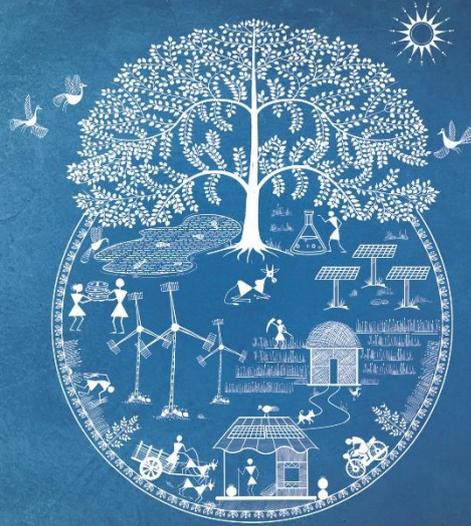




WORLD SUSTAINABLE DEVELOPMENT SUMMIT 2023

MAINSTREAMING SUSTAINABLE DEVELOPMENT
AND CLIMATE RESILIENCE FOR COLLECTIVE ACTION

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Crop-based Agriculture Systems and Climate Adaptive Solutions

THEMATIC TRACK SUMMARY

Venue: Silver Oak Hall II

Date: 23 February 2023

Time: 11:30 am – 1:00 pm (IST)

Suggested Citation

World Sustainable Development Summit (2023), Crop-based Agriculture Systems and Climate Adaptive Solutions, Thematic Track Summary (Rapporteurs: Madhuparna Maiti and Saheli Das), New Delhi: The Energy and Resources Institute.

Actionable Messages

Message 1: It is important utilize the data effectively and make it relevant to both productivity as well as to the profitability of the farmers which calls for a pragmatic approach. A stack approach is required to develop solutions as climate-related activities also has to be locally sourced and locally driven.

Message 2: An inventory must be created by identifying and locating gaps in policies. Policies need to promote interventions in infrastructure and technology for crop-based agriculture systems including in emerging technologies such as internet of things (IoT) and artificial intelligence for climate services to enable robust management of water and natural resources for sustainable agriculture. Climate services also need to consider areas such as water budgeting, specifically in rain-fed agriculture, and for that, a holistic approach is required, especially in terms of data collection and planning.

Message 3: The potential for innovations emerging from start-up systems is very high. Social, economic, and institutional measures should promote solution-based approaches to address climate adaptation challenges in the agriculture sector where start-ups can play a significant role. This can be done by promoting the agribusiness incubators and mentorship so that the start-ups can gain knowledge to translate their scientific ideas into practical solutions.

Message 4: Since climate change, agriculture, and societies are complex, the intersections of all these areas become much more complex. So, combinations of interventions are needed that can be created into effective solutions. Trade-offs between the policy instruments and options needs to be assessed to strengthen existing systems and institutions. There is a dire need to give further impetus to systems approach and integrated policies in decision-making processes. Hence political will and ownership at the highest levels promoting such systems based approaches in agriculture is extremely crucial. Along with social, economic, and institutional measures, political will is important to promote cross-sectoral interactions. Along with policy innovations, awareness raising and capacity building are crucial.

Message 5: Sustainable intensification for adaptation in crop-based agriculture systems requires incentivizing of climate-resilient variety of seeds, bio-inputs, sustainable water use along with sustainable nutrient and pest management. Financial resources can be repurposed to address market failures. The present policy ecosystem subsidizes those technologies which leads to overexploitation of water and overuse of fertilizers, which is leading to degradation of the soil, depletion of the groundwater and negatively impacting ecosystems.

Message 6: South Asia has some of the lowest levels of regional collaboration in the entire world. Since climate change is also a transboundary issues, collaboration between various administrative set-ups is crucial. There is a need for a poly-centric and multi-level approach when it comes to climate change adaptation including regional cooperation.

Message 7: Towards ecosystem-based adaptation, the concept of special cropping zones could be considered. Here special cropping zones can be promoted based on agro-ecological and ecosystems-based approaches. Ecosystem-based adaptation and climate resilient approaches can benefit farmers in the long-run.

