# The Economics of Ecosystems and Biodiversity (TEEB) for Agriculture and Food India Project
# National Symposium Proceedings

November 2023, New Delhi

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# Proceedings of the TEEBAgriFood India - National Symposium

## 16-17 November 2023, New Delhi

The UN Environment Programme (UNEP) global project titled "Economics of Ecosystems and Biodiversity: Promoting a Sustainable Agriculture and Food Sector", funded through the European Union Partnership Instrument (EUPI) was launched in 2019 and implemented in 7 countries, namely, Brazil, China, India, Indonesia, Mexico, Thailand and Malaysia. In line with the aim of the TEEB Initiative, the project draws attention to the invisibility of nature economic choices across the domains of international, national, and local policy-making, public administration, and business. TEEB sees this invisibility as a key driver of the ongoing depletion of ecosystems and biodiversity.

The EUPI TEEBAgriFood project in India started in 2019 and draws to an end in December 2023. The TEEBAgriFood framework application in India has assessed organic farming and agroforestry interventions in the Ganga basin region of India, i.e., the States of Uttar Pradesh and Uttarakhand, and the Northeast Region of India, particularly the State of Assam. The project has been guided a Project Steering Committee, led by the Ministry of Agriculture and Farmers Welfare (MoAFW) and the Ministry of Environment, Forest and Climate Change (MoEFCC) and implemented in partnership with the institutions of the Indian Council of Agricultural Research (ICAR), i.e. Indian Institute of Farming Systems Research (IIFSR), Central Agroforestry Research Institute (CAFRI) and the GB Pant University of Agriculture and Technology (GBPUAT) in the States of Uttar Pradesh, Assam and Uttarakhand respectively. The project also worked with business federations and agri-businesses whose actions have a major impact on biodiversity and ecosystem services.

At the culmination of the project, a national workshop was organized on 16 and 17 November 2023 at the Dr Ambedkar International Centre in New Delhi, India to:

- Share the findings and achievements of the TEEBAgriFood research projects in India
- Engage with fellow practitioners and deliberate on the range of True Cost Accounting studies in the agriculture and food sector in India
- Discuss mainstreaming opportunities for integrating True Cost Accounting studies with key national and sub-national stakeholders.
- Reflect on how TEEBAgriFood assessments among other True Cost Accounting studies can be strengthened and act as a catalyst for food systems transformation in the Indian context.

The workshop included representatives from the Government of India, State Governments, UN officials, representatives of bilateral organizations, experts, NGOs, businesses among others. This report provides a detailed account of the proceedings of the workshop.

## High-Level Inaugural Session

**Mr Atul Bagai, Country Head – India, UNEP** in his welcome address, acknowledged the diverse expertise represented at the workshop. He recognized that the participation of senior government representatives from various ministries signifies the importance of discussions on food systems transformation in the national context and brought forward the need to translate scientific assessments into actionable policies. Mr Bagai underscored UNEP's pivotal role in advancing scientific assessments as the foundation for addressing environmental issues, citing the TEEBAgriFood project as a tangible example. He expressed

gratitude for the on-the-ground research conducted by implementing partners, including ICAR-IIFSR, ICAR-CAFRI and GBPUAT. He hoped that the workshop would serve as an important platform to discuss on-ground implementation of results and suggested furthering discussions on sustainable agriculture by linking with other important initiatives on food systems transformation in the country.

**Dr Salman Hussain, TEEB Coordinator and Head a.i., The Economics of Nature Unit, UNEP** presented an overview of the TEEBAgriFood Initiative and outlined the role that TEEB assessments play in shaping economic decision-making on a global, national, and local scale. He also announced that despite the conclusion of the EU-funded project in December 2023, there is positive news as the IKEA Foundation has committed to an additional four years of funding follow-up, ensuring the continuity of the work in India. The following points were put forward in his remarks:

