Working document To Facilitate Discussion and planning for IUFoST 2024 – 2029

IUFoST Framework and Objectives (IUFoST By-Laws)

Mission

To promote international co-operation and information exchange, to provide education and training to food scientists, food technologists and food engineers around the world and to promote professionalism and professional organisation among food scientists, food technologists and food engineers.
To strengthen global food science and technology for humanity.

Objectives

The objectives of the organisation (IUFoST) are the encouragement and fostering of:

(a) international co-operation and exchange of scientific and technological knowledge and ideas among food scientists and technologists, to advise and consult with international organisations such as The International Science Council (ISC) of which IUFoST is a member Union, United Nations Educational, Scientific and Cultural Organisation (UNESCO), The Food and Agriculture Organisation of the United Nations (FAO), the World Health Organisation (WHO), the United Nations International Development Organisation (UNIDO) and other organisations of similar nature in the area of food science and technology.

(b) further development of and support for food science and technology research.

(c) progress in the fields of theoretical and applied food science for improvements in the processing, manufacturing, preservation, and distribution of food.

(d) education and training of food scientists and technologists.

(e) development of both individual professionalism and professional organisation among food scientists and technologists; and

(f) co-operation with other international organisations whose discipline could have an influence on food science and food technology, e.g., water, soil, nutrition, and chemistry.

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SECTION 1- IUFoST, Interdisciplinary Work and Food Policy Decision making

SDG "Sustainable Development Goal" References Applicable to Food Science and Technology

Thirteen of the seventeen United Nations Sustainable Development Goals (SDGs) directly reference food. The application of Food Science and Technology skills are needed to help achieve these specific SDGs:

No poverty (Goal 1)
Zero hunger (Goal 2)

Good health and wellbeing (Goal 3)
Quality education (Goal 4)
Clean water and sanitation (Goal 6)
Affordable and clean energy (Goal 7)
Decent work and economic growth (Goal 8)
Industry, innovation and infrastructure (Goal 9)
Responsible consumption and production (Goal 12)
Climate action (Goal 13)
Life below water (Goal 14)
Life on land (Goal 15)
Partnerships for the goals (Goal 17)

UN Summit Identified Action Tracks Applicable to Food Science and Technology

Action Track 1: Ensure access to safe and nutritious food for all
Action Track 2: Shift to sustainable consumption patterns
Action Track 3: Boost nature-positive production
Action Track 4: Advance equitable livelihoods
Action Track 5: Building resilience to vulnerabilities, shocks and stress

INTRODUCTION:

Nations around the world are facing serious challenges related to food, water and energy security, health and environmental change, and ever-increasing demands for science advice. The global pandemic has accelerated the need for a comprehensive and collective global response to the needs of future food systems. Food systems involve all processes related to food - from the production, processing, and distribution of food, to its preparation and consumption.

Representing the international discipline of Food Science and Technology, IUFoST members, affiliates and interdisciplinary partners and fellows of the Academy are enabled by our ongoing commitment to the UN Sustainable Development Goals; by commitment through the IUFoST Budapest, Cape Town and the World Food Day Declarations to the objectives of the International Conference on Nutrition (ICN) and World Declaration on Nutrition. Food scientists, technologists and engineers have been accepted as active participants and agents for positive change towards a strong and resilient food system through contributions to the UN Food Systems Summit and the work arising.

Historical Context

The ICN that led to the IUFoST Budapest and Cape Town Declarations of food scientists, technologists and engineers brought about a number of programs and policies that were instrumental in creating an appropriate environment for revitalizing the agriculture sector. The national plan of action was then finalized based on the country papers that were prepared at that time. Among the achievements, the Ministry of Agriculture was re-named in some countries as Ministry of Food and Agriculture.

This was a significant achievement in the recognition of the interdependence of agricultural raw materials to food production and sustainable food consumption. Food Science and Technology is identified as being involved in all post-harvest activities from farm to consumer and should also have a voice in agriculture from the perspective of efficient and affordable food chain, including transportation, mitigation of post-harvest losses, safe handling, retention of nutrients and environmentally friendly choices for manufacturing, including marine and aquaculture challenges (reference Blue Revolution).

That landmark meeting serves as a reference point for possible change through government action, industrial action, educational improvements at local, national, regional, and international levels. The acknowledgment that Food Science and Technology must be part of policy decisions at all levels provides the basis on which future resilient and sustainable food systems will develop globally.