Narrative

Over 600 million farms worldwide rely heavily on crops as a source of food and income, and crop-based agriculture systems provide around 80% of the dietary energy. Given the effects of climate change and the scarcity of natural resources like water and land, climate adaptation techniques might focus on balancing the requirement for food security with maintaining the health of the ecosystem. By managing natural resources (such as land, water, soil nutrients, and genetic resources) and putting institutions and incentives in place to achieve climate-smart transitions, production systems can become more efficient, resilient, and adaptive overall. There is an urgent need to address issues with data information in a form and at scales that support adaptation decision-making, identify innovation to cater to local needs, develop policy instruments and measures involving capacity building and human resource development at all levels.

This thematic track's goal was to discuss approaches based on solutions to address issues related to climate adaptation in the agricultural sector. The opinions of specialists from the Global South were presented on the thematic track titled "Crop-based Agriculture Systems and Climate Adaptive Solutions". The eminent speakers included **Dr Purvi Mehta** (Deputy Director, Global Growth & Opportunity, Bill and Melinda Gates Foundation), **Mr Ananda Mallawatantri** (Advisor to the President, Environment, Climate Change and Green Finance, Government of Sri Lanka), **Dr Shahidur Rashid** (Director for South Asia, IFPRI), **Dr Kiran Kumar Sharma** (Senior Director, Sustainable Agriculture, TERI), **Mr Siddharth Chaturvedi** (Senior Program Officer, Agricultural Development, BMGF), and **Dr Manish Anand** (Senior Fellow, TERI).

In her opening remarks, **Dr Purvi Mehta, Deputy Director, Global Growth and Opportunity, Bill and Melinda Gates Foundation (BMGF)**, discussed the impact of climate change on nutrition security as well as agriculture and food security, noting that developing countries are most vulnerable because small farmers in these nations grow nutritious commodities. She stressed the fundamental focus on adaptation, as it requires much more investment. Because of the trans-boundary nature of the challenges being discussed, adaptation requires more attention, particularly from small holders for perspectives in developing countries. There is a need for multi-level approaches in terms of taking a global or, more specifically, a regional approach rather than only country level approaches. The bottom line is that South Asia has some of the lowest levels of regional collaboration in the entire world. Dr. Purvi reaffirmed the necessity of viewing all systems collectively from a holistic perspective. "There has been a lot of data and discussion on access to land, but what is required is to understand more about the suitability of land. To give context, a farmer owning 200 acres of land that is hit by drought and has poor productivity can be a poor farmer, whereas a farmer with one hectare of land and good climate resilience can perhaps produce much more," remarked Dr. Mehta. There is an asymmetry in data, and moreover, there is a lot of focus on the collection of data, but what is more important is the effective utilization of data along with the interoperability of data. A stack approach is required to bring in many levels of data for not just the diagnosis of the problem but also solutions because a considerable number of solutions, particularly in climate-related activity, also have to be locally sourced and locally driven. In order to utilize the data and make it relevant to both the productivity angle and the profitability angle of the farmers, we must adopt a really pragmatic approach.

