Virtual Consultation on 'Science for resilient food, nutrition and livelihoods: Contemporary Challenges'

Organized by: M S Swaminathan Research Foundation
August 7, 8 and 10, 2020

Report of Proceedings

Background

The Virtual Consultation on 'Science for resilient food, nutrition and livelihoods: Contemporary Challenges' was organized by the M S Swaminathan Research Foundation, to focus on insights that to overcome contemporary challenges, especially in the context of the pandemic and changing equations. The conference was held in Chennai, India on August 7, 8 and 10, 2020 and included virtual participation and presentations from across the globe.

As the world grapples with a pandemic, it puts greater stress on pre-existing concerns, especially for challenges that affect a large population of the world, from the point of view of equity. There are estimates that the COVID-19 and its economic fallout will lead to many more people becoming poor and food-insecure with an estimated over 140 million people falling into extreme poverty (Laborde et al., 2020). On the other hand, higher food insecurity could be a multiplier for the epidemic due to negative health effects and increased migration (Smith & Wesselbaum, 2020). This needs urgent reconfiguring of current ineffective food, nutrition, health, and social protection systems to ensure food and nutrition security for all (Maternal & Child Nutrition, Editorial, 2020). Also, the pandemic has disrupted access to fresh and nutritious food at affordable prices, made worse by weak infrastructure and poor institutional support (Lal, 2020).

In this context, a conference on 'Science for resilient food, nutrition and livelihoods: Contemporary Challenges' was organized by the M S Swaminathan Research Foundation, to focus on avenues and policy insights to overcome existing challenges. The conference was held in Chennai, India on August 7,8 and 10, 2020. This document captures the highlights of this conference including action points for policy makers.

Individual session rapporteurs: Mr Girigan Gopi, Mr Prasanth Parida, Mr Goutham Radhakrishnan , Dr Sreeja Jaiswal, Ms Priyanka Mohan, Ms Rojarani, Ms C S Dhanya, Ms T R Suma, Dr DJ Nithya, Dr V Pratheepa

Editing and overall compilation: Ms Jayashree B

MSSRF /PR / 2021/ 81

Inaugural Session

Science for Resilient Food, Nutrition and Livelihoods: Contemporary Challenges

Introduction **Jayashree B,** Director Communication, MSSRF
Welcome Address **Dr Madhura Swaminathan,** Chairperson, MSSRF
Setting the Agenda for the conference - Remarks **Prof. M. S. Swaminathan**, Founder Chairman, MSSRF
Inaugural Address: **Shri M Venkaiah Naidu Hon'ble. Vice President of India**
MSSRF Annual Report Presentation: **Dr K S Murali,** Executive Director, MSSRF
Release of MSSRF's 30th Annual Report
Announcement of the Mina Swaminathan Fellowship on Gender and Development for Journalists
Remarks on Contribution of Science to Food & Nutrition System, **Prof K VijayRaghavan,** Principal Scientific Advisor to the Government of India
Vote of Thanks**: Dr R V Bhavani,** Director ANH, MSSRF

Highlights of the session

The virtual inauguration of the conference was performed by the Vice President of India, Shri M Venkaiah Naidu. The inaugural session was held to coincide with the birthday of Prof M S Swaminathan, Founder MSSRF.

Ms Jayashree B, Director, Communication MSSRF who introduced and presented the speakers, emphasized the importance of this conference and the various discussions planned, in the context of the COVID-19 pandemic.

Dr Madhura Swaminathan welcoming the Vice President thanked him for honoring with his presence, expressing that this was a reflection that the work of MSSRF was valued. It also placed the onus of exploring new science-based ways of ending poverty. In the fourth decade of the Foundation, the lives and livelihoods of millions of Indians, particularly the vulnerable have been affected by the global pandemic.

Prof Swaminathan's speech – at the end of the year you look back at the useful work that has been done. Improve the productivity of farmers; doubling the income; recalled the importance of women farmers when he was Member of Parliament and efforts to

advocate for their rights; Tamil Nadu agriculture is one of the best in the world – rejuvenate the Bill so that women farmers and men farmers get their equal rights;

Vice President's Speech:

Greetings to all on the occasion. Prof Swaminathan is a guiding force, walking encyclopedia to agriculture, growth and expansion of agriculture both nationally and globally. It is wonderful to be associated and know Professor as a visionary scientist, genesis, international administration, architect of India's green revolution.

The concern on land rights for women is important and we need to take it forward. Basically Land rights have to be given to women as well. Housing patta titles and all properties to be given to both members of the family. It is heartening that MSSRF aims to accelerate more on science and technology on agriculture to improve lives and livelihood for communities.

Today India and the world are engaged in developing methods by which the deadly corona can be controlled. Eternal vigilance is the approach to avoiding serious pandemics. We need a multi-pronged approach, one dealing with control measures and the other with delivery system. Although, India has high competence in developing vaccines, we may need to develop infrastructure to effectively control pests like Corona. Our success in the eradication of small pox is a good example of how our public are willing to take part wherever social mobilisation can help solve the problem. In fact, today many of our public health problems can be solved through public cooperation and action.

While dealing with the problem like corona, we should not forget the human dimensions of the suffering caused by the outbreak of the disease. Women and children are particularly targets of diseases like corona. Farmers, fishing community, and small time agriculture produce vendors are particularly affected by the lockdown due to corona. The other escalating issues are raise in non-communicable diseases, malnutrition, loss of biodiversity, climate change, poverty, inequality, inequity and, all point to the need for resilient communities, equipped to face these challenges. While targets have been set under the 17 Sustainable Development Goals (SDG) to address the challenges under Agenda 2030, the pandemic may delay achieving the results. The current crisis caused by the COVID-19 pandemic has further exacerbated the situation; many have lost their livelihoods and it is expected that the number of food and nutrition insecure people will rise. The need for resilient communities has never been more urgent. Human society has

made major advances in science over the last few years. This knowledge has to be proactively adapted and blended with traditional knowledge of indigenous communities, to show the pathway to sustainable, inclusive, and resilient communities. I am happy that the M S Swaminathan Research Foundation is discussing this issue in a multi-pronged strategy. Such problems require concerted action by the public, civil society, panchayati raj institutions and states and central governments. International cooperation assisted by bodies like the World Health Organisation will help to accelerate progress and achieving lasting success.

Corona reminds us of the progress made in science and technology. There is much to achieve in terms of anticipatory research where we can take proactive action. Anticipatory research, participatory research and translational research (converting theoretical know how into field level do how) are all important. The science policy of problems to provide adequate fund for the three forms of research. In fact, success of the MSSRF is the emphasis they are playing during the last 30 years on anticipatory and participatory research. This helped to reduce damage during severe cyclone and tsunami. The Foundation established a Media Resource Centre to achieve a linkage between science and society.

Farmers in villages are benefitted from anticipatory warning as we see from the current experience with locust. Similar anticipatory warnings are being done in natural hazards such as floods through informing individual farmers. Telemedicine is another success where high tech has reached hinterlands for appropriate diagnosis of human diseases. The permeating capacity of mobile phones has helped the technocrats and sector specialists to work together to solve myriad problems of the poor in general and agriculturists in particular. Thanks to the progress made in information technology and virtual conferences, we are able to reach the unreached and voice the voiceless in a very effective and speedy manner.

At this juncture, farmers are facing challenges of reduced production, marketing and price rise apart from inadequate quantity and quality of food. The conference not only addresses the challenges of the quality of food, nutritional requirements and sustainability of livelihoods but also increased income to improve family health care. The conference understands the importance of blending traditional systems of cultivation along with the modern technology to enhance productivity and acceptability of the technologies for rapid scale up. In the meanwhile, the Government has set a target of doubling of farmers' income by the year 2022. There are several sources of income growth identified such as, improvement in crop productivity; improvement in livestock productivity; resource use efficiency resulting in reduced production cost; increased

cropping intensity; diversification towards high value crops; improvement in real prices received by farmers; and shift from farm to non-farm occupations. Several initiatives have already been rolled out which inter-alia include advocating progressive market reforms through the State Governments, Encouraging contract farming through the State Governments by promulgating of Model Contract Farming Act, Up-gradation of Gramin Haats to work as centers of aggregation and for direct purchase of agricultural commodities from the farmers, e-NAM to provide farmers an electronic online trading platform, Distribution of Soil health Cards to farmers so that the use of fertilizers can be rationalized, Increase water efficiency through Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)-" Per drop more crop", Better insurance coverage to crops for risk mitigation under Pradhan Mantri Fasal Bima Yojana (PMFBY), providing total interest subvention on short-term crop loans, thus making loan available to farmers at a reduced rate of interest and extended the facility of Kisan Credit Card (KCC) for animal husbandry and fisheries related activities as well as Interest Subvention facilities to such categories of farmers.

Increase in the Minimum Support Price (MSPs) for all Kharif & Rabi crops at a level of at least one and half times of the cost of production as giving major boost for farmers' income. In addition, other social benefits (such as pension) to old farmers can enhance the income significantly to enhance the standard of living of farmers.

The conference will deliberate on the technical aspects of the production enhancement apart from considering the social, economic and policy aspects of various issues of enhancing farm income to better the lives of farmers.

I am confident that the conference will bring out solutions to tide over the current problems of Corona and still achieve the Sustainable Development Goals in India and elsewhere in the world. I am also very happy to virtually release the 30th Annual Report of MSSRF for the year 2019-20. I wish the conference all success.

Remarks on contribution of science to food and Nutrition System by Prof. K Vijay Raghavan , Principle Scientific Advisor, Govt. of India

We are evolving together during the time of the pandemic. This is the time for us to learn our lessons. Optimistic and forward looking of human endeavors for planning the near future. This has change for three reasons:

1. From the first, industrial revolution order has been created, wealthy western countries had the luxury of resources for sustainable development and its impacts had an effect Sustainable development possible.

2. Meeting of certain goals
3. New model of sustainable development having zero negative impacts, increase quality of life, generates mitigate. This is possible with the same tools.
4. Farming more sustainable at local levels bottom up demands for a sustainable way.

MSSRF Annual Report Presentation by K S Murali, Executive Director, MSSRF

Key highlights at the Foundation for the previous year were presented by the Executive Director. These included:

- establishment of a Mangrove Genetic Resources Conservation Centre in Coringa
- marking of the 10th year of the Fish for All Resource and Training Centre
- launch of the Humboldtia conservatory at Wayanad
- establishment of Farmer Producer Companies in Jeypore, Odisha
- evaluation of 43 salt-tolerant rice landraces
- launch of comprehensive water resources management plan in two districts
- support to Krishi Vigyan Kendras in Andhra Pradesh and Maharashtra to promote the Farming System for Nutrition model
- MSSRF's 30th year conference and various seminars including a collaborative science-seminar with Nature Research

Announcement of Mina Swaminathan Fellowship on Gender and Development for Journalists

A video of Mrs Mina Swaminathan was played out on the occasion where she spoke about the need for a gender lens and the importance of gendered approach in an institution as well as in science. Following this, the formal announcement was made by Dr K S Murali, ED , MSSRF who spoke about the Mina Swaminathan Media Fellowship on Gender and Development, that would identify journalists in Tamil, Malayalam and Odia media to focus on the theme of gender and COVID-19 in rural India.

