USA
36.	Sanjeev Sharma	UK
37.	Samarendu Mohanty	Vietnam
38.	Siebe Schuur	The Netherlands
39.	Sikander Gill	Canada
40.	Sudhir Chandra Nath	Bangladesh
41.	Tamilarasan Thangavel	Tasmania
42.	Warren Henninger	USA
43.	Wei Yan Chee	Norway

ORGANISING COMMITTEE

Chairperson

Dr SK Chakrabarti

Convener

Dr Vijay Kumar Dua

Co-convener

Dr T Janakiram

Dr NK Pandey

Organising Secretaries

Dr. Manoj Kumar

Dr. Brajesh Singh

Dr. Sanjeev Sharma

Dr. Jagdev Sharma

Dr. Vinay Bhardwaj

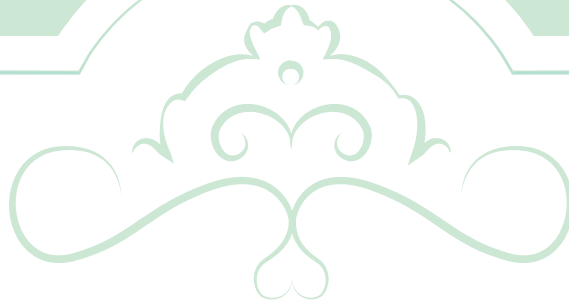
Dr. Ravinder Kumar

Joint-Organising Secretaries

Dr. Vinod Kumar

Dr. Vinay Sagar





Co-Organizer



Partners



Directorate of Horticulture, Gujarat



DST, GoI



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