Food science and technology focus

Food Science and Technology through IUFoST has structured itself on a framework to meet the future food security challenges – through filling the void in the supply side gaps and influencing demand changes and including Nutrition into food security, reduction of the production gaps, increasing the efficiency of post-farm operations and influencing demand. This approach was refined into a food science and technology food system approach on which the IUFoST Expert Food Security panel presented highlights and potential future actions. A report on these IUFoST proceedings is found in The Science of Food 2018 by Martin Cole et al *on The science of food security* (publication details in Appendix A). Food Systems must reflect food security, food safety and nutrition to produce healthy diets. Most of the approaches are taken in the global context and therefore lose the importance of the local contexts. The COVID 19 pandemic taught us that the limitation of mobilizing commodities globally. It is the availability of local resources that is the key for resiliency.

Government recognition of IUFoST

The first IUFoST Food Systems Summit in 2016 was convened and hosted by the Irish Government to coincide with the World Congress of Food Science and Technology. The food security sessions that followed included more analysis and specific examples of actions by different actors in the food systems, and clearly demonstrated the need to consider and integrate drivers relevant to each step of the current and emerging food chains. (see Appendix 1)

Toward Mobilization

This first IUFoST-led Summit recognized the importance of international food science and technology contributing to governmental policy, with IUFoST as the representative international organization that can lead in the identification of needs, development of research prioritization and the underpinning of the formation of advice and implementation of policy for a more secure and resilient global food system.

As examples, the ongoing work areas of food science and technology have included actions to reduce food losses and waste; mitigating environmental effects through development of new technologies; expanding knowledge of traditional foods and processes and their immune functions; educating the consumer on food choices and introducing new alternatives, expanding knowledge of how food reacts with the body to reduce over and undernutrition, improve capacity building and education and training at all levels. Empowering the existing IUFoST organization through its national scientific bodies globally and Fellows of the International Academy of Food Science and Technology (IAFoST) and its partners can contribute to address food system issues at the global level that meet the local needs as well and therefore the food system will be more sustainable.

The next gathering of international food science and technology and across disciplines was held in September 2020 and as reported in these pages re-affirmed the action areas that need food science and technology and policy involvement to ensure resilient and sustainable future food systems. Governmental policy around funding, research and development, education and resources, mobilization of the workforce with equitable distribution of opportunity, and access to safe, sufficient and nutritious food is

fundamental and Food Science and Technological expertise must be employed to ensure the security, sufficiency and safety of future food systems.

SUMMIT RECOMMENDATIONS FOR ACTION FOR GOOD GOVERNANCE TO SUPPORT RESILIENT AND SUSTAINABLE FUTURE FOOD SYSTEMS

1. Reinforce that Food Science and Technology expertise is critical to governmental policy at local, regional and international levels as it has an impact on all post-harvest activity from farm and table. The discipline of Food Science and technology works in multi-disciplinary capacities with many partners on an ongoing basis and it is a necessary partner in achieving safe, sufficient and sustainable food for a healthy diet. Scientific evidence, facts and definitions are needed about healthy diets. More research is needed on total diet studies, including socio, cultural and economic studies. The effects of food processing and preservation must be included in any healthy diet study.

2. Include food scientists, technologists and engineers in agricultural and urban policy, environmental discussions as they have key roles to play in improving the industrial sector and food chain to improve sustainability and resiliency.

3. Promote the importance of food processing to provide sufficient food that is safe, has a longer shelf life and provides enhanced nutrition. Improve opportunities to Food Science and Technology through increased R&D, education and enhancement of pilot plant facilities to develop new technologies to further improve food for a healthy diet, to look at improved immune functions of raw materials and how to process them in an environmentally sustainable manner. Improvement of food safety and prevention of food-borne diseases through processing and preservation need to be recognized.

4. Involve food scientists, technologists, and engineers in capacity building, education and training with particular reference to mobilizing young people to train in food related careers and to improve food safety and security from the community setting through to urban centers.

5. Focus on expanding local food production and processing, and traditional foods and processing to offer opportunities for a flexible, resilient food system that is resistant to shocks and can also offer a healthy diet and immune functions.

6. Bring together all partners, inter-disciplinary, governmental and non-governmental resources, to work together to improve the resiliency of the food systems, to withstand food chain disruptions with the acknowledgement that Food Science and Technology is included as an effective and important partner. Using the Penta Helix approach, government, industry, academia, community and media would all be brought together.

The third such gathering was held in Thailand in November 2023, at which the interdisciplinary group for this Summit produced a Roadmap (see figure 1 below) to support Resilient, Innovative and Sustainable Food Systems.

SUMMIT RECOMMENDATIONS TO SUPPORT RESILIENT, INNOVATIVE AND SUSTAINABLE FOOD SYSTEMS – THAILAND, 2023

IUFoST delivers roadmap to support resilient, innovative and sustainable food systems
December 1, 2023 - Responding to the call for action stemming from the 2021 UN Food Systems Summit, and supporting commitments to transform food systems to address the rapidly growing needs of an increasing world population, the International Union of Food Science and Technology (IUFoST) partnered with the United Nations Industrial Development Organization (UNIDO) to organize the Future of Food Summit: Resilient and Innovative Food Systems, hosted by the Food Science and Technology Association of Thailand (FoSTAT), in Bangkok, Thailand on 13 November 2023.