Vote of Thanks by R V Bhavani, Director Agriculture-Nutrition-Health, MSSRF

While expressing gratitude to the Vice President Shri Venkaiah Naidu for setting the tone for the deliberations to start to Prof Vijayaraghavan for emphasizing the importance of science in food and nutrition and challenges we face. Grateful to Professor Swaminathan for continued guidance for the years to come, to participants attending online with request to continue to do so for the following sessions. Honoured by guests Mrs Mina

and Dr Sowmya Swaminathan. This is the first time, which is a virtual conference a strategic move for making sure that this conference works and benefits all so thanks to all who are working behind the scenes.

Session 2:
Agrobiodiversity for Strengthening Resilience and Sustainable Food Security

Speakers:

Dr. Carlo Fadda,
Director, Bioversity International, Rome
Mainstreaming Agrobiodiversity - Challenges and Prospects

Dr. Shantanu Mathur,
Lead Adviser, Global Engagement & Multilateral Relations, IFAD, Rome
Use of Agro-biodiversity in managing risk and strengthening resilience

Prof. Darshan Shankar,
Vice-Chancellor,
University of Transdisciplinary Health Sciences and Technology
Mass Personalization of Food –an Indian Perspective

Prof. L. Venkatachalam
Professor, Madras Institute of Development Studies, Chennai
Economic Valuation of Wetland Ecosystem Services

Dr. Pricilla Marimo
Associate Scientist, Gender, Bioversity International
Gender dimensions in Agrobiodiversity Management
and

Dr. Marlène Elias
Gender Specialist, Conservation and Management of Forest
Genetic Resources, Bioversity International, Rome (and)

Session Moderator: Dr. K. S. Murali. Executive Director, MSSRF
Coordinators: Dr N. Anil Kumar & Dr E.D.I. Oliver King
Rapporteurs: Mr.Girigan Gopi & Mr. Prasanth Parida

Session Report

Dr. Carlo Fadda - Mainstreaming Agrobiodiversity - Challenges and Prospects

- Dr Fadda emphasized on the need for conserving local landraces, vital agrobiodiversity resources, and mainstreaming them into food production.

- Local landraces have superior traits and perform better than the improved varieties in certain environment. He emphasized that here is a need for participatory approaches in breeding taking into consideration of the ecosystems and needs of local communities

- Farmer centered participatory approach in plant breeding is necessary for conserving the landraces of crops and developing seeds

- ICT tools can be effectively linked to involve farmers in participatory breeding and sharing data

- A sustainable breeding approach should be more farmer specific, ecosystem specific and genetic trait specific to contribute to the seed systems

- Seed is the core for food production and hence sustainable food production demands strengthening of seed systems

- Strengthening of food seed systems need strengthening of the network between national/international gene banks, community seed banks and seed cooperatives at local or regional level.

Dr. Shantanu Mathur
Lead Adviser, Global Engagement & Multilateral Relations, IFAD, Rome
Use of Agro-biodiversity in managing risk and strengthening resilience

- He emphasized the need for developing systems and approaches reflecting multi-stakeholder perspective in designing actions and policies for managing risks and strengthening the resilience of production systems.

- He also emphasized the need for people centered approaches in strengthening and transforming agricultural production systems using more biodiversity. There is a vital role for traditional knowledge in building resilience and adapting to climate change.

- He also expressed concern over dwindling use of species for food production; as modern agriculture contributes towards biodiversity loss, climate change and depletion of ecosystems

- He proposed three ways to empower farmers to cope up with climate change; (1) judicious use of biodiversity in agriculture, (2) sourcing of different crops and varieties for cultivation, and (3) strengthening and utilizing local knowledge systems for production and strengthening of the health of ecosystems

- By integrating agrobiodiversity in smart way, we can address food and nutrition security and also cope up with climate vulnerabilities – this requires interdisciplinary approach for promoting greater integration of biodiversity and traditional/local knowledge into production process.

Prof. Darshan Shankar,
Vice-Chancellor,
University of Transdisciplinary Health Sciences and Technology
Mass Personalization of Food –an Indian Perspective

- The current scenario of food policies and practices failed to address food from the perspective of health and nutrition, rather it gives emphasis to uniformity and yield

- The current mass food production system neglects the production of ecosystem specific food of nutrition value. There are lots of investment for developing improved breeds and varieties that can potentially address nutrition requirements of human beings. However, such efforts overlook agrobiodiversity and specifically crops and varieties. He cited an example of iron rich rice of Tamil Nadu.

- The current mass food production system encourages only a few number of species of plants of food value

- The food practices and food species consumed by ethnic communities are to be documented and validated

- Ayurveda, Indian System of Medicine describes more than 1000 food formulations of health and nutritional values. Such knowledge needs to be further validated for addressing nutritional issues

- Prof. Darshan Shankar emphasized the transdisciplinary strategy for mass personalization of food by developing an interface between food and health, which demand a revisit of current policies

Prof. L. Venkatachalam
Professor, Madras Institute of Development Studies, Chennai
Economic Valuation of Wetland Ecosystem Services

- Prof. Venkatachalam emphasized the need for undertaking economic valuation of ecosystem services from a conservation and food production points of view

- He also stated that valuation exercise is vital for creating awareness about ecosystems and its potential economic value for judicious decision making

- Wetland ecosystems of Tamil Nadu provides tangible services, however, lack of awareness about its value, people are misusing or not putting efforts to conserve wetlands. There is a huge loss of wetlands from 43000 to 22000 at present.

- Provisioning, regulating and supporting services is necessary to protect the loss of valuable wetlands

Dr. Pricilla Marimo
Associate Scientist, Gender, Bioversity International
Gender dimensions in Agrobiodiversity Management
and
Dr. Marlène Elias
Gender Specialist, Conservation and Management of Forest
Genetic Resources, Bioversity International, Rome (and)

- Unequal in gender norms ascribe distinction in women and men. She emphasized the need of applying a gender lense in policies, biodiversity conservation and food production. Policy should be made on rights to access and control over resources by women

- Dr. Pricilla stated that conservation efforts, if not gender responsible, can augment women's work burden

- Loss of biodiversity affect men and women differently; women are more vulnerable to the loss of biodiversity. Need for enhancing gender equality through bio-diversity management leading to recognition and representation.

- Majority of the customary practices followed in different parts of the world act against the interest of women.

- Focus on gender equality and equity in context of global strategies (SDG-5). Multidisciplinary efforts need to be established to resolve gender inequality.

Response to Questions:

Addressed by Dr. Carlo:

- Economic paradigm need to provide a space for traditional crops for which can provide us with healthy food.
- Marketing strategies need to be established to develop a business model with regards to traditional food crops.
- Farmers' management aspect for improved lines should be taken into consideration.
- Issue of productivity of traditional varieties can be resolved through pure line selection process in five to seven years
- There should be a greater effort to characterize the materials for climate change and nutrition

Addressed by Dr. Darshan Shankar:

- We are moving slowly to an era of transdisciplinary education.
- Every culture has generated knowledge. Monoculture does not work in present situation of climate change.
- Correlation in kafa, Vata and pita comes from a different means- Ayurgenomics

- There is a need of developing cross cultural database in food – Food Pharmacology
- Food chemistry is totally misleading. We have to create a database by looking at food from different perspective.
- We should create a food card (phenotype of an individual) of an individual through Mass Personalization programme.

Addressed by Dr. Pricilla:

- When it comes to agro-biodiversity, we need to go to community and see what can be done for women especially when men migrate to other regions and Collaborative efforts required

Agrobiodiversity for Strengthening Resilience and Sustainable Food Security

Key points from the session

1. Strong commitment to interventions that are Science, technology and evidence-based and operated with robust policy levers and diversity-based sustainable food system approach for the restoration of the agroecosystem health and diversity of diets. The renewed agricultural interventions that is based on sustainable intensification and mainstreaming agrobiodiversity in production and consumption can reduce health, nutrition, and climate-related vulnerabilities.

2. Indispensable need for conserving local landraces, vital agrobiodiversity resources, and mainstreaming them into food production as local landraces have superior traits and perform better than the improved varieties in adverse conditions. There is a need for Farmer centred participatory approach in plant breeding taking into consideration of the ecosystems and needs of local communities

3. Seed is the core for food production and hence sustainable food production demands strengthening of seed systems; A sustainable breeding approach should be farmer specific, ecosystem specific and genetic trait specific to contribute to the seed systems; Strengthening of food seed systems need strengthening of the network between national/international gene banks, community seed banks and seed cooperatives at the local or regional level.

4. Empower farmers to cope up with climate change through judicious use of biodiversity in agriculture, sourcing of different crops and varieties for cultivation, and strengthening and utilizing local knowledge systems for production and strengthening of the health of ecosystems

5. Integrating agrobiodiversity in a smart way to address food and nutrition security and also cope up with climate vulnerabilities – this requires an interdisciplinary approach for promoting greater integration of biodiversity and traditional/local knowledge into production process.

6. Orienting the R&D and product development that leverages the power of trans-disciplinary research partnerships and controlled use of the advancing data science for achieving a "Mass Personalization of Nutrition". India and the Asian region in general keep thousands of ecosystem-specific and culture driven foods that to be studied and promoted to address the inadequate accessibility of nutritious foods.

7. There is a dire need of applying a gender lense in policies related to biodiversity conservation and food production. Unequal in gender norms ascribe distinction in women and men. Policies should be made on rights to access and control over resources by women. Multidisciplinary efforts need to be established to resolve gender inequality.

Session 3:
Special Lecture: Prof Rattan Lal: 'Soil Centric Approach to Realize India's Evergreen Revolution'

Distinguished University Professor of Soil Science and Director of the Carbon Management and Sequestration Center, The Ohio State University, Ohio

Date: August 7, 2020
Time: 4.00 pm – 5.00 pm

Session Coordinators: Dr. R. Rengalakshmi Ms. B. Jayashree

Key points made during the special lecture by World Food Prize 2020 Laureate, Prof Rattan Lal

1. The contemporary challenges of increasing rate of soil degradation and environmental pollution necessitates the shift in seed-centric approach of 1960s to soil-centric approach to achieve ever-green revolution
2. Increasing rate of urbanization has huge impact on top soil quality and productivity by increasing the demand for bricks. Scalping of topsoil upto 1 meter depth is common in fertile areas including gangetic plains.
3. Advocates shift from Commodity centred approach in soil management to an Integrated NRM strategy as suggested by then President of India, Hon. Shri. KR Narayanan. The Shift in approach here needs moving from NPK centric nutrient management to Carbon based fertilization by Cover crops – thus it becomes C N P K and here the cover crops futher reduce the dependance of NPK
4. Evidences proved that increase in soil organic carbon is enhancing crop productivity and Technologies which promote soil organic matter and Soil carbon sequestration such as application of biochar, compost, growing cover crops, incorporating root biomass and crop residues needs adequate attention.
5. Policy measures can encourage farmers to add more crop residues to increase SOC by practices like recognizing and rewarding the farmers who maintain Soil organic carbon
6. The average nutrient efficiency in India is only around 30% and technologies which promote the carbon based fertilization, fertigation and micro irrigation to increase nutrient use efficiency are important from economic and environmental dimensions.
7. Promotion of site specific soil protection policy encompassing the payments for ecosystem services and discourage the policies which degrade the soil ecosystems

8. Integrated team approach of plant breeders, soil scientists, entomologists and pathologists help to develop varieties which reduce the use of chemicals
9. Necessary farm machinery have to be available at the village level to promote the cutting of crop residues and converting to compost and applied back to soil.
10. Similar to the rights of human being and animals, the concept of "Rights of Soils" to be protected, restored and managed judiciously came up strongly
11. A soil-health report mapped brought out once every five years for rich data on soil status to serve as a base for agriculture and conservation-related activities.