Following the opening remarks by Dr Mehta, the panel discussion began with **Dr Kiran Kumar Sharma, Senior Director, Sustainable Agriculture, TERI**, as he recalled a recent workshop in Delhi and deliberated on the pressing need to address issues related to the governance of agriculture systems and stressed the crucial need to have a system approach to sustainable and resilient agricultural systems management as it can help by focusing on intervention areas that jointly improve water, food, and nutritional security and hence support farmers' livelihoods. The specific solution-based approach is needed to address climate adaptation challenges in the agricultural sector, even so in terms of governance. Due to the lack of observation stations, an inventory must be made by locating the gaps. There is also a need to examine policy gaps. In order to envision a strong management of water and natural resources, areas of the Internet of Things (IoT) and artificial intelligence can be explored. The potential for innovations emerging from start-up systems is likewise very high. Some of the key limiting factors linked to governance include poor management between ministerial institutions, a lack of coordination, convergence, and interaction between various actors. There is a significant need to focus on water budgeting, specifically in rain-fed agriculture, which comprises about 17% of the agricultural systems. We need a holistic approach, especially in terms of data collection and planning, that should be based on demand rather than resource allocation, and an inventory to collect data must be created by identifying the gaps in the available data. He further added to this by saying that in the case of river basins, the availability of data is only at the state level. In order for users to process and analyse this data, there is a need for standardization of some of these data into a common format for accuracy, quality assurance, and accurate aggregation and disaggregation. This is in addition to the traditional approaches based on ground-based monitoring networks, and modern data approaches such as IoTs and artificial intelligence, which would be critical for developing climate resilience and improving the utilization of water and natural resources. He also highlighted the innovations coming from the

start-up ecosystem, which is growing very fast. There is an imperative to strengthen the existing system by using sensor-based climate and water monitoring systems, and promoting start-ups on innovative low-cost technologies that help with sustainability can be one of the ways to mainstream research and action for the development of nature-based solutions for specific regions as well as developing site-based and scalable solutions and innovative approaches for agriculture. There is a need to envisage the nutrition aspect in agriculture, which can be attributed to biofortification, a mechanism through which nutrition components are brought into the breeding pipelines. The session continued to discuss crop diversification, where an example was put forward by Dr. Sharma that Punjab produces much rice, but the data suggests that probably less than five percent of that rice is consumed in Punjab, so they're just producing it for someone else, which puts a stress on the water resources.

Following Dr Sharma's address, the discussion steered towards understanding the challenges in Sri Lanka, shared by **Mr Ananda Mallawatantri, Advisor to the President, Environment, Climate Change, and Green Finance, Government of Sri Lanka**. Being one of the top ten most affected countries by climate change, Sri Lanka is adopting the strategies in the "Overarching Agriculture Policy," which is at the core of the EU "Green Deal," to increase the adoption of renewable energy, minimize pollution (air, water, soil, and ocean), and promote circularity, life-cycle analysis, green supply chains, clean production, science-based targets, and sustainable business practices. Due to the island's combination of forest and ocean, Sri Lanka has a complicated topography and landscape that necessitates systemic approaches. Green financing is enabled by Systematic Ecosystem Environment Accounting (SEEA) for Natural Capital Assessments and Accounting (NCAA).

The next panelist was **Dr Shahidur Rashid, Director for South Asia at IFPRI**. He commenced his discussion of the inevitable nature of climate change by stating that one need not be a climate scientist to understand or experience it. Dr Rashid underscored the need to adopt a systemic outlook, and in order to do this, we must consider the food system or ecosystem rather than just crop, livestock, or agricultural systems. Because these systems are interconnected, the objective is to shed light on what is currently available, what else can be done to improve climate or the carbon footprint in our food system, or to minimize their impact in the future, and how to finance them. He also emphasized the availability of data and its effective utilization, which calls for teasing out the insights from the data that don't mean anything. The global subsidy bill was 650 billion dollars last year, but it could be more than that because the way they estimated it was a very conservative estimate. If we can use those resources to address the so-called market failures, then it is very much justified to subsidize those technologies, such as irrigation, which incentivizes farmers to over exploit water or overuse fertilizer, which can lead to degradation of the soil that further leads to pollution and depletion of the groundwater. "Given that rice is the largest contributor to water depletion, and since 78 percent of the world's rice-growing area is in South Asia and South-East Asia, we have a greater responsibility to solve this systemically", explained Dr. Rashid.