***A case for applying the TEEB and TEEBAgriFood frameworks for decision-making***

- In the process of economic decision-making, a pro-nature option, though available, is often neglected, either because it is not considered or might not appear financially and economically viable.
- Pro-nature options such as organic farming and agroforestry can appear suboptimal because these are often devoid of the considerations of externalities that apply; neglecting these in decision-making often leads to making erroneous choices.
- The TEEB Initiative which has been ongoing since 2008 is making a case that nature does have a seat at the table when economics are discussed. It is to correct our assumptions that nature's ability to provide ecosystem services remains constant; in reality, this ability can change over time.
- The aim of applying the TEEBAgriFood framework is to Fix Food Metrics – it does not only focus on yield per hectare but also takes into account the externalities and impacts that occur across the entire value chain
- TEEBAgriFood applications globally are indicating that even after discounting social and environmental benefits of pro-nature farming choices, it does make financial and economic sense to take forward pro-nature agricultural practices.
- A vast majority of agricultural research that is carried out globally and in India has focused on a specific subset of the total picture. For instance, breeding and breeding technologies, machinery and equipment, farm practices, while reasonable and sensible aspects to further scientific research on, the focus of TEEBAgriFood is on the invisible flows of agricultural production.
- Industrial agriculture systems have significantly contributed to the degradation of natural capital, resulting in a reduction of available ecosystem services. This in turn poses challenges for the productivity of agriculture. As such towards providing a comprehensive perspective accounting for impacts, the TEEBAgriFood framework examines the social and environmental dimensions including how health is influenced by the management of agricultural systems.
- The TEEBAgriFood Initiative offers a framework to look at the entire value chain. From an economic standpoint, it is illogical to invest effort in enhancing one segment of the value chain only to witness degradation elsewhere along the same value chain.
- Through modeling and valuation, it is evident that embracing sustainable practices makes sound financial sense. While there might be a temporary decrease in yields, it is crucial to respond promptly to the challenges posed by climate change. Unlike before, we no longer need to

emphasize that these changes are beneficial for us in the distant future; instead, we can assert that they are in our best interest right now.

***Importance of engagement with the TEEB process (Global and national decisions and its linkages to True Cost Accounting)***

- An outcome of the **UN Food Systems Summit** is the establishment of the **True Value Coalition** as an active workstream. This coalition is dedicating substantial efforts to integrate TEEB and other True Cost Accounting (TCA) methods in the evaluation of costs and benefits associated with policies, programmes, and business interventions.
- **G20** policy papers have been developed by the T20 grouping on True Cost Accounting and highlights the importance placed on TCA within the G20.
- The recently released **State of Food and Agriculture (SOFA) Report** for 2023 by the FAO focuses on True Cost Accounting (TCA); this thematic focus is expected to continue into the 2024 edition. This marks the first instance in the 70-year history of the SOFA report where the same topic will be featured consecutively. There is a prospect for a case study from India to be incorporated into the SOFA Report for 2024.
- The attainment of Goal B and several targets within the **Kunming-Montreal Global Biodiversity Framework** is intrinsically connected to utilization of True Cost Accounting in policy and decision-making.
- Several highlights from other countries were shared:
    - Statement made by the Minister of Ecology and Environment of China and President of Conference on Biological Diversity (CBD) COP15 at CBD COP15 – "China is willing to join hands with all parties to actively apply the TEEB approach and carry out TEEB national actions, to work together to reverse the global trend of biodiversity loss and build a community of life on earth and a beautiful home where people and nature live in harmony."
    - TEEBAgriFood Guidelines was directly used towards the issuance of a Presidential Decree on urban and peri-urban agriculture (UPA) in Brazil
- India holds significant importance for the TEEB Initiative along with other countries due to its potential to utilize metrics and modeling to facilitate policy change.

**Mr Christopher Garroway, Senior Economist, UN Resident Coordinator's Office - India** highlighted that Food Systems Transformation is a part of six main transitions that the United Nations is promoting as a part of the SDG Acceleration Agenda, along with energy, digital infrastructure, education, social protection, and solutions on the triple planetary crisis, of climate change, biodiversity loss and pollution. He elaborated that discussions on transitions fundamentally involve discussing investment pathways to expedite progress, as TEEB aligns precisely with this advocacy, providing evidence to facilitate these transitions. His remarks included the following points:

- The progress towards the Sustainable Development Goals (SDGs) is significantly off track, with merely 12% of the targets on course, and a concerning one-third actually regressing. The global food crisis stands at the leading edge of this backslide, a trend that has become more evident since the disruptive impact of the COVID-19 crisis, highlighting the severity of the issue.
- In 2019, the World Food Programme (WFP) reported 135 million people in 55 countries experiencing acute food insecurity according to the WFP Operational Response Plan. However, as

of November 2023, the number has more than doubled to 333 million people across some 77 countries. This significant increase is primarily attributed to factors such as conflict, climate-related issues, and economic slowdown.

- The number of chronically hungry people has escalated from less than 600 million in 2017 to surpassing 700 million in 2022. This situation necessitates a humanitarian response from the international community.
- We find ourselves in a challenging dilemma - while there's an immediate urgency to address the issue, it's also crucial to consider the long-term perspective and invest in sustainable solutions to change the course of action.
- Accelerating the SDG achievement is an issue that India raised to the forefront with its G20 Presidency, focusing on transitions that have large multiplier effects across a wide range of SDGs.
- India has a rich history of applying scientific advancements to shape policy, with the ICAR system serving as a notable example, particularly during the Green Revolution.
- There is a widespread consensus that there is a pressing need for a new green revolution that incorporates environmental considerations.
- The dynamics of how this process moves through the market landscape, involving private sector participation, and transforms into a business case that positively impacts the livelihoods of farmers is a key area of interest and consideration.