Session 4: Special Lecture: Dr. Bruce Alberts

'Science Communication is more important than ever before in the Covid19 crisis: scientific journals and much more'

Chancellor's Leadership Chair in Biochemistry and Biophysics for Science and Education, University of California, San Francisco

Date: AUGUST 8, 2020
Time: 9.15 am – 10.15 am

Highlights of Prof Bruce Alberts special lecture titled 'Science communication is more important than ever before: scientific journals and much more'

- Science has to explore truth, humanize it and apply it for benefit of humanity. We need much more of the creativity, rationality, openness and tolerance and are crucial for science...as is developing a scientific temper for all the nations.
- Honesty, Generosity, a strong demand for evidence, with openness to all ideas and opinions irrespective of their source are the some of the 'Values of Science'
- Through the wisdom and example, Prof M.S. Swaminathan have made the globe aware of the enormous good that can be provided to the world's poor through both science and the work of scientists.
- Improving scientific publication will also require making those publications more rapidly accessible and hence to expand the use of preprint servers. Also require improving standards for peer review and it is important to stop the Predatory Scientific Journals
- The success of Science over the past three centuries has enabled our lives much more stable and predictable
- "Inquiry Based" Science Education will develop children as great problem solvers in the workplace and help them to make wise judgments for their family, their community, and their nation
- An important tool for strengthening science – both in each nation and across the globe – is the formation of "Young Academies" and India has one thanks to the efforts of Prof MSS.

Session No. 5: Climate Change and Resilient Tamil Nadu

Date: August 8, 2020
Time: 11.30 am - 1.00 pm

Speakers names and designations:

- Mr. Bishow Parajuli, Representative and Country Director, The World Food Programme of the UN-India
- Prof. T. Jayaraman, Senior Fellow - Climate Change, MSSRF
- Dr. R. Ramasubramanian, Principal Coordinator, MSSRF(and)
- Dr.S. Velvizhi, Principal Scientist, MSSRF
- Dr. V. Surjit, Associate Professor, NIRD&PR, Hyderabad
- Ms. Sonam Dumbre, Alumnus-SBI YFI

Session Coordinators: Dr T Jayaraman, Dr. R. Ramasubramanium, Dr S Velvizhi
Names of rapporteurs: Goutham Radhakrishnan , Sreeja Jaiswal

Mr. Bishow Parajuli – Impact of climate on food security/agriculture: Regional perspective and need for regional approach

Mr. Parajuli's address focused on four aspects: i) Food security and its global and regional dimensions, ii) impact of climate change on food and nutrition security, iii) context of South Asia and India and, iv) way forward and the regional approach. On the global perspective of food security, he said a positive development over three to five decades is advancement in science and agriculture driven by the Green Revolution when India went from food deficit about six decades ago to being food surplus with a production of 291 million tonnes. He credited agricultural scientists, farmers, research institutions such as MSSRF and prevalence of right policies for this achievement. He pointed out the dichotomy of persistence of hunger and food insecurity existing alongside the significant improvement in production and surplus. Globally 690 million people are estimated to be food insecure and hungry, more than half of who are from Asia, and a majority in India which remains one of the most important challenges in global food security. He also added that every year about 10 million people are added to the list of hungry and food insecure. Discussing the COVID-19 pandemic impact on food security and livelihood, he said the havoc of the pandemic, according to WFP, could double the number of food insecure population to 270 million in 2021 compared to the previous year. Child hunger is another crucial aspect of the exacerbating crisis and about 50% of child deaths occurring

in the developing world are caused by food insecurity and malnutrition. With the challenge of the Covid-19 pandemic, mortality among children could rise sharply. He further drew attention to the fact that mere availability of food supply is insufficient to address hunger and food insecurity but equally important are questions of affordability, adequate nutritional availability, and livelihoods.

Climate change is a high-risk multiplier exacerbating drivers of food insecurity and decreases crop production and the frequency and intensity of climate related hazards, lead to more humanitarian and food security crisis, evident across the world. It is anticipated and estimated that impact of climate change is becoming increasingly visible and some sectors are more intensely affected than others, as witnessed in the West Bengal and Kerala floods and Odisha cyclone. He recalled his experience of leading the UN system in Zimbabwe where three out of five years were hit by cyclical droughts. Apart from economic mismanagement, this was the most important factor for small and marginal farmers. The country which once had a food surplus is now depending on external food sources and aid for 50% of its population.
Therefore, climate change affects the availability of food due to drought, flood or disruption in agriculture, changes in yield, as well as the quantity of arable land and water availability. It also results in barriers to production itself due to reduced rainfall, for instance, which leads to questions of adaptability ad resilience. The third element is the direct impact of climate change on livelihoods especially rainfed agriculture and livestock, besides concerns of migrations and drastic changes in productivity.

Coming to Asia region and India, he stated that 700 million people have been affected by climate change related factors in the last decade. World Bank estimates that climate change could push 62 million people to extreme poverty by 2030. He warned that India with its particular context – high reliance of climate sensitive livestock and agriculture, high incidence of poverty and food insecure population, high population density of vulnerable exposed to climate related extreme events, and also long term changes such as gradual changes in monsoon patterns, glacier melting and sea level rise –is extremely vulnerable to climate change.

Finally, on the way looking forward, Mr. Parajuli opined that climate change is here to stay. Therefore, the focus must be on adapting to climate change and looking at how to prepare for it and developing early warning systems. Some of India's safety net programs such as TPDS, mid-day meal, ICDS, etc are excellent examples of safety net support for vulnerable population which are crucial in adaptation efforts. It is also required to work on micro nutrient supply and diversification of food etc. On the point of regional approach, he added that it gives good added value in policy, efficiency, and in general

practise and it can be a great lesson to be learned going forward. To sum it up, he concluded that climate change has a major impact on food security and agriculture. Adaptation is important and so is preparedness and early warning. Safety net and support to vulnerable population fundamental to our efforts going forward in dealing with climate change. He ended the address by referring to a recent statement by Bill Gates where he points out that climate change can have a much larger impact on our society and economy that Covid-19 which is causing panic, mortality and loss of economy etc, climate change can have a much larger impact than that. Because of its slower pace of progression some countries perhaps do not see it, but it remains a serious issue for policy makers, agricultural scientists, and planners to factor in during development and agriculture promotion.

Prof. T. Jayaraman – "Climate Resilient Agriculture in Tamil Nadu - Key Challenges"

Prof. Jayaraman opened his address by acknowledging Mr. Parajuli's focus on vulnerability in his address breaking away from the usual analyses based on climate risk. He said that such a focus is very valuable in the context of India. He then set out the policy context of his presentation. Firstly, in several levels of government and in the scientific community in agriculture there is some misapprehension about what exactly is India's commitment to the Paris Accord in terms of emissions reductions and in particular agriculture. He clarified that India has made no commitment to reduction in emissions as such but has only committed a reduction in emissions intensity of GDP as well as large-scale deployment of renewable energy. This is to be kept in account by those dealing with official policy. Second, India's Nationally Determined Contributions (NDC) do not bind it to any sector specific mitigation obligation or action including in the agriculture sector. India has always made it clear that agriculture is an arena of adaptation and not mitigation. There are two references to natural resources in India's NDCs: the first partly mitigation in character is to create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2020 as part of NDDC No. 6; the second, more related to agriculture is to better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management.

Moving away from government policy he then proceeded to present some numbers and facts on the ground. India's agriculture contributes 1.224 Gt of CO2 equivalent which is about 29.6% of India's total emissions. It is to be noted that India's annual emission are about 7% of the global total. Second, India's emissions from agriculture and LULUCF sectors contributes 7.35% of the global total of this sector which is 29.7% of total global

emissions without taking account of CO2 removal by forests etc. It should be borne in mind that India is not a major emitter if one looks at the per capita emissions in the agriculture and Land Use, Land Use Change, and Forestry (LULUCF) sector. He added that it is often ignored in discussions how the poor in India and many developing countries depend on agriculture for livelihood. Their engagement with agriculture suffers from instability of production, adverse impact of price shocks relating to input and output, low income and low productivity. Inability to cope with weather and climate shock is a consequence and not a cause of poverty. Another point to be kept in mind is the aspect of differentiation in our country side. The world does not appear the same to the small farmer and the large farmer. Large farmers do well and this is reflected in positive indices of agricultural growth, input sales and rising production.
Prof. Jayaraman then moved to situating India's productivity problem in the global context. India's position in the world can be characterised as leading in area and production, and lagging in productivity. He referenced Prof. Rattan Lal's address the previous day where he made the point about the success of green revolution in positioning India as a major producer of agricultural commodities. For rice, India is the first in acreage, second in total production, but the fifth in terms of productivity, while in wheat we are first in area, second in production and fourth in productivity.

He then discussed the context of Tamil Nadu with regard to climate change. The rainfall distribution in TN is unlike the rest of the country and unfortunately very often this is neglected. Even Tamil Nadu state action plan version 2.0 on climate change has no analysis of the October-November-December (OND) season rainfall which accounts for most of the precipitation in the state. Overall, we find that there is no statistically significant trend in both total and seasonal rainfall (OND and June to September season). He reminded that like the rest of India, operational holdings in TN are also dominated by marginal, small and semi-medium cultivators. However, the ICAR, in an important observation, has noted that the climatic zone distribution in Tamil Nadu has shifted. While Coimbatore has moved up with a higher moisture index from Semi-arid to Dry sub-humid, and similarly Nilgiris from Semi-arid to Humid, a number of districts including those in the Cauvery delta has moved from Dry sub-humid to semi-arid. Around 20% of total cultivated area has shifted in its climatic classification.

On the question of yield gaps, he stated that the yield gaps in TN agriculture is relatively low compared to other states. In paddy the average gap is only about 26% in contrast to much higher levels elsewhere in the country. The gap is significant in maize but that is true of the entire country. There is room for improvement in pearl millet and sorghum. However, there are two very important aspects about trends in yield that should be noted. One is the virtual stagnation in rice yields over two decades followed by recent

increase. Other is the catch up by millets and coarse cereals. This is a very striking feature of Tamil Nadu. A lot of it is driven by maize and the question remains open to what extent the rise is driven by human consumption or needs of feed etc. The challenge of scale however remains. Policy measures and agricultural research have resulted in new varieties of millets and coarse cereals being made available in the state. Although in terms of area coarse cereals have to catch up, it is nevertheless a promising indicator in terms of climate change.