The session thereafter steered towards understanding the administrative climate action in Sri Lanka as **Mr Siddharth Chaturvedi, Senior Program Officer, Agricultural Development, BMGF**, the moderator of the session pointed out the concept of climate prosperity in a country like Sri Lanka, which is so vulnerable to climate change. "It becomes important to bring the climate agenda into the erosion, pollution, and health agendas by connecting various sectors that bring climate prosperity," said Mr Chaturvedi. Realizing the significance of inter-ministerial collaboration for climate change issues as emphasized by Dr Ananda, Dr Kiran laid down a contrast between the administration systems in India and Sri Lanka and said that there exist different aspects of water—groundwater, green water, and blue water—and each one is looked after by a different ministry or a different department in India. There are complications in water budgeting between the state policies. Sometimes the federal government has certain policies, but they cannot be implemented at the state level because the state has a very different agenda altogether. He also said that there are many instances wherein there exists no cropping pattern alignment with natural resource availability in India. For example, in Punjab, which produces a lot of rice at the cost of water, and apparently Madhya Pradesh is also trying to produce rice, whereas that land was actually supposed to be good for pulses. So, there was a thought that a call for special cropping zones could be considered. Dr Sharma deliberated on why we cannot have something similar in agriculture, where you have special crop zones depending on what is available and what are the natural resources available in those regions, and where the government allocates a particular region for a specific type of economic activity. In the context of governance, Dr Rashid mentioned that execution of policies require commitment and if the commitment does not come from the top, things don't get done. He shared two experiences – one from Africa and another from Asia. When the Green Revolution began and CGIAR system started, Africa and Asia had almost an equal number of CG centers. CGIAR system did not see a green revolution in Africa, but it was seen in Asia. The fundamental reason for such different outcomes between Africa and Asia was the commitment that the governments of Asian countries made in those years during the late 60s or the 70s. The second example from Africa is about the challenges in inter-ministerial coordination during setting up of European Agricultural Transformation Agency where he was also involved. This challenge was very complex given the bureaucracy of it. He mentioned that

when they were doing diagnostic studies and thinking about where it can go, the Prime Minister took the responsibility to create this empowered organization and that's why the transformation took place due to that high level commitment. However, these are not new revolutionary concepts as the concept already existed, for example, South Korea did that and Taiwan also did that in the 50s. What matters is that 'high level' commitment. Further, he emphasized that in Bangladesh, digital technology was successfully promoted because of the Prime Minister's commitments for the slogan "Digital Bangladesh". Regarding their commitment, they had created a highly empowered unit called A2I that is, Access to Information, and as a result, the spread of technology in the country was remarkable despite all other challenges because of that commitment. So, if one takes climate change mitigation and adaptation agenda seriously, there must be commitment from the highest level.

The session further explored the amalgamation of private sector in agriculture. In regard to the path of technology innovation in lab to its marketing and scaling, Dr Sharma mentioned the importance of ecosystem of agribusiness start-up in different aspects of agriculture as the smallholder farmers cannot afford big technologies as well as there are last mile connectivity issues. So, he stressed on promoting the agribusiness incubators and their mentorship so that the start-ups can get knowledge about the way to translate their brilliant scientific ideas into practical solutions, which is a big challenge for the first-generation start-ups. So, one of the options he mentioned was to internalize this whole ecosystem in different institutions or government schemes to an extent. He felt happy that India has picked up a lot in its start-up ecosystem. Finally, Dr Sharma supported Sri Lanka's ecosystem accounting, and he mentioned that TERI also works in the same line for example, mycorrhiza. This is one of the adaptive solutions which is not new and has been picked up from nature itself. Another adaptive solution on which he focused are the nano fertilizers, which has the approval of the Government of India albeit based on a testing system. These solutions are less costly as these save energy as well as ecology, and thus, have much better management.