**Dr Michael Bucki, Counsellor, EU Delegation to India** drew attention to the European Union's policies to support food systems transformation, speaking of the headline Farm to Fork Strategy and supporting policies. Additionally, he highlighted flanking policies on air, water, and soil and the strong commitment of the EU with member states on the Global Gateway Strategy to support partner countries such as India to accelerate this transition. He highlighted that from June 2023, the European Union (EU) has aligned its communication on food systems in accordance with the UN agenda on Food Systems. Additionally, concerted efforts have been made to align policies with the Global Biodiversity Framework. In his remarks, Dr Bucki provided insight on:

- The EU code of conduct and legal framework to incorporate labelling and due diligence for the private sector for the responsible corporates, which includes details of food contact material, animal welfare, sustainable use of sanitary and phytosanitary products, nature restoration, greening of the agriculture sector, deforestation regulation as well as mitigation in the AFOLU sector.
- Complexity and the extensiveness of the policy suite that is in place across several of the EU member states that have different conditions, similar to the Indian states which have different conditions. Efforts are being made to harmonize efforts to be consistent with each other.
- Achieving objectives comes at a cost. Specifically, for biodiversity alone, the European Union allocates an annual budget of EU 20 billion, equivalent to approximately Rs. 2 lakh crores.
- The application of the TEEB framework serves to address crucial overarching questions for governments:
    - What is the cost-benefit of a transition and whether the cost of a transition makes sense?
    - How much time do we have before inaction becomes catastrophic for food security and for geopolitical stability of the world?

- While a transition is absolutely necessary, it does not make it easy. There is much work required to increase transparency of all actors in the food chain including farmers, the processors, the retailers and the consumers in collaborative efforts in this transition.
- Establishing fair and transparent benefit-sharing arrangements is imperative. This involves recognizing that not all benefits, whether tangible and marketable or intangible like those related to health and nutrition, can be easily translated into financial terms. Creating incentives for certain actors to embrace changes in their practices may hinge on acknowledging and fairly addressing these diverse forms of benefits.
- Highlighted that the TEEB framework has been utilized by the EU and commended India's application of TEEBAgriFood assessments in Uttar Pradesh, Uttarakhand, Assam and similar work in Andhra Pradesh on natural farming. Additionally it was brought forward that the EU have written to MoAFW and MoEFCC to build on the TEEB experience.
- Appreciated India's demonstration of commitment through the G20 in incorporating sustainable agriculture, including sustainable landscapes into the agenda and expressed EU delegation's support to India in its efforts to transition 20% of the total cultivated area towards nature-positive farming practices by 2030.

**Mr Bivash Ranjan, Additional Director General of Forest (Wildlife), MoEFCC** reflected on how ecological considerations are the foundation for economic prosperity of rural India, however there is a need to take into consideration the availability of land for expanding forest and tree cover, particularly when 24 percent of the total geographical area of the country is already under forest and tree cover. Mr Ranjan presented the following statistics to further discuss opportunities for scaling agroforestry in the Indian context:

- A considerable expanse of 520,000 sq.km is designated as reserve forests in India, emphasizing the preservation of natural resources in the country. Additionally, around 300,000 sq. km constitutes the area of trees outside forests which plays a significant role in the rural economy.
- Around 71% of the growing stock of timber and non-timber forest produce is situated within forest areas, with the remaining 29% located outside forests. However, this 29% of trees outside forests supports a substantial 81% of timber production for the Indian markets, indicating a highly efficient use of resources. In contrast, only 3% of timber is extracted from the forest areas themselves. This signifies that while forests cover 24% of the area, they contribute only 3%, and the remaining 16% is imported from other parts of the world.
- Trees outside forests situated in agricultural areas, play a crucial role in the economic well-being of farmers. Notably, they serve as a resilient economic source for farmers as their growth is less susceptible to climatic variations as compared to other agricultural crops.
- There exists a substantial timber supply and demand gap in the country, leading to an annual import of timber amounting to approximately Rs. 50,000 Crores. There is potential to address this gap through the expansion of area under agroforestry.
- Trends in timber consumption patterns observed indicate that plywood and panels industry constitute almost 58%, construction material 15%, furniture 13%, and paper and pulp 12%. Despite a demand of 97 million cubic meters in India, the current production falls significantly short of meeting this demand. Enhancing productivity in the timber sector holds the potential to tap into a substantial market demand and meeting international commitments.