In terms of climate resilience, he drew attention to the fact that the proportion of irrigated (partial or full) area to total area it is almost over 70%. As a result, it is observed that there is a fairly low sensitivity directly to current climate variability in TN agriculture. But there is a complex seasonal pattern of cultivation of cereals, millets and pulses. There are as many as 6 seasons. Hence determining trends without further data is difficult and more analysis is required. What this attest to is a strong trend in what is known in literature as autonomous adaptation to current climate variability backed by strong irrigation trend and varietal diversity. How to test it quantitatively remains a challenge. If one looks at the actual results in terms of direct impact of climate variability on rice for instance - it is difficult to determine season wise production of paddy is hard to come by over a sufficiently long time period – we see quite gratifyingly that extreme temperatures above the cut-off point optimal temperature for rice does in fact lead to drop in yields. But the overall impact/sensitivity to temperature and rainfall trends is somewhat minimal. Signals are much clearer is other parts of the country.

Summarising his address, Prof. Jayaraman stressed that in terms of climate resilient agriculture we must pay attention in TN to the differences rather than the similarities with the usual story from many other parts of the country. There is limited scope for closing the yield gap because the gap is small. He made some observations on the way forward for climate resilient agriculture in the state. First is the need for strong technology driven varietal development utilizing GM/CRISPR to address abiotic and other stress. A rethink of the debate around GM and related technologies is warranted in this context. While measures such as soil health are very important, he added a word of caution that they are marked by high expenditure, and while its environmental co-benefits are significant so are its costs as shown by global data. Payment for Ecosystem Services (PES) is a somewhat complicated matter. It is a market mechanising and it's dis-equalizing character for a large number of small holders is something that must be borne in mind very clearly. Rationalising input use to lower cost is important but he emphasised that Tamil Nadu must think of this primarily as an economic question rather than as an agronomic or scientific issue. Lastly, he proposed some guidelines for the way forward:

1) Any new methodology of cultivation that has negative impact on yields will exacerbate crisis of more than half of the households involved in cultivation.
2) Agriculture remains the target of adaptation and not mitigation. The TN (or Indian) cultivator cannot yet be the target of implementing "global environmental values".
3) Purely ecology or environmentally driven large-scale cropping pattern shifts by regulatory methods will provoke further crisis in the agriculture sector.
4) Much work remains to be done in the area of understanding the importance of supply chains and value chains and the impact of climate variability on them.
5) Tamil Nadu has achieved notable growth in sectors like livestock, including dairy, meat, poultry and eggs. It is critical to protect and further develop these.

Dr. R. Ramasubramanian & Dr. S Velvizhi- "Ecosystem-based Adaptation - Coastal Ecosystems"

Dr Ramasubramanian and Dr Velvizhi spoke on ecosystem based adaptation (EbA) initiatives that they have been working on for coastal ecosystems. Dr Ramasubramanian spoke first on land-based ecosystem adaptation, followed by Dr Velvizhi who spoke about ecosystem based adaptation for marine ecosystems.

Dr Ramasubramanian began with an overview of the coastal ecosystems in Tamil Nadu, characterizing them as highly productive, but ecologically sensitive. He then summarized the climate change projections for Tamil Nadu and its impact on coastal ecosystems. He elaborated that the temperature is set to rise 1 to 3 degree by 2100. The Tamil Nadu coast might witness a sea level rise by 0.19 to 0.73 m by end of the century, with the Cauvery Delta being highly vulnerable to sea level rise. Moreover, though the number of cyclones may decrease, the intensity of cyclones in the east coast is projected to increase and the northern coastal Tamil Nadu will be the most affected. He outlined the various strategies outlined in Tamil Nadu State Action Plan for Climate Change (TNSAPCC) for climate change adaptation such as establishing bio-shields (mangrove and non-mangrove), biodiversity conservation in coastal zones and reclaiming saline soils. At MSSRF, EbA has focused on conservation and management of mangrove wetlands, integrated farming with aquaculture and biosaline agriculture to address the impact of climate change.

He proceeded to give an overview of the mangrove cover in Tamil Nadu and identifying scope for further increasing the mangrove cover especially in Nagapattinam, Ramanathapuram and Thiruvarur district. He then spoke about MSSRF's efforts in increasing mangrove cover and conservation in Tamil Nadu, Andhra Pradesh, Orissa and

Maharashtra, through Joint Mangrove Management- a science based, community centred, process oriented approach to conserve, restore and sustain mangrove wetlands. He gave an overview and explained the benefits of the Integrated Mangrove and Fishery Farming System which MSSRF has established in Tamil Nadu and Andhra Pradesh and suggested replicating it in other states. The integrated systems produce fish in combination with agriculture centred around the fish pond. He also gave an overview of the biosaline agriculture initiative wherein seven species of halophytes were cultivated in the saline soils along coast of Tamil Nadu and Andhra Pradesh.

He concluded that ecosystems based conservation and management of coastal resources such as mangroves, sea grass beds, coral reefs and sand dunes, will reduce the climate change vulnerability. Moreover, climate change adaptation measures like integrated aquaculture, bio-saline agriculture and biodiversity conservation are important strategies to cope with the impacts of climate change.

Dr S Velvizhi focused on marine fisheries and coastal livelihoods. She started with a brief fisheries profile of the state of Tamil Nadu. Tamil Nadu has around 576 fishing villages across 13 coastal districts, with around 8 lakh persons dependant on fisheries. Tamil Nadu is one of the top fish producing states in the country.

She gave an overview of the impact of climate change for fisheries in Tamil Nadu. Climate Change effects the physiological functions like growth, reproduction and spawning. It has affected the migration pattern of mackerels. Climate Change can therefore have an impact on fisheries sector through reduced yields , yield variability and increased vulnerability of those living near coasts, thereby affecting livelihoods and well-being.

EbA is an integrated approach that can assist adaptive management and effective planning, with increased stakeholder participation in planning and decision-making and can promote gender equality and resilience of fishing community. It is an approach that can balance ecological and human well-being.

In the remaining presentation, Dr Velvizhi highlighted the work carried out by MSSRF for EbA. One of them was the artificial reef for marine bio-resource enhancement. The artificial reef provides artificial fish habitat for living, hiding and breeding for marine organisms. Additionally, it acts as a barrier to reduce height and spread of waves and protects eroding of the coast and coastal settlements. MSSRF has also provided safety-at-sea training and capacity building for fishermen community. Fisher Friend an android-based application developed in collaboration with other agencies, provides information on risk reduction, early warning and livelihoods to small scale fishers which are the most

vulnerable group to climate change. The other activity MSSRF is engaged in is supporting and improving fish value chain, especially reducing post-harvest loss.

In her concluding remarks she highlighted the need for an integrated approach such as the EbA which advocated integrated management across land, water and living resources to reduce the climate change effects while balancing ecological and human well-being.

Dr. V Surjit: Contemporary Challenges in the Cauvery Delta - The Protected Special Agricultural Zone

At the outset, Dr Surjit highlighted that the Cauvery delta has the epithet of being the rice bowl of south India. It has one of the oldest irrigation system in India going back to 2nd century. It has also has a long history of implementing agricultural development programmes, including the Green Revolution. Therefore, the region has received considerable policy attention. He stressed that though the region has been known for agricultural prosperity. However, there is a need to focus on the contemporary challenges of Cauvery delta. The first issue is the level of water availability. In the last 50 years, irrigation water from the Grand Anicut has not reached the amount mandated by the Cauvery Tribunal. The decadal average of discharge from the grand Anicut has also seen a decline. This has implications for agricultural production system.

The state disaster management plan categorizes the delta region as a high risk zone with respect to natural disasters associated with cyclones, droughts, extreme rainfall events, which can have an impact on agricultural production. Dr. Surjit gave an overview of the productivity and profitability of paddy cultivation in Cauvery Delta and proceeded to show that only around three times in the last 14 years, have the districts in the Delta managed to achieve the breakeven yield per hectare.

He discussed that the Cauvery delta can be divided into six agro-ecological zones based on five characteristics: type of irrigation, quality of irrigation, soil characteristics, agrarian density, mode of production. He emphasized the need to formulate strategies that address the differences between these agro-ecological zones for enhancing productivity.

The Cauvery Delta was declared as an agricultural protected zone in February 2020, and this is expected to shift the focus from non-agricultural activities back to agricultural due to restrictions on the former. In order to make sure that the welfare of the people is not effected, would require integration of agriculture, livestock and fishery to generate

livelihood opportunities for the local people. Suitable MSMEs with linkages to agricultural sector, traditional crafts, arts and tourism could be promoted. There needs to be a focus on strengthening decentralized institutions to support income and employment opportunities.

Ms Sonal Dumbre: Raising the living standards of the salt pan workers

Ms Dumbre presented the work she had carried out among saltpan workers in Tamil Nadu as an SBI Youth for India Fellowship in association with MSSRF. Tamil Nadu is the second largest salt producer in India, with the activity primarily concentrated in Thoothukudi and Ngapattinam. Ms Dumbre gave a brief overview of the various processes involved in salt production, from land preparation, crystallizing and scraping, collection , processing and packaging. She then spoke about the various aspects of quality of life of saltpan workers. She elaborated that saltpan workers mainly belonged to scheduled castes and other backward communities. Low and fluctuating wages, seasonal nature of employment and lack of influence in salt value chain contribute to employment insecurity among salt pan workers.

Salt workers work in harsh environment with corrosive air, high temperatures, lack of shade and resting places and without protective equipment. Many workers suffer from dehydration and renal issues are quite common. There is a lack of toilet facilities, due to which workers decrease their intake of water, further exacerbating dehydration. The nature of their work makes them vulnerable to a number of health complications, ranging from eye irritation, to renal diseases, keratinized palms, callosities and fissured heels. A number of workers suffer from chronic dehydration. The nature of their work and associated hazards demand replenishment of bodily fluids and appropriate nutrition. However, salt pan workers, significant proportion of whom are women, lack access to toilets. Holding urine for long hours or avoiding drinking water lead to complicated renal issues. However, toilet construction is challenging because of corrosive and harsh windy atmosphere, fear of contamination of salt, high ground water table and flooding in monsoon.

Ms Dumbre in an attempt to address this issue undertook a pilot project for providing urinals for salt pan workers in Vedaranyam in Tamil Nadu with the help of MSSRF . The major design challenge was to make a zero liquid discharge urinal. Going ahead, Ms Dumbre suggested that an integrated intervention needs to be designed for salt pan workers which takes care of the micro and macro issues involved. These include, nutritional intervention, specialized protective equipment, resilient structural spaces

such as shades and restrooms, building alternative livelihood capacities. Further on the macro-level, awareness and dialogue amongst general public and policy makers, inclusion and participation of salt workers in policy making, formation of salt cooperatives, adherence to human and labour rights, and explore automation and mechanization in the sector.

Q & A session

To Mr. Bishow Parajuli

Q1. Subhash (ICAR-IIFSR) – We need to do quantify both long- and short-term impacts of climate change on agricultural productivity both at households, districts, agro ecological zones rather than state or country level estimates.

A1. Bishow Parajuli: - World Food Program has done these works in a number of countries. In fact, we have now started in response to the Covid in Odisha where we are working with the state government to study the impact of Covid at the household level. Definitely, in certain other areas where there are relevant linkages to climate change, be it weather patterns or extreme events we can plan our work on it in collaboration with institutions such as MSSRF.