Food scientists and researchers, opinion leaders, industry representatives and regulators* present at the meeting, reaffirmed:

- **The pivotal role played by food science and technology** to provide solutions to challenges testing the resilience of food systems, namely the vulnerability and scarcity of natural resources, climate change, regional and global conflicts, and continued food losses,
- **The importance to offer food processing solutions** as a means of prevention of food losses and remediation of the possible introduction of food safety hazards that can be further managed

through post-harvest interventions. This needs to be coupled with awareness raising and education efforts aiming to clarify the role of food processing and to rebut the claims propagated about the negative impacts of processing interventions, as may be relevant,

- **The importance to continue to invest in innovation** supporting the development and availability of novel food and feed sources and ingredients, such as alternative protein being developed from plant origin and /or through the application of technologies of likes of precision fermentation,
- **The importance to consider optimization of use of resources in food and feed production** such as land and water resources as well as to consider the reliance on recycling technologies where relevant, supported by the corresponding safeguards ensuring the safety of food production applications and technologies used,
- **The need to benefit from the experience gained from indigenous knowledge and/or the re-development of traditional food**, as well through traditional knowledge to develop solutions to prevent and/or mitigate food loss and to identify new food sources and/or processes.

Participants in the Summit identified a Three-Pillared Path Forward to support the development of resilient and innovative food systems (Figure 1):

- **Continued Investment in Food Science and Technologies:** that enable the development of novel food sources and enhance current practices of food and agri-food production. These investments should include the development of research aiming to better understanding consumers' interests and concerns to support readiness to address such concerns or mitigate consequences of consumers acceptance of available food sources. Particular attention should be developed to the introduction of digital solutions, including the reliance on Artificial Intelligence that can facilitate and optimize food production conditions, food safety and traceability.
- **Availability of Funding and Investments:** dedicated not only to research and development but to the overall food and agri-food production sector, in particular to support knowledge and technology translation and scalability of innovative solutions of food production. Investments should cover skill and competency development, indispensable to sustain efforts of reseach, and food production.
- **Development of Effective Partnerships**: harnessing the capacities of the public sector i.e., government interventions, academia and the private sector, to support availability of sustainable food production operations resulting from research and innovation or to offer enablers and solutions to translate research, scale-up new production processes or facilitate market access where relevant.

WORKPLAN:

- Strengthen connections with Codex through Disciplinary Group GFoRSS, include Fellows and others regionally, to increase visibility of IUFoST, increase interventions in Codex by experts in food science and technology, to communicate the science proactively and consistently - to become reliable as the scientific as non-aligned expert global resource.
    - Require science communicators in the Secretariat who work with GFoRSS, Scientific Council, other disciplinary and special interest groups, working groups (in process)
- Capacity Building through Research and Development, Education and Training
    - Mobilize IUFoST Early Career and Mid Career Scientists for research initiatives

- Enhance and expand IUFoST curricula development programmes at all levels including primary, secondary levels of education, tailored to area – improve food safety education with clear guidelines to underscore IUFOST as trusted source of FS&T information

- Increase interdisciplinary presence, become preferred partner with other international organisations on FS&T and related issues
- Other

SECTION 2 – EDUCATION and TRAINING, CAPACITY BUILDING

The General Assembly of IUFoST meets regularly to determine priorities and the work being done in capacity building and education. The need to develop capacity and to mobilize the workforce to create and sustain future food systems is agreed upon among the scientific community of food science and engineering. This begins with fostering education and training at every level as life-long exercises. A key component of this is train-the-trainer activities that will allow local instructors to present material to groups in their own language or dialect.

Consultations with partners in food science and technology, other related disciplines, government agencies, and academia have resulted in ongoing programs initiated at the country level with IUFoST national scientific members. These include educational programs at all levels within the formal educational systems (primary, secondary, post-secondary, MSc and Ph.D. levels). In addition, technical programs have been designed and developed for those employed in the food industry without formal secondary school certification. IUFoST Symposia, such as the Myanmar Food Safety symposium for small and medium-sized businesses (SMEs) address specific issues at both country and regional levels. Mentorship programs are employed globally spearheaded by the Fellows of the International Academy of Food Science and Technology (IAFoST) and many IUFoST partners to provide individual expertise and leadership in information fora, as well as guidance for educators and students at national and regional levels. These have been identified as Visiting Professorship programs, amongst other mentorship activities.

The Food Safety Education series in South East Asia, South America, and Africa was a partnership among governments, academia, and industry. These symposia have been focussed by request on regulators, nutritionists and health professionals, the consumer, and media.

