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&
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Climate Smart Initiatives for Nutrition & Food Security

Agriculture, Food Processing, Nutrition and Diet

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Compendium of Abstracts & CVs

International Life Sciences Institute India

Abstracts and CVs

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Session One

Adoption of Sustainable Practices - Technologies in Agriculture and Food Processing

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BRIEF CV

Professor K. C. Bansal
Adjunct Professor, Murdoch University, Perth, Australia and Former Director of National Bureau of Plant Genetic Resource ICAR, Gurugram
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Prof. K. C. Bansal is a renowned plant biotechnologist with deep interest in genome engineering for building climate resilient and sustainable agriculture. He obtained his doctorate with Gold Medal from Indian Agricultural Research Institute **(IARI),** New Delhi and pursued post-doctorate from the prestigious **Harvard University**, Cambridge, USA. He worked as Visiting Scientist at **Rutgers University**, USA under the aegis of Rockefeller Career Biotech Fellowship.

Currently, Prof. Bansal is **Adjunct Professor** at the Centre for Crop and Food Innovation, Murdoch University, Perth, Australia, and serves on the **Board of Directors** of Global Plant Council; **Board of Trustees** of the MS Swaminathan Research Foundation, Chennai, and on the **Research Advisory Council of IARI**, New Delhi. He is **Chairman** of the Technical Advisory Committee of the **National Network on Genome Editing in Plants** of ICAR. He is the first recipient of the prestigious **Norman Borlaug Chair**, selected in 2010, a position equivalent to the University Vice-Chancellor.

Prof. Bansal served as elected **Secretary** of the National Academy of Agricultural Sciences (NAAS), India (2021 to 2023), as **Director** of the premier ICAR institute, National Bureau of Plant Genetic Resources, Department of Agricultural Research and Education, Govt. of India, New Delhi from 2010-2016, and as elected **Vice-Chair from Asia** for the **15th Regular Session** of the Commission on Genetic Resources for Food and Agriculture of the **United Nations** (2013-2015). ***Prof. Bansal is Haryana Vigyan Ratna Awardee.***

Prof. Bansal played a visionary and key role in formulating the **World Bank** project on **National Agricultural Higher Education (NAHEP)**, which is implemented across 75 agricultural universities in the country, since 2017.

Overview of Climate Smart Agriculture Technologies for Promoting Sustainability and Balancing Productivity and Nutrition

Prof. K. C. Bansal
Adjunct Professor, Murdoch University, Perth, Australia
Former Director, National Bureau of Plant Genetic Resources (ICAR), New Delhi

ABSTRACT

Climate Smart Agriculture (CSA) encompasses a variety of technologies and farming practices designed to enhance agricultural resilience to climate change while improving productivity and nutritional outcomes. Technologies like conventional crop breeding, modern biotechnologies such as genetic engineering and genome editing, diversified cropping systems, conservation agriculture for soil and water management, digital and information technologies all play a crucial role. Integration of these technologies will play a vital role in creating resilient food systems. I shall be highlighting the role of genome editing in my presentation.

Genome editing technologies, such as CRISPR-Cas9, have emerged as transformative tools in the pursuit of CSA, aimed at enhancing sustainability, productivity, and nutritional quality in food systems. These innovative techniques enable precise modifications to crop genomes, facilitating the development of varieties that are more resilient to climate-related stresses such as drought, heat, flooding and pests. By improving stress tolerance as well as nutrient use efficiency, genome editing contributes to increased agricultural productivity while minimizing resource inputs, thereby promoting sustainable farming practices. Furthermore, genome editing holds the potential to enhance the nutritional profiles of crops, addressing collectively malnutrition and food security concerns. For example, biofortification efforts can increase the levels of essential vitamins and minerals in staple crops, improving health outcomes for vulnerable populations. The ability to rapidly develop improved crop varieties also supports the agility required to adapt to shifting climatic conditions, ensuring food systems remain robust and efficient. Thus, genome editing complements other practices such as agroecology and conservation agriculture, fostering resilience and sustainability in agricultural landscapes.