Q2. [Ram Janakiram] Your emphasis on regional approach to address climate change is very much needed. What needs to be done to accelerate this process?

Bishow Parajuli: We are very much encouraging regional approach because climate is beyond politics. The effect of climate change happens across borders, so therefore so much learning can be done in terms of modality of application, understanding measurement of vulnerability, response, resilience approach, adaptation approach, early warning etc. looking concretely, on some work in this area linked to Sri Lanka, and another linking India, Bangladesh, Bhutan and Nepal from climate adaptation point of view. This kind of work has been done by WFP in Southern and Western Africa. It can bring the package available from responses, nutritional interventions, crops and livestock etc. WFP is encouraging South-South cooperation and thinking of a special initiative in the Delhi office from a multiple angle but this new dimension of early warning and adaptation is something we can think about.

To Prof. T Jayaraman

Questions/comments addressed at the speaker as are given below.

Q1. [Karthikeyan] Is there a correlation between land becoming more arid and the 'catch up' of millets in TN?

Q2. [Ravichandran Vanchinathan] Why technological interventions are not availed to avoid biotic stress factors including drought? Why the molecular marker assisted breeding technology is applied to rice alone for submergence? Why not in other crops for other stress factors? If GMO Seed could address the abiotic stresses, why not research on it and make them available to farmers? The salinily tolerant rice developed by MSSRF is gathering dust at the policy makers shelf. Policy paralysis is affecting farmers like me. We the rice farmers used to be the victim of flooding during monsoon. Right now, it has inundated farm lands in Kerala, Karnataka, Maharashtra, Bihar etc. I have been escaping the loss due to submergence of my Rice Crop during North East Monsoon by growing submergence tolerance rice breed through molecular marker assisted technology. (This morning I sowed CR 1009 -Sub1). Thanks to Gates Foundation, I have avoided the loss since 2010. Unfortunately, we have very few varities CR 1009, & Swarna to choose from.

Q3. [Sheela Immanuel] Tuber crops like cassava are climate resilient and is a food security crop. How far change in the cropping pattern can address the climate change issues?

Q5. [Ram Janakiram] Recommendations made Dr Jayaramanan requires moving towards a science based agriculture and adoption of these by marginal and small farmers - these are being done in many places in India and other countries - how can we scale up successful and tested initiatives in this area?

Responses: Prof. Jayaraman –

I would like to make a point at this occasion that we need to build afresh a coalition for science in agriculture. This is our mandate in MSSRF and we should re-dedicate ourselves to this. We have learned a lot but I think this is very important. I would certainly be keen to pursue it. Those of you who are hearing this I would like to get in touch, and we can take this forward. We must have a coalition for science in agriculture of the future.

The second is the question of soil, which I want to respond to. It is complex and currently expensive. In order to make a viable intervention we need both. We need a suite of practices and it has to be backed by good science and technology and also keeping into account economic value addition, returns, incomes, and ways to reduce costs.

To Dr. Ramasubramaniam

Q1. [Ravishankar] Interventions have great potential for replication and further work for policy intervention to replicate in similar social and geographical conditions.

A1. The suggestion is well taken and we will try to intervene at policy level and also replication in coastal zones in other states.

Q2. [Dr. Gopalakrishnan]: Will we lose mud-flats which is an important ecosystem like mangroves, due to climate change?
A2. Yes, true. There is a possibility of losing mud flats to sea level rise and inundation.

To Dr. Surjith

Q1. [Gopi]: Pointed out the need for huge public investment required to protect the Cauvery delta.

A1. I completely agree. Almost half of the time, the region is affected by one extreme event or the another in the form of droughts, floods etc. In 2003 when I was doing field surveys there, it was a bad year. Farmers wanted to move away from agriculture as they could make a livelihood from it. 15 years down the lane, when there was a legislation to protect the agricultural land in the region, the onus is again back on agriculture to provide livelihoods and employment. This can happen only through science-based interventions, that integrate crops, animal husbandry and fisheries technologies, taking into account the difference rather than the similarities of various regions of the delta, and building inclusive and sustainable value chains. This requires strong public investment through R&D and technological transfer mechanism.

Q2. [Anil Kumar]: Increasing the catchment area with support from the three states.

A2. I completely agree with you but that has to be dealt more as a scientific issue than an emotional one. In a longer perspective, this aspect needs to be looked at with scientific collaboration between states to look at more sustainable solutions to maintain the delta as well as supporting the lives and livelihoods. The key point is that agriculture becomes the focal point to provide livelihoods and employment. The recent regulation call for a shift from non-agricultural sectors to agriculture. It is not that non-agricultural activities will be stopped but a larger responsibility will be on agriculture.

To Sonam Dumbre

There was one suggestion from an attendee which is given below:

Q1. In addition to what Ms. Sonam Dumbre presented about salt-pan workers, during 26th June 2014 foundation held a consultative meeting on the health of Vedarayam salt workers. We involved all the stake holders and we gave the action to the government of TN for further immediate action. People participated from the labour department also and some of the recommendations by us was taken up. We can follow up to see how the implementation is going and more points if needed

Session No. 6

Panel Discussion on Gendered impacts of the COVID-19 crisis

Date : 8th August 2020
Time : 4 – 5.30pm

Special Lecture "Broader health impacts of COVID" Dr. Soumya Swaminathan, Chief Scientist, The World Health Organization of the UN, Geneva

Panel discussion

- **Dr. Kezevino Aram,** President, Shanti Ashram, Coimbatore: *Community level responses to emergent health risks confronting women*
- **Prof.NityaRao,** Professor, Gender and Development, University of East Anglia, Norwich: *Impacts of Covid-19 on women's work and food and nutrition security*
- **Ms. Poonam Muttreja,** Executive Director, Population Foundation of India, New Delhi, *Gender-based violence and women's sexual and reproductive health*
- **Dr. Avni Amin,** Scientist, Gender Team, Department of Reproductive Health and Research, WHO, Geneva: *Global Gender Impact of Covid-19*
- **Dr. Anjana Mangalagiri,** Senior Fellow, Institute of Social Sciences; Country Representative, South Asia Forum of ECD Professionals, New Delhi: *The differentiated impact on children's development and learning*

Session Coordinators: Prof Nitya Rao and Ms Jayashree B
Names of rapporteurs: Ms Priyanka Mohan and Ms Rojarani

Speaker 1: Special lecture on Broader health impacts of COVID by Soumya Swaminathan

Experience of men and women depends on biological characteristics and determined for both Covid preparedness and response. Ensure meaningful participation in implementation and decision making

1. Limited Sex and age disaggregated data + other factors which is reported on 38% of countries are reporting age how decisions are not able to Death between men and women, its important discharge rates etc other strategies address Covid health and inequalities. Invest in gender quality responses on men women and children
2. Stringent lockdown measures – increased incidents on partner violence and domestic violence, services related to health and reproductive (contraception,

nutrition services, childhood obesity and vaccines preventable disease, essential services, social network were disrupted, increased stress in the stress role. Mitigating measures is important

3. Healthcare worked: High risks for women who are strongly affected 70% from Spain and 60% in Italy. Data from this sector has to be put together and evaluated. Training in how to use the gears and ensuring essential products are put in place, to avoid burn out. Resources for mental health. Women health workers must be made available for the decisions made in designing of materials, Anganwadi works, Asha Sanitary inspectors, all given training and person protective requirement. Psych social support must also be provided.
4. Inequities, financial, information care and social protection facing social exclusion. Due to a range of factors, basic needs are not in place, less ability to comply with physical. Lack water, soap, and bathroom facility leading to high risks.

Speaker 2 – Poonam Muttreja

- Gender based violence are likely to get excerbrated
- Disruption of essential health services and constraints already limited access women have reproductive health services.
- Impact of COVID – alarm bells ringing, half of health line workers, women are not accessing anti natal services, fear factor is there and hence young people in the four states in Rajasthan/ Sanitary pads/ implications
- Many intimate partner violence – concern that data is sporadic, what ever numbners we have across, limited permissible movement, number of captured with perpetrator in and within the house.

Speaker 3 – The differentiated impact on children's development and learning by Dr. Anjana Mangalagiri

- Pre pandemic that 38% below five year stunted. And underweight and india has also slipped in . 120 million can be pushed into declarations and gender inequalities.
- Covid has revealed that children are the least of the priorities
- Needs Individuality of children’s rights and
- Decades of progress in malnutrition access to early learning centres and threatened to be reversed. Retrogressing children’s work. They are the hardest hit.
- Early child development a blind spot, suffered in low income households
- Increased responsibilities how children are being sent out to work.

Speaker 4 – Global Gender Impact of Covid-19 by Dr. Avni Amin

India has the highest number of cases and yet sex data is not yet reported to the WHO

Global pattern of who is likely to die

- Men are likely to die – caveat this is not the case in all countries.
- WHO eastern only 37 cases are sharing
- Women seems to be more represented
- Pregnant women were not seen as vulnerable, until some of the data in Sweden states otherwise. 6% landed up in ICU and hence would need to be considered.

Steps to be taken : Critical interventions

1. Anganwadi workers need to be realised on duties and look at formal recognition
2. Quick need for cluster mapping exercise going with reverse migration population, for children below 6 and bring people under the angawdi system
3. Block education offices need to identify new track gender response planning and budget
4. UNICEF – emergency child benefit for the most vulnerable families. Its worth considering. Too much hunger in the country. One size fits all will not work.
5. Schools in rural areas are displaced
6. NEP couldn't have been postponed to the current covid times. Children from low income become the collateral damage and the decade of progress and it must not be lost.

Key points from Session 6: Gendered response to COVID-19

1. Gender analysis of existing data to be taken up by health and research institutions, in connection with the pandemic; there is need for disaggregated data by gender, socio-economic status etc.
2. Recognize women's increasing care / work burden and provide access to special services for their needs
3. Increasing domestic violence across groups and sectors should be addressed on high priority
4. Ensure uninterrupted reproductive and health services especially for women and adolescent girls
5. Increase role of panchayats and community-level support systems and governance for women to replace regular roles shared with others (eg. school or ICDS centres)

6. Immediate restoration of services for early childhood development and care and community health systems required and these frontline workers (anganwadi workers, ASHAs, village health nurses etc.) to be relieved of their COVID-related responsibilities
7. Built capacities of frontline workers to engage with and use digital devices to ensure improved knowledge and communication at the field level on key concerns
8. Improved distribution of dry rations and entitlements including more nutritious food to be implemented with direct access to women
9. Government and research institutions should invest in quality gender-responsive research around COVID-19.