In China, IUFoST has an ongoing partnership with the government, academic institutions, the national scientific body, and International Science Council representatives in presenting annual fora for media and industry. The main thrust is discussing the issues behind food safety, food, and nutrition security from the perspective of sound science.

The mobilization of youth is key to ensuring food and nutrition security through capacity building. Enhancing the level of knowledge of food industry workers and those in the retail food sector can be accomplished by providing educational material that can be taught by individuals who participate in a train-the-trainer program provided by IUFoST. Teaching the importance of food science and technology beginning at the pre-school level and throughout every part of the system is urgently needed. Numerous programs are underway. Particularly successful achievements in this regard are demonstrated throughout India with classroom learning in science and chemistry of food from the pre-school level that the children receive. In parts of Africa, the Rural Outreach Africa program is successfully teaching girls about local raw materials (crops), harvesting, handling, processing, and marketing through school programs that provide for their whole communities. In China, there are Taste

Literacy programs that embrace the teacher, classroom, home, and business together community by community. These need to be emulated.

THE CRITICAL ROLE OF IUFoST and FOOD SCIENCE AND TECHNOLOGY IN CAPACITY BUILDING

Food Science and Technology and Food Safety programs in colleges and university programs in Singapore, for example, provide an essential learning component that empowers young people and sends the students to less-developed communities in the Association of Southeast Asian Nations (ASEAN) to assist with food safety and food processing of local foods. Knowledge of and replication of successful programs aimed at or for young people, girls, and women all need to be disseminated more widely and employed more universally as applicable. Empowerment programs, and involvement of students in training programs from farm to table all need to be initiated country by country. This has been a key part of the IUFoST success in developing Food Safety curricula as requested and recognized by the World Bank in the Global Food Safety Partnership initiative. IUFoST consulted country by country, and region by region in developing a curriculum that could be used as a standard for post-secondary food safety education. It is still being refined and undergoing further development as it begins a rollout in conjunction with national scientific members and the FAO. Training of Trainers (ToT) is a way to expand capacity building in an effective way. This can be further enhanced if the training material can be made available to a wider group in easy-to-understand formats, which are readily accessible at any time. One such example is the Small Industries Development Organization (SIDO) work in this regard in Tanzania.

These initiatives need to be stepped up to provide educators and industry professionals with the required updates in their lifelong education. This will encourage them to learn the latest in innovations, safety and technology around food, food safety, food and nutrition security, and to lessen food waste and losses. Certification programs need to be tuned in countries and supported by governments and academics in partnership.

“Capacity Building and Mobilization” includes implementing a beneficial application of a multidisciplinary approach of Food Science, Technology, and Engineering to improve food systems, secure capacity building, and build resilient food systems which are locally available. A collective approach of professionals in the areas of food, nutrition, and public health that come together to promote safe food and healthy diets for all and draw upon the expertise of professionals can be organized. This helps take a holistic approach to food and nutrition through cross-fertilization of ideas among professionals of different disciplines. Such an educational network can be envisaged as a self-sustaining model functional at national, state, city, and rural levels to adopt and implement activities to address the needs and issues in a coordinated phased manner.

FURTHER ACTIONS THAT NEED FOOD SCIENCE AND TECHNOLOGY AND ENGINEERING EXPERTISE

In order to facilitate the dissemination of food science, technology and engineering, the following actions are proposed:

1. Continue to develop cross-sector collaboration among businesses, policymakers, citizens, and academics to execute capacity building and developmental projects.
2. Provide advice and know-how, show-how, and do-how with a focus on successful projects by the local population. It is important to recognize cultural practices of food management and the varieties of foods grown in different seasons within a region to help spread nutrition over the whole year. IUFoST understands this well through its fellowship across all the continents and, therefore, can help prepare

the human resources to meet the needs of the region, while maintaining the rigor and benchmarking the training in these areas. Scientific knowledge can bridge the effect of consumer behaviour and cultural diversity in supporting healthy diet patterns by conducting total diet studies in that particular area or region.

3. Increase education programs as they form a part of "capacity building" in the broad sense. Food-related education spans a wide spectrum of audiences, from young to old (pediatrics to geriatrics), village-level training to tertiary education. It can cover disciplines such as food production, packaging, distribution, safety, security, nutrition, health and sustainability, plus affordability and marketing. It has also to embrace a wide range of disciplines such as Industrial Management, Information and Communications Technology, Artificial Intelligence, Robotics, etc.

4. Provide ongoing information sources based on science. For example, booklets produced during training on utilization of traditional or novel foods also serve as tools of capacity building. Digital resources with cell phone accessibility in the local language will need to be increasingly utilised as the majority of the people at the ultimate receiving end of capacity building in the above programs end up contributing to the economy both, directly and indirectly.

5. Training and re-training the trainer by helping young faculty (and in food pilot plants) with certifications and re-certifications to improve standards, enhance food safety, and build capacity is important.