BRIEF CV

Prof. Rajni Chopra
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Prof. Rajni Chopra has done PhD in, Nutritional Biochemistry from CFTRI, Mysore (2003-2008). She joined NIFTEM K in 2008.

She has experience of 16+ years in Teaching and Research, she has published 80+ publications in reputed national and international journal/books. She has Guided/Guiding 40+ master and 10+ doctorate researchers in the field of Oil and Fat Technology.

Prof. Chopra has received Dr. S. Husain Zaheer Memorial Award by the Oil Technologists' Association of India (OTAI) for the year 2023 for research contribution in Lipid Science and Technology.

Green Food Processing Technologies for Promoting Food Safety and Nutrition

Dr. Rajni Chopra
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ABSTRACT

Green food processing technologies play pivotal role in boosting nutritional profile and accentuating food safety while minimizing environmental impact. This area includes a wide range of innovative methods like high-pressure processing, cold plasma treatment, and bioprocessing techniques that enhance the quality and safety of processed foods.

These methods reduce reliance on chemical additives and energy-intensive processes, aligning with eco-friendly goals. A variety of alternative green processing technologies can be employed to ensure food safety and maintain nutrient retention in food products. By utilizing natural enzymes and microorganisms, bioprocessing improves the nutritional profile of foods, aiding in the preservation and the development of various functional foods rich in bioactive compounds.

Apart from these technologies, other treatments, such as enzymatic treatments and vacuum drying, play a key role in preserving the sensory qualities (taste, texture, aroma) and bioactive compounds (vitamins, antioxidants) in fruits and vegetables. Preserving these qualities is crucial for gaining consumer acceptance and optimizing health benefits.

Retaining nutritional value not only improves dietary choices but also promotes public health. Also, by addressing food waste and nutrient losses, green processing technologies can enhance public health and ensure food safety in a complex food matrix. Future research should focus on optimizing and elevating these technologies.

In summary, green food processing technologies present a promising strategy to enhance food safety and nutritional quality while minimizing environmental impact. As the food industry evolves, prioritizing these methods will be crucial in meeting consumer demands, addressing public health issues, and fostering sustainability in food production.

BRIEF CV

Dr. Kirtiraj K. Gaikwad
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Dr. Kirtiraj K. Gaikwad is an Associate Professor in the Packaging Technology Division, Indian Institute of Technology (IIT) Roorkee, India, since January 2020. He received his Ph.D. in Packaging from the Department of Packaging, Yonsei University, South Korea, in 2018; MS in Packaging from the School of Packaging, Michigan State University, USA, in 2023; M. Tech in Food Safety from SHUATS Allahabad, India, in 2011; and B.Tech. in Food Science from Dr. Panjabrao Deshmukh Agriculture University, India, in 2009. He is a fellow of the Linnean Society of London, UK. Before joining IIT Roorkee, he worked as a postdoctoral fellow at the Chemical Engineering Department, École Polytechnique de Montréal, Canada, from 2018 to 2019.

Dr. Gaikwad has received numerous national and international awards, including the Outstanding Young Faculty 2024 Award by IIT Roorkee, the Student Scholarship Award from the International Association for Food Protection (IAFP), USA; the A J Bank Research Award from the Society of Chemical Industries (SCI), London; the Outstanding Foreign Student Scholarship Award from Yonsei University, South Korea; the INSPIRE Faculty Award from the Department of Science and Technology, Government of India; and the FSSAI Research Award 2022. He has also been shortlisted among the top 5 young faculty members under PG instruction at IIT Roorkee for the prestigious Excellence in Teaching Award. He has published more than 115 research papers in SCI/SCIE-indexed journals and holds four national and international patents. Dr. Gaikwad has edited three books with AAP and CRC Press, USA, focusing on food packaging. His research projects, valued at over 11 million Indian rupees, have been supported by the DST and the Science & Engineering Research Board, GOI.

Dr. Gaikwad is also on the editorial board and serves as associate editor of prestigious international journals, including *Food Bioscience*, *Food Measurement and Characterization*, and *Packaging Technology and Science*. He is actively engaged in teaching graduate and doctoral students (M.Tech/Ph.D. in Food Packaging Technology) and conducting cutting-edge research. His research group focuses on sustainable active materials and advanced manufacturing innovations, utilizing green and sustainable chemistry and engineering to develop active, smart packaging and flexible Packaging. These innovations benefit both society and the environment. He has supervised three Ph.D. students and is currently guiding 12 others in areas such as active, intelligent, and smart food packaging.