Session No. 7: Post-harvest markets and supply chains

Date: 10/08/2020
Time: 9.30 am

Speakers names and designations:
1. Dr. C. Anandharamakrishnan, Director, Indian Institute of Food Processing Technology, Thanjavur,
2. Dr. C. Shambu Prasad, Professor, Institute of Rural Management, Anand,
3. Mr. Gagandeep Singh Bedi, IAS, Agricultural Production Commissioner and Principal Secretary to Government of Tamil Nadu
4. Dr. Nikita Gopal, Principal Scientist, Central Institute of Fisheries Technology, Cochin

Session Coordinators: Dr G N Hariharan, Dr R Rengalakshmi
Names of rapporteurs: C S Dhanya, T R Suma

1. **Dr. C. Anandharamakrishnan – Value addition and food processing**

Dr C Anandaramakrishnan talked on Sustainability strategies for value addition and food processing industries in India. He started the session by pointing out the importance of processing food for getting better taste, nutrition, to remove pathogen, for increasing the shelf life and for convenience in transportation etc. And he also stressed on the need for food fortification to combat malnutrition in India, and observed 3 to 5 times increase in the demand for processed food in the country in the context of COVID 19. He emphasized the need to recognize and mainstream 25 Lakh unorganized Micro food enterprises in India as this sector links directly to the farm gate.

He had explained the major challenges faced by the micro enterprise sector in India as lack of branding, packing and marketing skills, lack of knowledge on quality aspects and GMPs etc and had further stressed on the need to empower the sector in these aspects.

Dr. Anantharamakrishnan had identified these key sustainability strategies for the food industry viz., minimize resource utilization especially water, minimize transportation of raw materials, maximize technological upgradation and waste utilization, and planning and managing the whole supply chain according to the consumer preference and market demand ensuring nutritional security. Food industries also need to focus on developing customized food and to expand the product range according to various customer preferences.

He has observed the need to focus more on research for bringing low cost technologies for developing alternative salt and sugar. And also stressed the importance of plant-based meat analogues, milk alternatives and high value-added super foods in creating diverse products for getting higher market demand.

He also opined that it is highly important to continuously upgrade our technologies for sustaining the food industries, and mentioned the relevance of IIFPT's effort on developing CARK Food 3D printer for bringing customized and miniature food products and for valorization of agro-wastes.
He opined that the Indian industries should explore the arenas such as Value-added products from food waste, diverse fruit wines, developing Nano foods, and also the next generation packaging technologies and 3D virtual stores.

He has provided a detailed account of the current scenario of world and Indian processed food and concluded the session by identifying the emerging technologies (Waste utilization& IOT based; HPP processed foods & frozen foods; vacuum frying & freeze drying; salt &sugar reduction) and the food trends (diverse food focused at personal values, food with specific health claims, plant based diet, ethnicity, exotic super foods etc.) to be promoted by Indian food industries.

2. **Dr. C. Shambu Prasad – Market, Institutions and Small holders**

Prof. Shambu Prasad talked about the significance of various market institutions in improving livelihoods of small farmers sustainably. Markets are increasingly becoming important for smallholders, as earlier subsistence based livelihoods are going on with changes and face various threats currently. Markets are important to maintain the biodiversity of their production systems, and to increase resilience.
Markets are not homogeneous entity, but it is a diverse system with different components and elements such as local markets, regional markets, hyper local markets, export markets etc.
As market plays a major role in farmers' income, they have to engage in direct interface with market as well as consumers. Markets being unequal inherently and shielded by middle men.
Direct mediation of farmers with markets is unfavourable but new opportunities are coming. But there are stories of small farmers successfully aggregating the products, direct mediation of small holders.

Example of small farmers made a substantial success is from AMUL under the leadership of Dr. Varghese Kurian, in Anand. That's partly because the ownership of the value chain is the farmer producer companies. But, this is not possible for all commodities
Due to the failure of extension systems, local dealers become the merchants of Knowledge and the deals, they decide what fertilizer to use and sell etc, which is suboptimal to farmer as well as planet.
A movement started in 1991 during the period of Manmohan sigh, to protect the small farmers from distress, Small farmers Agri-business Consortium has been suggested. Farmer Producer Company legislation came 2002. In 2010 there was a huge increase in the number of FPC in the country.
If you look at market access to farmers, main mechanisms of farmers accessing credit is through the primary agricultural cooperatives.Small farmers are often excluded.
There are now about 8000 FPOs in the country and they are inclusive in nature, large number FPOs have small and marginal farmers that can shape their own future. These changes brought good market orientation.

Most of the FPS are weak, poor capital base, no substantial share capital, serious issues of ease of doing business of procuring licenses, knowledge base is poor. One district one product, what is the optimal size of FPO, too much focus on business plan and execution of it over 4-5 years these are some issues to be addressed.
Amidst all these failures the question is "Can FPOs be solution for sustainability of farming sector?
There is lot of scope of Innovation, and experimentation, by treating an FPO as an MSME building the ecosystems, rather than trying to aggregate the products.
AP drought mitigation programme, where civil society organization tried a Click centre, an FPO collective providing critical irrigation is to reach out to more organic farmers. Provision of startup grant of 6 lakhs, and enabling a soft loan of 30 lakhs that enable the FPO to reach out to large number of organic farmers to reach out substantially
Diversification of produces is important, working on multiple commodities is important. Its important to design FPOS very differently, this requires innovation, incubation and establishment of robust institution and systems. COVID provide opportunity to rethink of food system for nutrition, shift to greater processing at local level, value addition and grading system for products.

3. **Mr. Gagandeep Singh Bedi – Agribusiness and value chains – Tamil Nadu perspective**

Mr. Gagandeep has presented a detailed account of Tamil Nadu's agriculture status, it's strength in terms of Agri business and supply chains. At the opening itself he has

emphasized the point that the farmers need not just be producers but have to become entrepreneurs and for this they have to be supplemented with knowledge on postharvest management of crops and marketing.

He has stated that the Tamil Nadu Govt have been silently focusing on promoting a farmer collective movement during the last four years in order to strengthen the back-end system of farming. Govt have formed collective farming groups, farmer producer organizations and cooperatives as a strong step towards shifting production and productivity to marketing. And he hoped that these FPOs will play a crucial role in the success of the primary sector in the present and the coming decades as the SHGs contributed towards the upliftment of rural economy in the previous decade.
He had explained the ways in which the TN govt had formed, empowered the farmers through different schemes and processes, starting from Farmer collectives to FIGs (farmer interest groups), to FPGs (farmer producer groups) to FPCs.

He also mentioned the different strategies that the Govt is adopting for promoting value addition and marketing viz., creation of a common infrastructure and funding for establishing value addition units for FPOs. Through these primary processing centres (PPCs) the FPOs are able to process fruits and vegetables, utilize the cold storage and market the produce whenever they get higher price. The Govt has also promoted village wise Value addition machinery unit for dryland farmers.

He had then explained how the Govt tried to help the farmers for marketing through promotion of e-trading, eNAM markets etc. and mentioned about Govt's plan to introduce agribusiness market complexes where all Agri inputs are marketed/available. Govt's further plans for investing in marketing and storage facilities for the benefit of farmers, so that it is ensured that farmers produce, process and market the produce themselves at a better profit range.

Mr. Gagandeep has concluded the session by sharing the vision of Tamil Nadu Govt pursued for agricultural processing that includes increasing the percentage of processed food, establishing food parks, more PPCs, promotion of more micro-food enterprises, contract farming etc. and the Govt's plan for bringing the Food processing policy for the district.

4. **Dr. Nikita Gopal, Principal Scientist - Gender/Women, Fisheries and processing**

Dr Nikita Gopal provided an overview of fishing in general along with the types of resources, fishing – capture and culture as well as in terms of scale – small, large and

commercial fishing. India accounts for 12 Million tonnes that is 6 per cent of the world fish production.

Traditionally. Fishing industry has a mens face, but women's efforts also are behind every bite of fish we taste. Fish production would not be possible without women where they are fabricating and mending nets managing the household while men go for fishing etc. Women are key to the fish processing process and and delivery to the consumer; without them, households would have less access to fish and food. FAO statistics says that out of 120 million in capture fisheries 50 per cent are by women. Even in harvest, especially in small scale fisheries, many women are actually involved. Post harvest includes diverse activities in which 90 per cent are performed by women and 60 per cent of all fish sellers in Asia and Africa are women.

Women have traditionally been involved in shore based activities like sorting of the catch, marketing it in interior areas, processing excess catch using traditional methods like drying, smoking, fermenting. They also had enough fish to feed the family and when fresh fish was not available relied on the processed fish for the same. Women now have to source fish from marketing from other traders. Women fish sellers usually still depend on spaces in markets or sell door to door. Women are also involved in traditional processing activities like Sun drying when excess catch is available to store fish for selling in lean season, or household consumption. Traditional processing activities have advantages of income and household food and nutritional security.
Within commercial seafood processing, about Rs. 46,600 crore comes as foreign exchange to India with about 1.38 million tons of seafood being exported. Almost all of this is contributed by women as the entire work force at the floor level in factories is women, but they are underpaid and often on daily basis.

However, Women Are still INVISIBLE. Why?

They have weak bargaining power due to historical gender biases normalized in the workplace and society. Gender inequality affects their food and financial security, personnel safety, family nutrition and stability of whole communities. Women's work is seen as an extension of their household responsibilities. Lack of recognition for her work and her place results in work place challenges going unrecognized as well Women don't have representation in institutions concerned to them. Modern markets, offices and apartments squeeze fisherwomen out of their former vending sites, with newer spaces often rented out to bigger, predominantly male operators. There are also many issues related to workplace safety for women. SDG-14 (conserve and sustainably use the oceans, seas and marine resources) does not reference SDG#5 (achieve gender equality and

empower all women all women and girls). There is also lack of sex-disaggregated data. In 2016, FAO fisheries and aquaculture employment statistics were broken out by sex for the first time. From 2009-2014, only 27% of FAO member countries reported sex differentiated employment data for fisheries. Only 33% reported them for aquaculture. There is urgent need to count women and make them visible, increase funding to gender hundred fold and support women's empowerment.

Q & A session:

Mr. Ravichandran, Farmer, Thanjavur: Whether IIFPT can provide glycemic index of rice varieties, it would be beneficial for the farmers and consumers to know the glycemic index of each varieties of rice as it is detrimental for the diabetes patients. And it is one of the quality criteria for labelling of rice/farm products?

Response: IIFPT has glycemic index center and has developed a model to see that how the disintegration takes place in the stomach after consumption of rice and how much glucose is released to the intestine etc. Further the institution has also studied about the change occurring in the GI when rice is consumed in combination with other food like cooked vegetables etc. IIFPT has come up with results on the GI of all the traditional rice varieties and the document will be released very soon.

Janakiraman: Covering all aspects of raw materials to processed foods to value chain, what institutional mechanisms are needed to scale up the tested solutions, that are mentioned in the presentation

Response: As an institutional mechanism IIFPT is supporting the entrepreneurs to utilize the incubation center, and the service is free except the electricity charges. So far the center has created 100 entrepreneurs.

Jithu Guha Sarkar: How women SHG members of lower stata of pyramid can get capabilities and technologies especially technologies like 3D food printer etc. at lower cost? Please share names of some of the low-cost technologies for farmers?

Response: Govt of India's recently launched FMAE scheme is exclusively for helping FPOS and SHGs. The group member can avail Rs 40,000 per head as seed money. IIFPT has been developing technologies for both large and small companies. Now the centre is giving the highly demanded technologies for free of cost, the details of three such technologies have already been uploaded in the institution website. It is also decided to release one technology every week and the details will be uploaded in all possible Indian

languages. And IIFPT is also trying to reduce the cost of 3 D printer so that it could be used even at household level.