- The Indian government has undertaken various initiatives to boost timber production. The Sub-Mission on Agroforestry (SMAF) under the Ministry of Agriculture and Farmers Welfare (MoAFW) is actively promoting the adoption of agroforestry practices. Additionally, the Ministry of Environment, Forest and Climate Change (MoEFCC) has implemented policy reforms based on research and pilot studies. The introduction of the One Nation One Transit Permit System aims to facilitate the smooth transit of timber from one state to another. Moreover, certain states have relaxed felling regulations on specific tree species that offer increased economic revenue and benefits for farmers.
- Silviculture practices of commercially important species have been shared with State governments for increasing the availability of Quality Planting Material.
- To further promote the adoption of agroforestry, the Indian Government in 2023 also unveiled an innovative and voluntary Green Credit programme designed to reward and incentivize individuals and entities for positive environmental contributions. This program is part of the broader 'LiFE' campaign (Lifestyle for Environment)
- We anticipate that India will achieve self-sufficiency in timber production in the upcoming decades. This will also contribute to accelerating India's progress in fulfilling its international commitments related to biodiversity and climate agreements.

**Mr F.A Kidwai, Additional Secretary (NRM), MoAFW** highlighted that UNEP TEEBAgriFood project has been engaging to evaluate and the projects have been able to demonstrate in a fairly brief period, the ecological benefits that can be accrued by scaling of nature-positive agriculture practices. He also indicated that there are several other projects being undertaken by the Government of India with ICAR and with other national and international partners to gain clarity on the steps required for a large-scale transformation towards sustainable agriculture. He emphasized that the real challenge however lies not in demonstrating the benefits of sustainable agriculture practices but in how scale can be achieved, not only across different agroecological zones but also throughout the entire value chain. The following points were put forward for consideration:

- MoAFW has undertaken projects in rainfed areas which are climatically challenged areas across the country towards understanding how sustainable agriculture practices can be scaled. The TEEBAgriFood initiative supplements such work and provides valuable insights. Additionally, the MoAFW has also been shaping policies, including the restructuring of the agroforestry mission (SMAF), policy intervention on natural farming which is ready for cabinet approval, on climate-resilient agriculture and on a voluntary carbon framework to compensate farmers for adopting good practices. Despite these initiatives, the current scale remains limited. The challenges lie in upscaling these efforts to a level where substantial environmental benefits are realized for the country and aligns with national and international targets.
- Executing initiatives on such a significant scale necessitates providing adequate compensation to practitioners, particularly during the transition period. If compensation is deemed necessary post-transition, there is a need to strategize on integrating it into mainstream practices, ensuring that farmers are motivated to adopt these measures. It is crucial to approach this matter with sincerity, particularly in determining how farmers can be adequately compensated in case losses are incurred.

- To achieve large-scale transformation, besides the Government of India, support from other institutions including the private sector is imperative. It is through collaborative efforts that we can aspire towards achieving scale, acknowledging that this is an ongoing process.
- Following the outcomes of the TEEB study, MoAFW has actively engaged not only with the three State governments where the TEEBAgriFood Initiative has been implemented in exploring opportunities for implementation, but has also been assessing the potential for adopting similar approaches in similar agroecologies.

**Prof. Ramesh Chand, Hon'ble Member, NITI Aayog,** in his keynote address, highlighted that the integration of economics and biodiversity necessitates a cohesive approach from the global level down to the local level. It calls for coordination across various production activities, governance structures, and ministries. Drawing upon key statistical indicators, Prof. Chand discussed the transitions in the agriculture sector in India and reflected on where India finds itself on transitioning towards sustainable agriculture. The points put forward by Prof. Chand include:

- Ecological and biodiversity concerns are concerns over global common goods that need collaboration among those who use or are affected by the use of these resources, including producers and consumers. In the context of global common goods, it is crucial to adopt a perspective of thinking globally but acting locally.
- India has undergone two significant transitions in the agriculture sector over the last 40-50 years: first, the shift from scarcity to self-sufficiency during the Green Revolution, and second, the transition from self-sufficiency to surplus. Presently, India finds itself at a crossroads, demanding careful consideration on how the next transition should unfold. In the absence of clear direction, the country is following the familiar path until a more defined course of action emerges.
- Whenever steps are taken to promote a transition, major concerns in the context of the agrifood sector must consider:
    - Food Security: A critical aspect which no country is willing to compromise on
    - Nutrition Security: Ensuring the availability of nutritious food is essential.
    - Income of Farmers which forms a substantial and influential constituency
    - Inclusivity of Farmers is vital to assess whether farmers are on board with proposed changes and whether their perspectives are considered.
    - Livelihoods: Approximately 46% of livelihoods in the India are linked to agriculture, highlighting the significance of considering the impact on livelihoods in any transition.
- The trend in agriculture output over the last decade in India has shown growth at a rate of 3.5% to 4%. However, the demand in India, including per capita income, is growing at a rate of 2.5%. As such, India currently has a surplus at the aggregate level which is expected to increase over the next decade. According to calculations, by 2030, India may need to export 20% of its production if the country does not transition towards good agricultural practices, a shift that currently seems unlikely.
- There exists significant untapped potential in many states where productivity levels are currently low. While states like Punjab and Haryana may experience a growth rate decline to 2%, other states such as Assam, Odisha, Jharkhand, and a large part of eastern India are showing growth rates as high as 6%.