6. Government ministries should work in concert with food scientists, technologists, and engineers in the development of skills centres and industries at large. For example, Senegal has a Ministry of Handicrafts. Tailoring government ministries to assist in the education and capacity building for youth and all those in the food sectors will mobilize resources and create capacity, and ultimately economic and social development as well.

The ICN (International Conference on Nutrition 1992) was an historic process on which IUFoST built its mission. It is understanding that capacity building encompasses the entire food chain. The magnitude of the problems must be examined. Our position is to continue to maintain and develop further realistic and effective strategies, to increase public awareness of the needs, and to mobilize the financial~~,~~ capacity building resources in addition to keeping a system in place for monitoring the effectiveness of the education and training. For example, important work could be accomplished with the African Union through national scientific bodies and other partners in food science and technology to expand the knowledge base on food safety, nutrition, and security. This solution could be employed with the support of the National Academies of Science. Everyone has to be invested in the future and knowledge transfer is the basis for securing a safer, more resilient food system.

Information exchange, training, local technology, social issues, equipment, security, and quality all require education input from food science and technology. Good hygienic practices~~,~~ and good manufacturing practices have education and effective communication at their core. The failure to understand the cause-and-effect relationships create food safety issues. Knowledge transfer to women and to local cooperatives and informal markets will reduce the vulnerability of the food systems. The community outreach education programmed including students and faculty can train the trainer or those handling food from village to multinational industry. Training and education must include understanding of farm conditions, soil conditions, challenges of processing and distribution in order to develop a sustainable and safe food chain. Some examples of the educational needs that can be met with the help of food scientists, technologists, and engineers continuous support to microbiological safety and storage~~,~~ stability, which are critically determined by water in foods (for example, control of microbiological hurdles). This requires a detailed understanding of the effects of processing,

formulations and distribution for sustainable food systems in the food chain.

IUFoST would continue to link projects in a synergistic way. IUFoST could network with other groups, such as the South African Confederation of Agricultural Unions (SACAU) on cassava processing for example. Containerized food processing of bitter cassava and adding capacity for value through food processing can be brought into a rural community rapidly. This would provide food and jobs. Novel aspects could be explored with a unit operating in a sustainable mode, close to energy and water autonomies.

Resource and data collection to facilitate education strategies and behavioral change to promote healthy sustainable diets and food systems need to be expanded to a global resource base. JIFSAN (U. of Maryland, USA) working with the FDA is rolling out programs related to traditional markets to reduce food safety risks. Partnerships such as this can be enhanced with national scientific bodies in food science and technology and the educational expertise present. For example, in Nigeria, the IUFoST national scientific body Nigerian Institute of Food Science and Technology regularly conducts workshops in the informal markets on food safety. They create a chain of educational know-how that reaches all corners of Nigeria. The development of a knowledge base that uses new and innovative technologies, artificial intelligence, robotics, and digitalization all need to be developed through appropriate partnerships with the core competence of Food Science and Technology.

The key objectives for global Food Science and Technology (through IUFoST) are:

1) Actively support various flagship programs of governments on food and nutrition,
2) Engage with academic, research, and higher education institutions to build capacity,
3) Engage with food businesses to ensure availability of safe and healthy food,
4) Create demand for safe and healthy food through a social and behavioral change of citizens,
5) Expand the knowledge base of the profession through collaboration and cross-disciplines,
6) Enable further growth of the associations and professional development of their members.

The intended result of these actions is to prepare a skilled, highly qualified agri-food workforce for the future. This can be accomplished through primary education in food, food processing and distribution, and nutrition. They will improve health and well-being in homes and communities which will provide a healthy future workforce. These actions will also provide teachers and training-the-trainer programs related to the future food industry directed towards tuned and sustainable food systems through equitable education programs in Food Science and Technology from the grassroots.

SECTION 3 – Food and Nutrition Security – Food Processing, Traditional Foods

INTRODUCTION

Traditional foods offer an equal opportunity to every nation to contribute to the issue of global sustainable and resilient world food systems for all nations have their own traditional foods that are part of the culture of the people. Traditional food processing techniques date back to ancient times and constitute a vital body of indigenous knowledge handed over from generation to generation. Traditional foods have sustained livelihoods over centuries, feeding local populations, sustaining health, showing resilience, and moreover, in many cases, contributing to traditional medicine. The knowledge, standardization and scaling up of processing of traditional foods is fundamental to preparing future food

systems to withstand shocks as recently occurred with the global health pandemic and the disruptions of food chains. Traditional food safety practices will continue to provide practical and local solutions for future food systems. Using a multi-disciplinary approach and bringing together experts from various scientific backgrounds, with global diversity, Food Scientists and Technologists and Engineers are focussing their attention more closely on how food interacts in the human body for delivering health and wellness.