Vihar: Are there proven technologies available for value addition in jackfruit/ how small farmer can access the same?

Response: There are technologies available for value addition in jackfruit, specifically for unripen jack fruit. It can be converted to jack fruit powder at the farmgate itself, for which there is high demand. Tamil Nadu Govt. is providing subsidy for solar dryer. The fruit can be dried and pulverized to get powder having many health qualities and thus the wastage of 70% of the resource in jackfruit can be minimized.

Gopinath: What is the proportion of farmers covered under FPOs in Tamil Nadu? Is there any plan to intensify FPO/FIG in Cauvery delta as it is protected as special agriculture zone recently?

Response: The percentage of proportion is 10%. The Govt has already broght 6L farmers in to collective groups to FIGs and some of them into FPOs. Apart from this other project like NABARD and SFAC are also forming FPOs. Further the Govt is planning to extend support to more FIGs and FPOs all over the state.

Ravichandran, farmer Thanjavur: Is there any possibility to train the farmers with management consultants in improving their skills so that they will be in a better position to participate in higher value chains?

Response: Definitely farmers have to be given support and training to improve their marketing skills, and Govt has been handholding them and providing skills in post-harvest techniques and marketing etc. Govt. has set up farmer markets and are helping them in fixing price for their produce.

Session 7 Highlights – Post-Harvest Markets and Supply Chains

- Research essential to come up the appropriate technologies to address nutrition related issues like recommended quantity of salt, sugar etc. in packaged foods
- Make nutrition related quality standards (e.g. glycemic index in rice) mandatory in processed foods
- Processing industries have to be environmentally sustainable especially in using ground water as well as handling byproducts of value-added products instead of treating them as waste. Such circular value chain- based planning is essential while

designing processing units with adequate backward and forward linkages for using agro-wastes

- Markets are inherently unequal and small holders are facing more risks. Hence it is important to support small holders in increasing their negotiating skills, accessing resources, additional support for building the institutions and right sizing it etc to make it as a sustainable model to small holders
- While promoting FPOs, 'one size fit for all' approach will not work - essential to study the context and design of the FPOs embedding both organizational and financial sustainability dimensions.
- Paradigm shift from production centric to income centric approach has been adopted in Tamil Nadu to promote agribusiness interventions with the participation of FPOs in the value chain. While enabling farmer's participation in value chain, it is important to ensure the adoption of strategies that promote inclusiveness to bring small holders and women farmers in the arrangement
- The study of fish processing from the gender lens clearly indicates the need for the promotion of women fishers' participation in the value chain through enabling access to appropriate technologies and the recognition of the important role played by them

Session 8: Global and national policies for sustainable food systems for balanced diet

Date: 10 August 2020
Time: 4.00 to 5.30 pm

Speakers names and designations:

1. Professor M S Swaminathan, Founder Chairman, MSSRF
2. Dr. Ismail Serageldin, Emeritus Librarian, Bibliotheca Alexandrina, Alexandria
3. Dr. David Nabarro, WHO Special Envoy on COVID-19 and SUN Lead Group Member, London
4. Dr. T. Mohapatra, Director General, ICAR & Secretary, DARE, Government of India, New Delhi
5. Dr. Renu Swarup, Secretary, Department of Biotechnology, Government of India, New Delhi
6. Ambassador Kenneth M. Quinn, President Emeritus, The World Food Prize Foundation, Des Moines

Session Co-ordinators: Dr.RV. Bhavani and Dr. R. Rengalakshmi
Names of rapporteurs: Dr. DJ. Nithya, Dr. Pratheepa

The session started with an introduction by Dr.Bhavani, MSSRF. She presented a summary of the deliberations at the conference starting with the inaugural session on 7th August forenoon, the four technical sessions and two special lectures over three days preceding this last and concluding session.

Prof Swaminathan: Special Remarks

Professor Swaminathan thanked all the speakers at the conference so far and indicated he was looking forward to hearing the speakers in this session. He emphasized that It is important to pay attention to farmer's income. Soil health and biodiversity conservation also need attention. It is important that we pay attention to utilization of all parts of a crop in development of the value chain. The rice bio park that MSSRF has helped establish in Myanmar is an example in this line. Soil fertility is most important in the endeavor for an evergreen revolution, as is translational research for sustainable agriculture. Agriculture is still dependent on monsoon and markets. Biodiversity conservation in the face of climate change, identifying crop traits to address particular problems and attention to vulnerable groups should be part of our approach. Recognition of women

farmers and their role in agriculture is very important. He had introduced a bill for women farmers rights bill as a Private Member's Bill in the Rajya Sabha; it is still an unfinished agenda. He recommended revisiting the recommendations of the National Commission on Farmers that he had chaired, as many of them continued to be relevant. The COVID crisis he said has highlighted the need for synergy between different institutions. The Panchayat raj institutions have to be the instrument for food security and nutrition literacy at the grassroot level.

Dr. Ismail Serageldin: COVID-19 and the challenges for food and nutrition security- Evidence based policies for inclusive food and nutrition

Current global health crisis has disrupted the supply chain, exposed the precarious condition of households and frailed the social security nets of many societies. There is a need to address the challenges of hunger, malnutrition, climate change and environment degradation. This emphasizes the need for proactive and collective role to achieve the SDGs and overcome the current pandemic crisis. National and international funding agencies should extend support for agriculture research and food security. for science is key to the future. Beyond policies, there is a need for action on the ground; referring to the current situation, he said that consumers are paying higher prices, supply chain disrupted, children are deprived of school feeding programme and families dependent on food assistance are struggling. Farmers lost their market and are worried about harvesting their current crops and planting for the next seasons. International trades have taken some blows: Government has responded to the crisis by export and import bans which led to price swings and trade tensions which were already high before COVID and now excessive. Government must keep the trade flow open with sensible export and import policies because many countries need to import part of their food. Effective functioning of the food supply chain has to be ensured. These are global effects and are not on desired scale. US and Europe can give trillions of dollars of support to population in developing countries. Developed countries should support poorer countries with effective action on the ground and support to avoid collapse of local currency.

Need to rebuild resilient local and regional supply chain based on diversified food systems and renewable resources. Urgent actions are needed for harvesting and planting in coming months. Therefore have to establish proper collection and distribution system that can deliver nutritious food to hungry people especially women and children. While short term actions are vital to address crisis, it is important to add long term implication on global food system. To achieve the SDGs, actions on agriculture and food security are needed. There is no way that SDGs will be met unless we transform agriculture. This means action on local, national, regional and global levels with well monitored and coordinated approach. Before the COVID 19 crisis, many countries were striving to meet

SDG targets, but now that effort has been pushed back further. Countries have to reconsider how best the food and nutrition security of the population can be ensured and long term supply and demand side destruction of economic effects be alleviated. Agriculture, economics, public health research remain in silos. Interdisciplinary and trans-disciplinary research is required to build more resilient agriculture and food system and nutrition system. Climatic change and disaster risks still exist although COVID 19 has taken centre stage in the media now. It is reported that restrictions following COVID 19 have demonstrated profound action on human activities and environment by way of decline in greenhouse gas emission, improvement in water quality, return of wildlife returning etc.; but being realistic, abrupt economic shutdowns are not acceptable. To rebuild better in terms of energy, infrastructure and resilient system, to conserve national resources, biodiversity and agro biodiversity, while increasing carbon sequestration, improving soil health and water quality, generation of renewable energy etc is required. Science, technology and innovation is going to be essential not just to address COVID 19 by coming up with new tests, therapeutics and vaccines but also to address other global challenges. Revolution of ICT on one hand and revolution of biology on the other hand can help restructure the food and agriculture system to provide food security to the poor and to transform the sector by reducing its environment and climate footprints. Innovations are needed to increase productivity and income through precision farming. Research should lead technologies to markets like biofuels from algae, accelerated fish farming, to improve livestock breeding and plant based protein. Such frameworks should have rapid movement from lab to land and from farm gate to consumer. Nutrition is important in all parts of lifecycle and for women, health is human right and access to nutritious food is fundamental to ensure good health and women empowerment. Well fed mother will give a healthy child and avoid surge of stunting and grow into more productive adults, fit to participate in more economic way in the future. Entire family will get benefitted from realization of women rights. Medium and long term post COVID action is required to address rights of all men, women and children including those who are most marginalized. Holistic approach is required and we should avoid disruption of input supply. Urgent actions should start now for agriculture credit, ensure seeds, fertilizers or pesticides are readily available when and when needed by farmers. Fertilizers should stop focusing only on chemical inputs. We need to understand biological action behind soil fertility. Transportation, storage and distribution system need to be enhanced as more and more population of the world become urbanized. We need to improve the capacity to meet demand. UN will be holding a Food Systems Summit in 2021. This will be a major opportunity to craft global efforts to address these challenges; build partnerships to implement actions on the ground between government and lateral agencies, private sector, NGO, Farmer Producer Organization, women's group and the consumers. Acting collectively for the common good, motivated by

nutrition for humanity, driven by care and compassion for the poor and weakest among the family, we can help human society to overcome the multifaceted challenges – both with regard to the pandemic and for more strong and sustainable growth and balanced development.

Dr. David Nabarro: Framework for a globally inclusive food and nutrition system

The virus is not going to go away, it is here to stay and it is a very unpleasant virus that provokes extremely challenging issues for society and requires really important policy decisions by all governments. It would be different, if the virus had high fertility rate, affects all people equally or people affected with COVID have lifetime immunity. But immunity after COVID remains unclear. Virus provokes multiple challenging ethical policy and programmatic decisions. In India and all the advanced countries face incredibly challenging struggle with this virus and nobody is spared. Virus reveals inequity and fragility. Focus on future food systems is made so much urgent and fragility of framing systems is seen. Vulnerability of small holder farmers is seen and the challenges of getting nutrition to small holder families and to those who are in informal sector and daily wages. We are concerned about challenges faced by women and children in dealing within COVID. The following three shifts are necessary in the current situation:

1. Develop systems approach: Italy was the main focus for food security for framing of decisions on food policy in UN secretariat meet in 2008. Much greater emphasize on nutrition and food system and the emergence of systems approach and the thinking that go with it, is being stimulated by MS Swaminathan Foundation and through debates throughout India on food policy. Within food system approach it is hunger and malnutrition. Illness caused due to lack of access to diet or by excess consumption of nutrients or certain food stuffs. Within the food systems approach, it is focused on the issues faced by food producers or people in indigenous community. We can go straight to the interest of producers and also of labours who operate in food systems and look at livelihood perspective or look at food systems from the perspective of the environment and biodiversity. We know food has an activity by contributing to significant losses of biodiversity everywhere. We can look at food systems in the perspective of climate change. One quarter among 1/3rd of the world damage at this time is caused by activities to do with food production processing. There are 4 different facets of food systems. i) trade-off that has to be explored. ii) incredibly stronger held positions, iii) deep tensions and iv) sometimes associated with violent conflict. Unless we take systems approach and recognize the multiplicity of purpose that is base of working on food.