- In the context of food security, India is now in a position where it can afford to consider trade-offs. If deemed worthwhile, the country can potentially tolerate a slower growth rate to prioritize the safeguarding of natural resources.
- Numerous sacrifices, including efficiency, biodiversity, food safety, and natural resources have been made to maintain the current production levels. Presently, there are allocations being directed toward initiatives such as natural farming, organic farming, and the restoration of traditional farming systems. These efforts represent attempts to reverse the sacrifices made and prevent further damage to nature, signaling a shift towards more sustainable agricultural practices.
- In the past, a challenge was the difficulty in quantifying the intangible elements of agriculture. Even when quantifiable, many elements were not assigned a value. However, tools have now been developed that allow for the quantification of non-marketed effects, contributing to a more comprehensive understanding of the impacts of agricultural practices. With quantifiable data in hand, policymakers can address market failures through the implementation of policies that provide incentives and disincentives. This enables the translation of these numbers into practical measures.
- Simultaneously, there is a need to generate demand signals by providing information to consumers through labeling, showcasing the environmental costs associated with agricultural practices. This can help consumers make more informed choices and encourage sustainable and nature-friendly consumption patterns.
- It can be observed that ecology is not entirely ignored by farmers in India. In various pockets, activities are taking place, whether driven by government initiatives, market dynamics, or individual conscientious decisions to integrate sustainable agriculture practices. Additionally, the relaxation of policies to promote agroforestry has led to a one-third reduction in India's imports of wood and wood products in the last 6 years.
- It's essential to recognize that while there are many discussions about land scarcity in India, there has been an increase in fallow land. Promoting ecological farming in such areas becomes a readily accessible opportunity to advance sustainable agriculture objectives being evaluated by the TEEBAgriFood Initiative.
- Given the diversity of India, documenting narratives related to agroecological farming and instances where biodiversity is actively promoted in agriculture, particularly in terms of economic values can provide invaluable insights to policymakers in the ministry. This information can aid in the development of appropriate incentives and disincentives to effectively scale up sustainable agriculture practices.
- There is a clear recognition that sustainable agriculture practices need to be scaled. With the availability of tools to quantitatively demonstrate the gains and losses from this transition, we now need to move forward in a manner that minimizes friction with economic indicators

## Summary of Key Messages: Inaugural Session

**On Food Systems Transformation and the role of True Cost Accounting/TEEBAgriFood Framework**

- **Food Systems Transformation is a part of six main transitions that the United Nations is promoting** as a part of the **SDG Acceleration Agenda**, along with energy, digital infrastructure, education, social protection, and solutions on the triple planetary crisis, of climate change, biodiversity loss and pollution.
- Discussions on **transitions fundamentally involve discussing investment pathways** to expedite progress. **TEEB aligns precisely with this advocacy**, providing evidence to facilitate these transitions.
- In the process of **economic decision-making, a pro-nature option, though available, is often neglected**, either because it is not considered or might not appear financially and economically viable.
- Pro-nature options such as organic farming and agroforestry can appear suboptimal because these are often devoid of the considerations of externalities that apply; neglecting these in decision-making often leads to making erroneous choices.
- **TEEBAgriFood applications globally demonstrate** that even after discounting social and environmental benefits of pro-nature farming choices, **it does make financial and economic sense to take forward pro-nature agricultural practices**.
- The TEEBAgriFood Initiative offers a framework to look at the entire value chain. From an economic standpoint, it is illogical to invest effort in enhancing one segment of the value chain only to witness degradation elsewhere along the same value chain.
- **The application of the TEEB framework serves to address crucial overarching questions** for governments:
    - **What is the cost-benefit of a transition** and whether the cost of a transition makes sense?
    - **How much time do we have before inaction becomes catastrophic** for food security and for geopolitical stability of the world?
- **Establishing fair and transparent benefit-sharing arrangements is imperative.** This involves recognizing that not all benefits, whether tangible and marketable or intangible like those related to health and nutrition, can be easily translated into financial terms. **Creating incentives for certain actors to embrace changes** in their practices may hinge on acknowledging and fairly addressing these diverse forms of benefits.
- The attainment of **Goal B and several targets** within the **Kunming-Montreal Global Biodiversity Framework** is **intrinsically connected to utilization of True Cost Accounting** in policy and decision-making.
- **India holds significant importance for the TEEB Initiative** along with other countries due to its potential to utilize metrics and modeling to facilitate policy change.