Green Food Packaging Technologies for Promoting Food Safety and Nutrition

Dr. Kirtiraj K. Gaikwad, PhD, FLS
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ABSTRACT

The increasing demand for sustainable solutions in the food industry has driven the development of green food packaging technologies. These innovative technologies aim to reduce environmental impact while ensuring the safety and nutritional quality of food. This presentation will explore the role of green packaging in promoting food safety and nutrition by leveraging eco-friendly materials, advanced barrier properties, and intelligent packaging systems. The focus will be on plant-based and biodegradable materials, edible coatings, and active packaging technologies that extend shelf life, reduce food waste, and enhance food quality. Additionally, the role of nanotechnology in improving packaging performance and the use of sensors to monitor food freshness in real-time will be discussed. Green packaging technologies not only minimize the environmental footprint but also safeguard food from contamination, spoilage, and nutrient degradation. As global food security and climate change concerns intensify, the adoption of sustainable packaging solutions becomes imperative. This presentation will highlight the synergy between sustainable packaging and climate-smart initiatives, emphasizing how these technologies can contribute to resilient food systems that ensure food safety, reduce carbon emissions, and support global nutrition goals. By integrating scientific advances with practical applications, green food packaging offers a pathway to a more sustainable and nutritious future. This talk will engage stakeholders across the food supply chain to discuss the challenges and opportunities associated with implementing green packaging technologies in food systems, promoting a shared vision of sustainability in the context of food safety and nutrition.

Keywords: *Sustainable Packaging; Food Safety; Active Packaging; Nanotechnology; Food Quality; Food Security*

BRIEF CV

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Dr. Arttu Luukanen is the Senior Vice President of Space & Defence at Solar Foods. He holds a Ph.D. in applied physics from the University of Jyväskylä, Finland. Prior to joining Solar Foods, Dr. Arttu has held several senior positions in industry and academia, serving as the CEO of a deep tech security sensing company, as well as a Research Professor at VTT Technical Research Centre of Finland. He is an elected fellow of the Finnish Academy of Technical Sciences.

Food Out of Thin Air – Microbial Protein Production via Gas Fermentation with CO2 and H2

Dr Arttu Luukanen
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Space and Defence, Solar Foods, Finland

ABSTRACT

Solar Foods is a Finnish alternative protein scale-up that produces nutritious protein "out of thin air" by gas fermentation of CO2 and H2 gases using hydrogen oxidizing bacteria. The result is a mild-tasting, well-functioning protein food ingredient called Solein® that blends well in a multitude of recipes, ranging from ice-cream, pasta, cream cheese to meal replacements. From a sustainability standpoint, production of Solein® produces a small fraction of the GHG emissions compared to animal or plant based proteins, uses a minimal amount of water, and requires no agricultural feedstocks which minimizes land use. This technology can turn deserts into future food baskets, while providing humanity with an inexhaustible complete protein source to feed the planet. Solein® has been granted Novel Food approval in Singapore, and has reached the Self-affirmed GRAS status in the US. Recently, the method won the NASA's & CSA's Deep Space Food Challenge Phase III, as the method is exceptionally well suited for food production in space using available waste resources as feedstocks.

BRIEF CV

Mr. Bharat B Mehta
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Mr. Bharat B Mehta is currently the Vice President Marketing, with the PET business of Reliance Industries. He has been with Reliance since 1995 with PET business. Over the years he has handled various responsibilities including: sales, building distribution network, PET business development, Business MIS, Advocacy, Sustainability initiatives and rPET.

Prior to moving into Reliance, Mr. Mehta worked with Ester Industries Ltd in Polyester Film Marketing and before that with Swadeshi Polytex Ltd in Polyester Staple Fibre manufacturing.

Mr. Bharat B Mehta holds a B. Tech (Chemical Engineering) from NIT- Warangal in 1990 and PGDBM – Marketing from IMT, Ghaziabad and Certificate Course in Export Marketing from IIFT, New Delhi.