In addition, the future of a healthy diet requires further understanding of consumer interests and preferences (local culture on diets and food consumption behaviours) as we have seen them looking for 'healthy alternatives' even more actively during the recent health crisis and yet fewer options have been available to many. The COVID 19 pandemic demonstrates that local traditional foods rich in nutrients and bioactive compounds strengthen resiliency against disease and improves immune systems. As well, the economic fragility of nations often comes from food crises, whether because of high costs or scarcity of food. Now is the time for sustained research and development of foods including scaling up the processes for the production of traditional foods.

There is a need for scientific understanding of how traditional foods have sustained diets over centuries including documenting immune functions of the foods and the nature and strengths of traditional food processing techniques. The operations need to standardize and improve the quality and safety of the products.

Traditional food systems use cultivated crops that are locally available in each region. Different food preferences, food habits, and consumption patterns have developed through the years. A resilient food system must be put in place to accommodate changing food habits through appropriate food processing methodologies, adequate access to local raw materials, development of nutritious food recipes using various technologies, and ensuring good quality and safe food products. The value chain of locally cultivated crops should be adequately studied. Examples of such crops include yam, sweet potato, millets, pulses, legumes, tubers, spices and herbals, among others. Climate impact could also be monitored by erecting more greenhouses and the use of modern scientific tools that would ensure the sustainability of traditional food systems.

Traditional foods and traditional food processing can be a 'game changer' as part of the solutions to sustain resilient and healthy food systems. International Food Science and Technology, represented by IUFoST, provides opportunities for government at all levels, market players, local and multinational industries, academia including food scientists, technologists, engineers, environmental and climate scientists, agriculturists, nutritionists, biologists, geologists, hydrologists, social scientists and others to use existing knowledge and skills to build greater sustainable and healthy foods in the ever-changing environmental, political, economic, and social dynamics.

CONSULTATIVE MEETINGS

Priorities with regard to traditional foods and future food systems were identified through a series of consultative meetings across disciplines, with International Science Council members, national scientific members of IUFoST and its disciplinary and regional groupings.

The priority is to create, adapt and improve technologies to address issues of lack of sustainability and safety of food from farm to table. It was established that processing technologies need to be improved,

adapted, and developed to address issues of the lack of sustainability of traditional food products; to standardize them, establish their safety and to scale up for large-scale commercial production for local, regional and global markets. It was agreed that international food science and technology through IUFoST and its partnerships can promote traditional foods and processes towards healthy diets for all.

Food Science and Technology plays a central role

Food Science and Technology plays a central role, supported by governments and R&D, in actions working across disciplines to:

- Document available raw materials, good agricultural practices, good hygienic practices and measures to reduce post-harvest losses and food wastes.
- Promote adaptation and improvement of traditional foods and processes, while respecting the traditional, ethical, cultural and religious aspects involved and supported by total diet studies related to these parameters.
- Develop sustainable and flexible food processing technologies that can be scaled up as needed.
- Develop food packaging materials and processes that will extend shelf life, reduce waste, and are sustainable and economical.
- Improve food systems and food and nutrition security through capacity building and dissemination of knowledge.

Some examples of existing traditional foods and processes available that can strengthen future food systems with the benefit of more research, development, and appropriate technologies:

- Miso soup in Japan is a proven example of contributing to healthy diets and the traditional food Kimchi in Korea and foods from China and India, South East Asia, the Mediterranean and Central and South America.
- Many traditional African fermented plant-based foods and condiments such as “dawadawa”, “ogili”and “ugba” are rich in bioactive compounds and nutraceuticals with health-promoting benefits. Even though considerable amount of research has been done on improving the quality of African traditional foods, including studies on the nature of the substrates (agricultural raw materials) and the fermenting microorganisms (largely lactic acid bacteria and yeasts), they remain largely at the bench scale. The lack of pilot plant facilities for scaling up research from bench scale to large-scale commercial production is the most important constraint to commercialization of research findings and upgrading African traditional foods. Given, the huge cost of modern food pilot plant facilities, the establishment of zonal or regional food pilot plants in Africa by governments or the private sector will improve traditional foods and processes, promote the commercialization of research findings from African universities and research institutes, and advance the cause of food science and technology in Africa.
- Herbal drinks from China have a proven role in boosting the immune system and thereby preventing disease and improving health. Food scientists, technologists and engineers can use this knowledge, together with their understanding of how food and the human body react to each other. This will also pave the way for the industry to deliver traditional foods using sustainable processes.
- The northeast part of India is characterized by diverse populations with different ethnic backgrounds. Indigenous and fermented foods are an intrinsic part of the diet for these ethnic groups. It is one of the oldest and most economical methods for the development of a diversity of aromas, flavors, and textures as well as food preservation and biological enrichment by manipulation of different microbial populations. There are more than 53 traditional knowledge-based immunomodulatory plants in the state of Manipur in India and more than 100 plants in the state of Assam in India. Detailed studies of the nutritive and medicinal value of these can provide valuable information and are well documented.