**True Cost Accounting and building on India's efforts on promoting sustainable agriculture**

- **India has undergone two significant transitions in the agriculture sector over the last 40-50 years**: first, the shift from scarcity to self-sufficiency during the Green Revolution, and second, the transition from self-sufficiency to surplus. Presently, **India finds itself at a crossroads, demanding careful consideration on how the next transition should unfold.**

- In the context of food security, **India is now in a position where it can afford to consider trade-offs.** If deemed worthwhile, the country can potentially tolerate a slower growth rate to prioritize the safeguarding of natural resources.
- Executing agro-ecological initiatives on a significant scale necessitates providing adequate compensation to practitioners, particularly during the transition period. If compensation is deemed necessary post-transition, there is a need to strategize on integrating it into mainstream practices, ensuring that farmers are motivated to adopt these measures. It is through **collaborative efforts that we can aspire towards achieving scale**, acknowledging that this is an ongoing process.
- **The Indian government has undertaken various initiatives to boost timber production.** The Sub-Mission on Agroforestry (SMAF) under the Ministry of Agriculture and Farmers Welfare (MoAFW) is actively promoting the adoption of agroforestry practices. Additionally, the Ministry of Environment, Forest and Climate Change (MoEFCC) has implemented policy reforms based on research and pilot studies.
- To further promote the adoption of agroforestry, the Indian Government in 2023 also unveiled an innovative and voluntary **Green Credit programme** designed to reward and incentivize individuals and entities for positive environmental contributions. This program is part of the broader **'LiFE' campaign (Lifestyle for Environment)**
- There is a **need to generate demand signals** by providing information to consumers through **labeling, showcasing the environmental costs associated with agricultural practices.**
- Given the diversity of India, **documenting narratives related to agroecological farming** and instances where biodiversity is actively promoted in agriculture, particularly in terms of economic values can provide invaluable insights to policymakers in the ministry. This information can aid in the development of appropriate incentives and disincentives to effectively scale up sustainable agriculture practices.
- UNEP TEEBAgriFood project has been able to demonstrate the benefits that can be accrued by scaling of nature-positive agriculture practices. **The real challenge in India and globally,** however lies not only in demonstrating the benefits of sustainable agriculture practices but in **how scale can be achieved**, not only across different agroecological zones but also throughout the entire value chain.

## TECHNICAL SESSIONS

The technical sessions were designed to present the key results from the application of the TEEBAgriFood framework under the project and discuss its implications for federal and state-level agriculture policies on sustainable agriculture. In addition to the results from the applications undertaken in Uttar Pradesh, Uttarakhand and Assam, and TEEBAgriFood for Business component implemented under the UNEP TEEBAgriFood project, other applications that bring to fore evidence to support decision-making in the agriculture sector was discussed.

As per the need identified by the Project Steering Committee, TEEBAgriFood applications in Uttar Pradesh, Uttarakhand and Assam assessed the socioeconomic and environmental impacts of government policy on organic farming and agroforestry through scenario modelling & valuation and includes:

- Paramparagat Krishi Vikas Yojana (PKVY)
- National Programme for Organic Production (NPOP) and third-party certification under APEDA
- Namami Gange – National Mission for Clean Ganga (NMCG)
- National Agroforestry Policy 2014
- Sub-mission on Agroforestry (SMAF) – now revamped and merged with Rashtriya Krishi Vikas Yojana (RKVY)
- Mission Organic Value Chain Development – Northeast Region (MOVCD-NER)
- National Bamboo Mission

The projects assessments carried out also aimed to inform national commitments and priorities concerning Doubling Farmer's Income (DFI), Crop Diversification, NDC on carbon sequestration through addition of forest and tree cover (UNFCCC), restoration of 26 million hectares of degraded land committed under UNCCD and the national implementation of the Kunming-Montreal Global Biodiversity Framework of the CBD.

**TEEBAgriFood India assessment details**

- **Study Area:** The districts selected for application in Uttar Pradesh were Aligarh, Bulandshahar, Hamirpur, Meerut, and Mirzapur. In Uttarakhand- Kosi and Kailash watersheds were selected which included districts of Almora, Nainital, and Udham Singh Nagar, covering both hilly and plain areas of the state. In Assam, a state-level study was conducted which would be drilled down to priority representative districts of the State.