Carbon Footprint Studies & Sustainability Initiatives with PET Packaging

Mr. Bharat B Mehta
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ABSTRACT

The population of planet Earth has galloped from 1 bn in the year 1800 to 8.2 bn in 2024. This corresponds to a CAGR of 0.94% for 224 years. The progression is explained in the following Table:

World Population Growth		
Year	**UoM**	**CAGR %**
1900	100-year CAGR %	0.47
2000	100-year CAGR %	1.36
2024	24-year CAGR %	1.17
2024	224-year CAGR %	0.94

The size of Earth is limited, its weight has been 5.972 x 10^24 Kgs and equatorial diameter of 12,760 kms for not only last 224 years but believed to have been so for millions of years. The Earth's resources are limited and are not expanding. Hence it is important to have strategies and materials that can sustain the rising human needs.

PET packaging is placed to meet this challenge as it is inert, lightweight, unbreakable, occupies space efficiently, safe for food contact and free from any harmful chemicals.

PET is one of the most collected post-consumer packaging material for recycling. In India, the PCR PET bottle collection rate is ~90%. PET is traditionally recycled into Polyester Fibres for Textile applications. In recent times, PCR PET is used to produce PET packaging resin using approved technologies that decontaminate the PCR PET to be suitable for food contact.

Several LCA studies have been done to demonstrate that PET has lower carbon footprint than other available substitutes. rPET goes a step ahead with its carbon footprint being lower than virgin PET as well. This is driving the consumption of rPET by the brands to address climate change.

Session Two

Climate Smart Dietary and Nutrition Practices

Abstracts & CVs

BRIEF CV

Dr. Kamala Krishnaswamy
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Dr. Kamala Krishnaswamy has nearly 6 decades of experience in Nutrition research. Her research interests include Diet related Chronic disease - Diabetes, Cancer, CVD and nutrient-drug interactions, pharmacoepidemiology, environmental toxicology. The very first "The dietary guidelines for Indians" was prepared under her chairmanship in 1998 (Updated again in 2012), Expert committee member DGI,2024.

Dr. Krishnaswamy has been invited to several expert committees by the nutrition policy making bodies. Participated, chaired, and presented in several National & International Symposiums. She spearheaded the establishment of the Centre for pre-clinical toxicology at the Food and Drug Toxicology centre in NIN. She is recipient of several awards such as Living Legend award of IUNS, Ramachandran oration of NFI, Dr Gopalan Centenary award of NSI, Dr. RajammaI P Devadas Annual Oration, S.G.Srikantia Memorial Award Lecture of NSI, Basanti Devi Amir Chand Prize, ICMR,Chopra Memorial Oration of IPS,Bires Chander Guha memorial oration of INSA, Distinguished Scientist &Sita Mahalakshmi oration of AP Akademi of Sciences, Dr. KamaIa Menon Medical Research Award in Internal Medicine by ICMR, Dr VN Patwardhan Prize in Nutritional Sciences ICMR, Shakuntala Amir Chand Prize for Medical Research.

Dr. Kamala Krishnaswamy is fellow of World Academy of Sciences, NAAS, IUNS, INSA, NASI, NAMS, Telangana Akademi of Sciences, Indian Academy of Sciences. She has over 300 publications which include research papers and reviews in several international & national journals of repute, chapters to books and she has also edited books.

Overview of Current Trends and Shifts in Dietary Pattern in India and Nutrition and Dietary Practices to Mitigate the GHGe

Dr. Kamala Krishnaswamy
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Former Director, ICMR – National Institute of Nutrition

ABSTRACT

The growing population and the need for 'food, fuel, fiber'are important determinants of climate change(CC). The anthropogenic greenhouse gas emissions (GHGe-carbon dioxide, methane, nitrous oxide, ozone, chlorofluorocarbons, and water), deforestation, land and water use due to cultivation of diverse crops are important drivers of CC and global warming. It is estimated that about 1/4th of GHGe emissions may be caused by the global food system. Food production, processing, distribution, and food waste significantly affect the planet earth, food and nutrition security, and promote infections/infestations in vulnerable groups. The average global temperature has risen by about 1.1°C to 1.3°C since the pre-industrial era. Ruminants and rice production are principal sources of GHGe in Indian agriculture with a country average of 5.65 kg CO2eq kg−1 rice, 45.54 kg CO2eq kg−1 meat and 2.4 kg CO2eq kg−1 milk.