• Many fermented foods are region-specific and prepared according to the region and therefore unique and deeply attached to the social fabric. Scaling up this knowledge would benefit and reach larger populations. Food Science and Technology expertise can play a key role in identifying nutritional and health benefits of the products and scale-up.

REACHING EVIDENCE-BASED FOOD SCIENCE AND TECHNOLOGY ACTIONS AND SOLUTIONS

Traditional spices and herbs have been used from time immemorial to promote good health and as medicines and they are being acknowledged for their immune-boosting functions. Scientific documentation needs to be brought together and shared with the medical profession, nutritionists, sociologists, and other scientists as well as the consumer.

Traditional foods of some regions remain unknown as potential food sources in other parts of the world. Through capacity building, such products can be introduced in future food systems into new markets. There are opportunities available for innovation through an understanding of traditional raw materials, ingredients, and processes. Industries can learn more about market needs around consumer preferences for healthy, environmentally acceptable, and socially friendly food products that are available economically, provide local employment, and through local sources that help to promote a healthy diet. Consumer preference can be guided through education by the lessons of the traditional food products, processes that provide safety and sustainability for the food systems.

Food Science and Technology has a central role to play to guide traditional, indigenous crops, through local technology processes that have been established through centuries in local kitchens and marketplaces to scale them up with the use of appropriate technologies. More research should be focused on the components of traditional foods, and processes related to the environment (soil, climate, water resource). Traditional processes for scale-up and adaptation to other localities need to be explored. Appropriate food engineering approaches, and standardization, in conjunction with cultural and environmental reference-points, would ensure the safety of the traditional foods.

Traditional Foods contain principal technological routes to reduced energy utilisation in processing: natural preservation; retention of micro-nutrients; and a wide variety of acceptable tastes and textures. All of these are technologies transferable into new product forms anywhere. As such they represent the basis of sustainable innovation, without the regulatory and consumer concerns associated with high tech novel processing.

Experts representing food science and technology in the areas of fortification, food safety, food processing and product development, production and market economy, human nutrition, food engineering, and quality control would work with partners in agriculture, animal breeding, and genetics, livestock processing, social agencies, government regulatory bodies, and UN agencies, including CODEX. Capacity building and collaborative research efforts are required from governments and must include industry engagement; overall a cross-discipline engagement is needed with food science and technology as the coordinating component to ensure the safety and sustainability of the traditional food chain.

There is a critical need for women to be educated in Food Science and Technology as they are the drivers in agriculture, traditional food production and processing in many parts of the world. Market gardens and informal markets are led by women. Women empowered with knowledge of food safety and processing teach others in the marketplace and informally with their families, thereby establishing a sustainable scientific understanding of food and will help direct consumer demand and the demand for

a healthy diet.

Local evaluation of markets and assessment of food safety aspects, availability, and suitability of training programs should occur on an ongoing basis and understanding food science and technology is crucial. Upgrading traditional foods is critical and the engineering and technology and market challenges and safety are all factors to be considered. To upgrade locally produced traditional foods and allow research on all aspects of food production from farmer to consumer, food pilot plants are a necessity in the chain if an impact is expected. This need is particularly urgent in many parts of Africa and Asia. Traditional food systems have many ingredients and processes that require standardization of research and technology to ensure food safety. These pilot plants are a necessity at the local and regional levels.

Besides the primary role of food pilot plants, an interesting example of the adaptability of a Food Pilot Plant during an environmental disaster is the case of the Central Food Technological Research Institute in Mysore, India. When the Tsunami hit South Asia in 2004, the Research Institute and the Pilot plants converted themselves into production centers of retort pouched foods and dehydrated foods suitable for the region of Southeastern India for nearly 10 days, transported in an organized manner to the disaster-hit areas in the east coast of India beginning within 24 hours of the disaster. The Institute had this wide experience helping in earthquake-hit areas, high altitude foods, and also in floods and hurricane seasons to prepare the traditional foods applicable to the affected local populations. This is a clear model that can be reproduced everywhere in the world as an added value where governments support and maintain adequate food pilot plants that have the resources to respond to their communities and country in the event of a food-related crisis.

Documentation of indigenous and local food thereby building resilience by including available techniques is required. The existing systems need to be valorized regarding their specific socio, climatic and economic conditions. Packaging, transportation, and markets need to be analysed. Value additions need to be identified and digitalization will be needed to build the architecture and documentation with coordination between UN agencies and International Science Council Unions and other partners. Mobile technologies have an increasingly large presence in many countries and can be utilized in this regard.