- **Scenarios:** The scenarios were modelled for 2030, 2040, and 2050 under six scenarios i.e., business as usual (BAU), optimistic and pessimistic policy scenarios combined with RCP 4.5 and RCP 8.5 climate scenarios, taking 2020 as the base year. In Assam, scenarios were modelled for 2030, 2040, and 2050 under three scenarios i.e., business as usual (BAU), optimistic and pessimistic only at RCP 4.5.

| Business-as-Usual (BAU) Scenario | Pessimistic Scenario | Optimistic Scenario |
|---|---|---|
| • Builds on existing policies and initiatives (as of 2021) and SDGs implemented by the Uttarakhand Vision 2030<br>• **Organic Agriculture:** Organic farming increases to cover 38% of the state's total cultivated area (250,000 ha out of 647788 ha)<br>• **Agroforestry:** Area under agroforestry continues to be maintained at 12% of the cropped area in the study area | • Assumes the emergence of unforeseen factors that may possess a threat to current goals and hamper the modernization and green transformation of Uttarakhand<br>• **Organic Agriculture:** Organic farming continues to cover 4% of the total cultivated area (current status)<br>• **Agroforestry:** Area under agroforestry reduces to 6% of the cropped area in the study area due to increasing urbanization and land-use change | • Assumes progress in agricultural modernization by organic policies and initiatives implemented under UK Vision 2030<br>• **Organic Agriculture:** Organic farming increases to cover 75% of the total cultivated area based on the scaling potential in the study area<br>• **Agroforestry:** Area under agroforestry grows at 3.5% per annum as per growth trends for agroforestry in the study area |

*A: Scenarios for Plain Regions in Uttarakhand*

| Business-as-Usual (BAU) Scenario | Pessimistic Scenario | Optimistic Scenario |
|---|---|---|
| • Builds on existing policies and initiatives (as of 2021) and SDGs implemented by the Uttarakhand Vision 2030<br>• **Organic Agriculture:** Organic farming increases from the current 36% of total cultivated area to 65% of the total cultivated area as per the scaling potential<br>• **Agroforestry:** Area under agroforestry continues to be maintained at 12% of the cropped area in the study area | • Assumes the emergence of unforeseen factors that may possess a threat to current goals and hamper the modernization and green transformation of Uttarakhand<br>• **Organic Agriculture:** Organic farming continues to cover 36% of the total cultivated area due to low yields and weak post-harvest processing infrastructure<br>• **Agroforestry:** Area under agroforestry reduces to 6% of the cropped area in the study area due to growing urbanization and commercialization | • Assumes progress in agricultural modernization by organic policies and initiatives implemented under UK Vision 2030<br>• **Organic Agriculture:** Organic farming increases to cover 95% of the total cultivated area based on Uttarakhand's vision to establish the entire state as an organic state<br>• **Agroforestry:** Area under agroforestry grows at 3.5% per annum as per growth trends for agroforestry in the study area |

*B: Scenarios for Hill Regions in Uttarakhand*

| Business-as-Usual (BAU) Scenario | Pessimistic Scenario | Optimistic Scenario |
|---|---|---|
| • Builds on existing policies and initiatives (as of 2021) and Government of India's Vision Document for Organic Agriculture<br>• **Organic Agriculture:** Area under organic farming increases from the current 0.4% (67,442 ha) of the total cultivated area to 6.5% (1,069,848 ha) at a growth rate of 10% per year as per currently observed trends<br>• **Agroforestry:** Area under agroforestry remains at 3% of the geographical area of the state (as per trends on Tree Cover in the India State of Forest Reports) | • Assumes the emergence of unforeseen factors that may possess a threat to current goals and hamper the modernization and green transformation of Uttar Pradesh<br>• **Organic Agriculture:** Area under organic farming increases from 0.4% to 1% of the total cultivated area in the state due to low yields and weak policy support<br>• **Agroforestry:** Area under agroforestry decreases to 1% of the total cropped area due to increasing land use change, especially contributed by growing urbanization | • Assumes progress in agricultural modernization by organic policies and initiatives implemented under India's Vision Document for Organic Agriculture<br>• **Organic Agriculture:** Area under organic farming grows at 22% per year from the current 0.4% (67,442 ha) to 87% (14,476,019 ha) of the total cultivated area in the state<br>• **Agroforestry:** Area under agroforestry covers 12% percent of the geographical area of the state (contributing to the attainment of National Forest Policy targets of 33% Forest and Tree Cover) |

*C: Scenarios for Uttar Pradesh*

| Business as Usual (BAU) Scenario | Optimistic Scenario | Pessimistic Scenario |
|---|---|---|
| Based on existing policies & initiatives in Assam | Assuming booster to organic farming and agroforestry initiatives. | Assumes unforeseen circumstance, unsustainable adoption rates and other natural factors. |
| **Organic cultivated area:** Based on APEDA time series, maintains the annual growth rate (CAGR) of 11% to the recorded area during the preceding year.<br><br>**Agroforestry:** Based on present 0.7 million Ha (ICAR-CAFRI) & continues to remain 0.70 million Ha. | **Organic cultivated area:** Based on APEDA time series data, continues with annual growth rate (CAGR) of 13% to the recorded area during the preceding year.<br><br>**Agroforestry:** Proportionate increase to the potential of 0.8 m ha deriving from the riparian & restoral zone). For this, an additional annual increase by 0.53 percent of the present 0.7 million (i. e. 3710 Ha per year) until 2050 is projected. | **Organic cultivated area:** Based on APEDA time series data, continues with annual growth rate (CAGR) of 1% to the recorded area during the preceding year.<br><br>**Agroforestry:** Proportionate decline in area from the present 0.7 million Ha by 0.10 % (i. e. 700 Ha per year) until 2050. |