2. Recognizing the need to involve multiple actors to bring the change: It has to be through collective actions. It cannot be one group that will dominate and bring someone else on board; whether it is political scientific argument or access to power. Systems change has to involve some degree of collective action. Be the common purpose and willingness of those who hold very different perspectives to find ways to talk to each other. Those who focus on livelihoods often find themselves at loggerheads with those who concentrate on environmental sustainability. And if they are not at loggerheads there are many who provoke discord and indeed conflicts. Those who focus on nutrition and health are often portrayed as working against those who are concerned with livelihoods particularly of small holders; those who are concerned with climate mainly with mitigation and adoption are often presented as working against interest of better nutrition and health. The necessity to find ways to enable the different protagonists to work together and to weave better future. Weaving approach is necessary involving multiple actors with varied perspectives, acknowledging tensions and using practice of systems leadership.
3. Institutional priorities: UN Food Systems Summit in 2021 is a welcome shift. There is scope for building together recognition for the need for collective action using multiple perspectives. Whether it is local, national, regional, international or global level, we will see approach to food that is much more inclusive of interdisciplinary with characterization to weave different approach together.

With the above prospect, over the next 10 years we will come out with framework for suitable resilient, people-centric, nutritious and climate compatible food systems for all.

Dr. T. Mohapatra, Indian Agriculture: Current Challenges and our preparedness

India has been self sufficient in food production now for decades and we have been able to erase hunger to a great extent, in the sense that food required for majority of the 1.3 billion plus population we are able to supply and feed them and export surplus. It was a challenge in the 1950s and 60s and Professor MS Swaminathan showed the path through the green revolution. From then onwards we have been really keep us with the population development and meet the requirements of food. During this pandemic period we were able to supply free food to majority of the vulnerable population. That kind of self sufficiency and strength we have on food front. Despite COVID, harvesting went on well and production at 295 million tons is an all time high. Nutri-cereals, millets are mainstreamed now not only in India but also globally. Millets are food for future because they are climate resilient. About 47 million tons of millets were harvested this year which is a landmark. Value-chain and startups are being established to link production with the market. Hon. Prime Minister has given a call to double the income

of the farmers and as Prof. MS Swaminathan mentioned, this is now mainstreamed. Linking farmers to the market is an important component in this. The government has earmarked Rs.6800 crores for establishing 10000 FPOs to mainstream and link farmers to market. Bringing farmers together will strengthen them to link directly with market and minimize costs. Soil health has been a major issue in the country. Prof. MS Swaminathan had said in 1968 itself that we cannot continue to do overexploit the soil as done during green revolution period. Many soils are devoid of carbon and in many areas it is just 0.1%; more than 88% of our soils are deficient in nitrogen. Similarly micronutrients like, potassium, phosphorus etc., are deficient in the soil. If we are talking about sustainable agriculture, these issues have to be addressed. Prof. Rattan Lal has also emphasized that soils are important component of agriculture. Soil health cards have been distributed to more than 100 million farmers and getting information from the cards will help to apply site specific fertilizers and address the issues of under and over application of fertilizers. We have developed 50 organic practices in different cropping systems and there is also a compendium of organic practices in agriculture that has been brought out and in place by central govt. Lot of emphasis is given to organic products and global markets has been created. There is lot more to be done and long way to go. Recently a 100000 crore rupees "agri-infrastructure fund" has been created by the central government to provide support to primary agricultural co-operative societies, farmer producer organizations, agricultural entrepreneurs and start-ups, and in the process support the production system. Not only on food grains, for horticulture also, the government is in the process of identifying clusters based on production in one area - "one district, one product" is the slogan. If it succeeds, it will be a great push for farmer's income.

Sustainable production system is a challenge not only for soil issues but also for water footprints in the environment. For crops like rice, sugarcane, banana, potato etc., addressing footprints has been a concern. Micro-irrigation and fertigation which is one of the challenges in agriculture system has been already worked out and we have been doing well. Integrated farming system (IFS) models have been developed and put in place and replicated. Through these models we are bringing in climate resilience, livelihood security, sustainability and ecosystem services. Nutrition focus was also brought in through diversified agriculture, horticulture, bee keeping etc. So in the process, protein and micronutrient malnutrition is being addressed. Tamil Nadu government has with their own funds replicated IFS model in farmers' fields; 60 models were developed and more than 17000 are already demonstrated on farmers' fields. In Kerala, more than 7000 IFS demonstrations were replicated. This approach will help bring climate resilience and also sustainability in small and marginal farm holding system. More than 85% of our farmers are marginal and have less than 1 hectare land, and the IFS approach is enhancing their income and also bringing in resilience. This is promoted not

only in India but also globally and needs attention so that small and marginal farmers get benefitted and also get improved nutritional outcomes in the process. India has started establishing "Climate resilient villages" almost 6 to 7 years back and around 50 villages were established with institutions like seed banks, fodder banks, climate resilience committees at various levels; capacity building and providing right technology are being provided. These villages are globally recognized and World Bank has extended support for replication in 5000 vulnerable villages in Maharashtra. This can be done in central Asia, Africa and other parts of the world also. These villages will bring much needed resilience and farmer's income is safeguarded and livelihood security ensured in the process. Digital agriculture is happening and will take some more years to develop fully - bringing in more digital platforms and technologies will address these issues holistically.

Dr. Renu Swarup Strategies for India's nutritional security and overcoming the pandemic

This dialogue is significant because we are talking about strategies for nutrition and agriculture in a new and unprecedented era. When new technologies are planned, technology disruptions are looked up, we look at how it is going to move; but today we are seeing changes that we never imagined within our system. Today, we are talking about supply chain disruption, behavioral change, economic crisis and livelihood challenges. Post COVID is going to be a new era. The changes that we bring in should also be reflected in agriculture and nutrition components. We have to look at availability, nutrition availability, ensure sustainable access, holistic access and now it is important to look up quality of food, keeping in mind the nutritional levels and immunity boosters. So this is a totally new paradigm that we are discussing and taking forward; looking at the challenges, an inclusive and integrated approach, and Science, Technology and Innovation (STI) is needed. Not only bringing in new technologies but adoption of those technologies, interdisciplinary fields that we have today and how to connect different technologies to bring out the solution that we are looking at. Whether we are looking at environmental aspect or nutritional or diversification, technology intervention is the key. "POSHAN Abhiyaan" is a very important mission for improving nutritional status of children, pregnant and lactating mothers and to bring in nutritional security within the population. Central govt provide many financial incentives and interventions and now technology intervention. Agriculture and nutrition has to be an integrated approach and all aspects like crop, horticulture, dairy, fishery has to be brought in. Stakeholder has to be brought on board, agriculturists, plant breeders, institutes, public sectors, start ups, industries, etc. We have look at how technologies are taken from lab to market and to the fields/land; how to connect technology to farmers and technology to fields. Major role is

played by extension workers, converting research to products and technologies which can be adopted within different ecosystems. It is the key role of startups and industry. As we position ourselves today to invest more in research and intervention, we know that economic crisis post COVID-19 is looming. COVID has taken priority but we have to keep in mind how to strike balance to ensure, we do not neglect other sectors that are important in a long run. Bringing the right technology intervention, investing correctly in the research and innovations which is going to help us to mitigate the risks and challenges is important. New technologies that are different, combining these with biological intervention and the combination is the key tool. Biofortification has much more relevance today when we look at crop improvement activities. This is one way to make diversification of food basket. Department of Biotechnology is working with Ministry of Agriculture, ICAR, international bodies and all other public and private sectors within the country and internationally. Large programmes are focused on nutritional aspects like malnutrition aspects, protein, energy, micronutrient deficiencies. DBT institutes like National Institute of Plant Genome Research in Delhi and National Agri-food Biotechnology Institute, Mohali are looking at biofortification in frood crop varieties. Last couple of years, large number of biofortified varieties have been released and given to farmers. Government should take up successful models and scale it up to many states. With the guidance from MSSRF, nutri-gardens were established in 4 districts with support from DBT and Gates Foundation. This is a relevant model involving small holders and women. Clear policy interventions and working along with state governments is the key. Biotechnology Kisan Hubs were started to look at farmer centric problem. It is a bottom up approach where the farmers provide the problem which the institute take up and provide solutions back to the farmers. Over the last one year, over 100 Biotechnology Kisan Hubs were established; over 105 aspirational districts are covered and in next couple of weeks, all 115 will be covered. DBT is working with KVKs and agricultural universities to bring solutions for farmers problems. About 100 thousand farmers are benefitted. Rural technology cluster has to be setup and approaches replicated. DBT has excellent models and they have run pilots in partnership with state government and public sector, NGOs and startups. In today's crisis, we have to connect all and pick up right technology and take it forward. Major aspects required are infrastructure, capacity building, having best human resource and to look at how to bring integration of technologies and skills for large scale adoption and inclusive of gender sensitization.

Ambassador Kenneth M. Quinn, Prof. M. S. Swaminathan's contribution for global policies

Ambassador Quinn referred to Prof.MS Swaminathan as the most respected agriculture scientist alive in the planet today and on the Times' list of top 20 influential people in Asia in the 20th century. He said that the two extraordinary challenges now are COVID and its impact on global food security. He shared his experiences while travelling back to US from his travel to Asia in February when US had only 15 COVID cases and now there were more than 5 million and approaching 170 thousand deaths, more deaths than during world war II. India, Brazil and Europe were also suffering greatly. Food security impacts are not getting the attention that it needs. Executive Director of World Food Programme, Dr. David Beasley had said that there is potential for disaster of biblical proportions i.e disaster that will be recalled for 1000 to 2000 years to come. The number of COVID affected people is shown but not the number of people affected due to the impact of it. In 1940s, when Bengal famine hit, Prof.MS Swaminathan was inspired. He started with Indian Agriculture Research and went on to Wageningen University and continued to Cambridge University to do his Ph.D. While studying there, another disaster, Europe Potato famine occurred. The impact was more in Norway and Ireland as there was only one variety and there was no biodiversity. Prof.MS Swaminathan has always emphasized the importance of biodiversity throughout his work. In 1963, Prof.MS Swaminathan collaborated with Norman Borlaug and Dr.C.Subramaniam and other scientists and leaders in India and Pakistan, to bring about the green revolution and prevent additional disaster and deaths of hundreds of people. This collaboration was one of the greatest that increased production and led to hunger reduction. He said that he met Prof Swaminathan in 2000 and set out to build World Food Prize Foundation and call attention to global issues and priorities. In 2000, then UN Secretary General Kofi Annan established the millennium developmental goals (MDGs), and reached out to Prof. Swaminathan to chair the Hunger Task Force to address the MDGs. Evergreen revolution to fight hunger while preserving our habitat is the vision of Prof Swaminathan. In 2009, Bill Gates launched his global initiatives to end poverty emphasizing on aspects Prof Swaminathan has been talking about - poor farmers, small holders and women. These are also reflected in the selection process of world food prize recipients whose committee Prof. Swaminathan chaired for many years. Ambassador Quinn reflected on the importance of collaborative research and Prof Swaminathan's contributions to global policy, stating that these were more important than ever before in the pandemic situation that we find ourselves in now.

The conference ended with vote of thanks by Dr. K S Murali, Executive Director, MSSRF