Next, the session discussed the ideas to reduce fertilizer subsidy and catalyse the change and reallocation of the budgets through policy instruments, where Dr Rashid mentioned the International Monetary Fund (IMF) report to address Dr Mehta's statement that climate change is everyone's business but nobody's responsibility, and Mr Chaturvedi's proposal to make climate change everyone's profitable business. The report emphasized generation of employment due to climate-smart investment and the number was staggered. These are model-based analysis and to go into implementation or make that happen that is a long way. So, similar to Sri Lanka, he suggested to look at those models that predict their billions of dollars' worth of business related to tackling climate change as an ideal solution, and then it becomes a real business proposition where the private sector can invest and gain from mitigating climate change. Furthermore, regarding the policy or programme instruments for cutting down the fertilizer subsidy and catalysing the change, Dr Rashid highlighted that subsidy had its role. Many of the policies such as, irrigation subsidies, stocking policies, food subsidies, fertilizer subsidies, etc., played a critical role in turning the picture of South Asian countries, especially India over the last 50 years, from high dependence on food aid country to the 5th largest funder of the CGIAR system globally. But, in policymaking, the important part is to understand when to get in and when to get out. The getting out part is very difficult because this is some kind of incentive that makes farmers or consumers used to of getting them, and in turn, that creates coalition and power, and as a result they cannot get out of it. This creates a vicious circle in which the aggregate level of the social welfare benefit of the people declines. So, the rationale for those policies has changed over time. As an example, he shared a few results of their recent studies on the importance of climate-smart technologies in Punjab and Rajasthan. They found that without adopting climate-smart technologies, Punjab can run out of groundwater in 40 years and Rajasthan can face severe food security crisis in 30 years. Now the question is, what are the alternatives? Should we gradually eliminate those incentives? How to get out of them? He highlighted that the solution is to make people move away from this incentivized system systematically and make the benefits noticeable effectively to people. Basically, we need to propose water-efficient farming so that farmers can reduce their cost and they can see the benefits themselves, while implementation and scaling up of new technologies are extremely difficult because of geopolitical and accountability issues. So, we need to create a platform of all the practitioners which can be done with the help of Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) or SARC as they have the power to organize multilevel ministerial meetings every year and practitioners, like IFPRI can contribute in it. In his address, he mentioned that the creation of such platforms was highly supported by BMGF and so he concluded his speech by thanking Dr Mehta. Finally, Mr Ananda supported Dr Rashid's viewpoint about creating the platform to scale up a new technology and for that, he emphasized on ecosystem accounting. He also mentioned that if everything goes well with the ecosystem accounting, then one could bring the health side of it and close the gap of the losses. Further, he added that those platforms can help in knowledge dissemination by spreading awareness and educating people about the loss and other impacts.

Following the panel discussion, the moderator opened up the session for a Q&A to the audience. The questions asked were about connecting farmers and technologies, mechanism of nano fertilizers that can produce more with less inputs, ultimate overall economic realization for farmers while adopting crop-specific climate-smart technologies that reduce

crop yield, direction in which our ecosystem is headed with such large-scale deficiency in soil and especially in the context of organic carbon, agricultural policies related to agroclimatic zone-specific crop production, and strategies for conserving pollinators from climate change. Few suggestions and comments were also received from the open discussion. One suggested that unless we have a connect with the end user to make it of his interest, we are going to have a big problem even though we incentivize or control the market or price mechanisms. It was highlighted that technologies are necessary but not sufficient. Climate change is complex, agriculture is complex, societies are complex, and intersections of all those become much more complex. So, no simple solution is possible, we need combinations of interventions that can make effective solutions. The other comment received was regarding the inclusion of women into the design of climate-smart technologies. Although a huge proportion of labour in Asian agriculture and food systems comes from women, none of the climate-smart technologies have been designed keeping the women in view. We don't have evidence to show whether they are able to access them or benefit from them. So, there is a huge data gap as well. Further, Dr Mehta stated that it is important to mainstream climate adaptation as well as make everything we do climate-sensitive rather than having a separate climate-only type approach in technology development or technology dissemination. Regarding the question on overall economic realization for farmers while adopting crop-specific climate-smart technologies that reduce crop yield, Dr Rashid mentioned the two components of optimum policy: one is the tangible benefit, and another is the intangible benefit. The tangible benefit is measurable in terms of money value. But the intangible benefit is non-measurable which is the responsibility of society to believe in the new climate-resilient crop that is going to improve the health of the next generation. This intangible part is missing in all the efforts. So, we must work together to address it in the future. Finally, Mr Ananda mentioned the potential to improve in the aspects of education and awareness creation so as to push in the policies as well as technologies. He also talked about the incorporation of precision into decision-making.