Taste is a fundamental factor to be considered in the scale-up of traditional food products as the consumer will not eat food that is not as it is remembered in the traditional process or if it does not taste good. Food processing techniques have to consider the expected demand by the consumer. Food scientists, technologist, and engineers must develop processes tailored to suit the specific markets, the socio and economic backgrounds and the underlying requirement for safety and sustainability. The solutions would be driven by academic labs and food pilot plants cooperating across diverse cultures – local, regional international partners in government, policymakers, national scientific bodies, individual industry at all levels, scientists, academia, students. Public-private partnerships and governmental agencies directed specifically at food as well as agriculture and nutrition are essential components.

Safe, sufficient, and nutritious foods are the basis of a healthy diet. The future of food systems requires the development of all aspects of food, from raw material to processes with consideration of environmental impacts and education regarding human consumption habits. Traditional foods offer the baseline to improve and provide a healthy and sustainable food system.

This goal cannot be achieved without food scientists, technologists, and engineers who can document

the health benefits of the foods that promote immunity from disease. To analyze the components of the foods to determine the safest way to grow the raw materials (crops), cooperation together with scientists in other disciplines to ensure most sustainable growth, feed, and nutrients, to continue to develop the safest and most effective way to transport crops, process the traditional food to maintain the traditional flavor and nutrients is needed. To scale up production to reach larger populations and to scale down in the event of future disruptions in the food chain, inter-disciplinary cooperation is required.

KEY TOPICS – HOW TO DELIVER ?

1. International Research and Funding Opportunities

international research initiatives that will develop the knowledge for responding effectively to the risks and opportunities of for supporting transformation towards global sustainability in the coming decades. -mobilising thousands of scientists while strengthening partnerships with policy-makers and other stakeholders to provide sustainability options.

The concept is to deliver:

- **Solution-orientated** research for food safety and food security, linking diet and health and development challenges due to climate change, instability
- **Effective interdisciplinary collaboration** across natural and social sciences, humanities, economics, and technology development, to find the best scientific solutions to multi-faceted problems;
- **Timely information for policy-makers** by generating the knowledge that will support existing and new global and regional integrated assessments;
- **Participation** of policy-makers, funders, academics, business and industry, and other sectors of civil society in co-designing and co-producing research agendas and knowledge;
- **Increased capacity building** in science, technology and innovation, especially in developing countries and engagement of a new generation of scientists.

The concept is a 'federation' of projects and other initiatives related to food science and technology research *divided into broad research themes (Roadmap 12.2023)*

2. Education benchmarking, centres of excellence, curricula, training

1. Expand collaboration with Association of African Universities and other like organisations to implement education programming together in Food Safety, regulatory affairs, food processing, 'pay forward' education for primary and secondary students.
2. Expand through national and regional networks the benchmarking of education through IUFoST, with hands on help and expert resource available to teachers and students – establish centres of excellence
3. Use media of all types for educational purposes with local dialect over English subtitles i.e. training videos, student education
4. Increase participation in Young Scientist, Early Career Scientists, Mid Career Scientist programmes

3. Scientific Communication, Communication to all audiences

1) Increase scientific communications, raise IUFoST profile through consistent branding, develop depth of scientific resource through publications, columns, internet resources, videos, all communication methods
2) Develop forecasting and senior resource panel (s)
3) Mobilize Fellows as expert communicators, mentoring with ECSs
4) Develop pro-active responses to emerging issues, respond quickly and effectively through science communications regarding issues
5) Form Task Forces, Commissions to look at specific issues, monitor output
6) Continue with SRDs, expand outputs to include more publications
7) Continue to solidify relationships with IUFoST publications, increase visibility of IUFoST and science related to FS&T

4. Collaborations, Associations, Memberships

1. Solidify existing collaborations, associations with MoUs, have dedicated personnel monitoring output.

2. Expand number of associates within FAO and WHO – both regionally and at headquarters

3. Expand multi-disciplinary collaborators, including other Unions, participate fully in ISC, FAO and WHO activities when possible- assign members, fellows to these roles depending on expertise – follow up particularly with CODATA in ISC and UNIDO opportunities

4. Increase number of associations such as the International Dairy Federation and related work

5. Include members and fellows, ECS and MCS in all Task Forces, Commissions, etc. – monitor progress.

6. Develop projects as above to secure funding to assist members and associations with their work

7. Increase opportunities for associations with IUFoST and therefore access to expert resource

5. IUFoST Meetings

1. Continue to strategically define IUFoST World Congresses, their locations, their focus

2. Continue to ensure annual FOOD SUMMITs, perhaps regionally organised, with emphasis on thought providers, forecasting, interdisciplinary approaches

3. Continue to support national symposia, conferences, congresses

4. Offer IUFoST resource for national, regional and international meetings.

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