The dietary shifts reported (NSSO, 2024) document an increase in monthly per capita expenditure(MPCE) in rural and urban India of different magnitudes across states and UTs. However, the expenditure on food has reduced with substantial reduction on cereals. Both in urban and rural areas diversification of food is apparent as the %MPCE on milk & milk products, fresh fruits, eggs, fish & meat. Crop and food diversity are essential for optimal food/ nutrient adequacy and health and well-being. The EAT-Lancet commission has outlined "Planetary health diet" for sustainable food production across the globe. The dietary guidelines for Indians released in 2024 suggest 'My plate for the day' an approach for healthy living for (2000KC diet). My plate for Indians when compared with the planetary health diet suggests refined cereal intake and milk are relatively higher, the others foods being in the range suggested by Planetary health diets. Whole grains, millets and legumes/pulses which are traditional (climate resistant) and more vegetables and fruits can mitigate CC. Further all climate change parameters reported in literature, on dietary consumption patterns in India, suggest Indian dietary impact on climate is low and can forestal climate change and protect 'planet earth'.

BRIEF CV

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Dr. Sylvia Fernandez-Rao is a seasoned psychologist and Scientist E at the ICMR- National Institute of Nutrition with over 15 years of research expertise, specializing in infant feeding, early childhood development, and behavior change interventions. She has implemented multiple randomized controlled trials, focusing on nutritional interventions like micronutrient fortification and diet diversity to improve cognitive and physical outcomes in children. With a background in psychology from Osmania University (Ph.D., 2011), Dr. Fernandez-Rao has contributed significantly to understanding stress, diet, and its impact well-being, particularly in maternal and child health contexts.

Dr. Sylvia Fernandez-Rao has co-led impactful projects examining micronutrient status, cognitive development, mental health, and diet-related behaviors, working with diverse rural, tribal, and urban communities to address health inequities. Her research also includes principal and co-investigative roles in probiotic and DHA supplementation, effect of carbonated beverages consumption, public health policy interventions and, HIV patients nutrition and wellbeing studies. Known for her evidence-based, sustainable strategies, she has published in high-impact journals and has mentored the next generation of researchers, with four Ph.D. and nine M.Sc. students completing dissertations under her guidance.

Challenges in Behaviuor Change Communication and Consumer Behaviour

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ABSTRACT

Behavior change (BC) and consumer behavior are essential for advancing public health, yet influencing these behaviors is increasingly complex within today's high-stimulation environment. Technological advances, mass media, and instant information access shape health behaviors heavily influenced by marketing and convenience rather than well-being. This landscape encourages consumption patterns driven by accessibility and immediacy, often resulting in unhealthy lifestyles. Traditional BC approaches focusing on individual education frequently fall short due to strong cultural habits, accessibility issues, and resistance to change. To overcome these challenges, BC strategies must now integrate policies that are also climate-smart, like incentivize eco-friendly, health-promoting behaviors—such as plant-based diets, clean and green environs, and urban planning to encourage active transport.

Digital health tools have the potential to enhance BC efforts by providing tailored, sustainable lifestyle recommendations; however, these tools must be ethically guided, relying on evidence based sources to avoid misinformation. To address barriers such as behavioral inertia and misinformation especially in areas like food choices, physical activity, and preventive health practices, public health initiatives grounded in core BC principles—addressing motivation, capacity for change, and environmental influences—can be more effective.

Sustainable interventions should harness local cultural insights to promote engagement, align policies with health and environmental goals. Effective BC communication, supported by collaborative efforts across governments, private sectors, and communities, is vital for sustainable impact. By focusing on education, incentivizing healthy, eco-conscious behaviors, and creating supportive environments, public health systems can address consumer behavior, health, and climate goals to build a resilient, healthier future.