The session concluded with the closing remarks by **Dr Manish Anand, Senior Fellow, TERI**. He summarized the insights and key takeaways from the session. He said that we need to adopt in a real-time basis and at the farm level. One of the key findings is about the overall consensus of systems approach, and the systems approach has to be across sectors including agriculture, livestock, fisheries and their vulnerabilities and also across scales, that is, at local, regional, national as well as international or global levels. He mentioned that we need to understand these systems approach because an incremental approach is not going to be the way forward. So, we need an equitable transformative adaptation approach. Another key takeaway was ecosystem accounting and the role of governance in terms of the top level and how it can flow down at various levels. He further mentioned the science-technology-society interaction, which had happened during the Green Revolution. But, in the context of sustainability, adaptation, technology development and R&D, there is a greater need for societal interaction. Dr Anand further added the governance aspect including issues of innovation, capacity building, scaling up of various technologies as a way forward message. Another aspect that was highlighted in the discussion was finance. He summarized that technology and finance are the core which is highly skewed towards mitigation. Finally, he highlighted the relevance of policy research. As a way forward, he emphasized that we should look at various trade-offs between the policy instruments and tools which we have used, be it in terms of direct regulation, information or strengthening the network structures.

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“	<p>Sri Lanka is one of the top ten countries in the world to be affected and hit by climate change. Sri Lanka, as an island, is fairly complex as it encompasses complex interactions between land, forests, and oceans. We are very proud to have placed the subject of climate change at the office of the Prime Minister as we all require inter-ministerial interventions.</p> <p style="text-align: right;">Mr Ananda Mallawatantri <i>Advisor to the President, Environment Change and Green Finance, Government of Sri Lanka</i></p>
“	<p>Sustainability debates have impacts not only on food security but also on the nutritional aspects, both quantitatively and qualitatively. Along with mitigation, a focus on adaptation is going to be important. There is a lot of asymmetry in climate-related data and unavailability of solution-based data. A lot of data is focused on the access of land but we need to focus on the suitability of land as well.</p> <p style="text-align: right;">Dr Purvi Mehta <i>Deputy Director, Global Growth & Opportunity, BMGF</i></p>
“	<p>You don't have to be a climate scientist to feel climate change. During Ukraine-Russia war, India had a wheat stock that it had sought to export as a gesture of assistance. However, in March 2022, we had faced the hottest year due to which India had to revise its forecast and was bound to ban the export of wheat. If we want to address climate change as a serious concern, it is required to put the commitments at the highest level (of the government). To quote examples of Africa and Asia, Asia was able to have Green Revolution whereas Africa didn't despite having the same population because Asia was committed to it.</p> <p style="text-align: right;">Dr Shahidur Rashid <i>Director for South Asia, IFPRI</i></p>
“	<p>There is a need to increase efficiency in water management as well as a shift in focus on nature-based solutions. There is a need to explore on the Internet of Things (IoT) and artificial intelligence for the maintenance of water and natural resources. We need to focus on water budgeting, specifically due the rain-fed agriculture which comprises about 17% of the agriculture. Inventory must be created by identifying the gaps in the data. We are already facing 5-6°C higher temperature at this time than the usual average temperature. We are expecting 35-45% reduction of crop productivity this year.</p> <p style="text-align: right;">Dr Kiran Kumar Sharma <i>Senior Director, Sustainable Agriculture, TERI</i></p>
“	<p>We need to adapt to real-time basis on farm level. There has been an overall consensus that we need a system approach and that system approach has to be across sectors including agriculture, livestock, fisheries etc., and across scales (local, regional, national and global). We also need a transformative adaptive approach and since we are talking on the Global South context, the issue of embedding it into just transition framework becomes important.</p> <p style="text-align: right;">Dr Manish Anand <i>Senior Fellow, TERI</i></p>