*D: Scenarios for Assam*

Alongside the development of scenarios for the study areas, elements of the four capitals that were prioritized through state-level consultations held during the course of the project for the three states included the following:

| Natural Capital | Produced Capital | Human Capital | Social Capital |
|---|---|---|---|
| **Uttar Pradesh** | **Uttar Pradesh** | **Uttar Pradesh** | **Uttar Pradesh** |
| • Carbon Sequestration<br>• Soil Loss and Sediment Export<br>• Water Provisioning (yield)<br>• Agrobiodiversity | • Crop Provisioning Services (Biomass & Economic Yield) | • Employment Generation<br>• Human health (LULC based malaria infestation) | • Sustainable Livelihood Security<br>• Women empowerment |
| **Uttarakhand** | **Uttarakhand** | **Uttarakhand** | **Uttarakhand** |
| • Carbon Sequestration<br>• Soil Loss & Sediment Export<br>• Water Provisioning (quantity and quality)<br>• Soil Health | • Crop Provisioning Services (Economic Yield)<br>• Timber Yield | • Education and skill development<br>• Human Health (nutrition, occupational hazards)<br>• Income | • Livelihood security<br>• Women Empowerment |
| **Assam** | **Assam** | **Assam** | **Assam** |
| • Carbon sequestration<br>• Soil Erosion | • Crop Provisioning Services (Economic yield – Rice & Tea)<br>• Bamboo (Economic Yield) | • Workforce (quality)<br>• Literacy | • Women Empowerment<br>• Farmer Producer Organizations/SHGs |

Figure 1: *Capital elements assessed under the TEEBAgriFood project in India*

## Technical Session: Uttar Pradesh

The session focused on presentation and discussion of the key findings of the TEEBAgriFood application in the State of Uttar Pradesh. The TEEBAgriFood application including the capitals assessed, scenarios developed, methodologies applied and key outcomes from the modelling and valuation studies in Uttar Pradesh was presented by **Dr Meraj Alam Ansari, Senior Scientist, ICAR-IIFSR** and Principal Investigator for the TEEBAgriFood application in Uttar Pradesh, followed by a panel discussion with key government stakeholders on opportunities for integration of results in agriculture policy and decision-making in Uttar Pradesh. The discussion was moderated by **Mr William Speller, Programme Management Officer, UNEP-TEEB**. The key outcomes of the TEEBAgriFood application in Uttar Pradesh presented by ICAR-IIFSR include:

- Expanding the area under organic farming at a rate of 15% per year, reaching 23% of the Net Cultivated Area by 2050, along with allocating 33% of the area to agroforestry by 2050 (in an optimistic scenario) demonstrates significant gains in natural, produced, social, and human capitals assessed.
- The values arrived at through the valuation studies can aid in the design and recommendation of Payment for Ecosystem Services (PES) for adoption of organic farming and agroforestry under changing climatic scenarios. It is recommended that PES incentives to boost the pace of adoption is done through the integration, linking and convergence of existing schemes such as Pradhan Mantri Kisan Samman Nidhi (PMKSN), Soil Health Card (SHC) Scheme, National Mission on Natural farming, Krishi Unnati Yojana (KUY) of MoAFW, National Rural Livelihood Mission (NRLM) of the Ministry of Rural Development (MoRD), National Agroforestry Policy of MoEFCC and the Rastriya Gokul Mission (RGM) of Ministry of Fisheries and Livestock (MoFL).
- The evaluation provides key insights on expanding area organic agriculture in the state/Indo-Gangetic Plains through the identification of niche areas and crops without affecting the overall production.
- Carbon sequestration potential modelling and valuation studies can effectively contribute towards the design of the voluntary carbon market policy framework and boost the pace of adoption of nature positive practices to meet the SDGs related to agriculture (SDG 1 to 3, 5, 12, 13, 14, 15).
- There is a need to significantly enhance the promotion of organic farming and agroforestry through local institutional mechanisms such as Panchayats and Women SHGs through the values arrived at under the TEEBAgriFood application. As such, there is a need to significantly undertake awareness generation activities on initiatives like PGS certification, E-market for Jaivik products and FPO membership.
- The Research Advisory Committee (RAC) for ICAR-IIFSR has recommended extending the application of the TEEBAgriFood framework to evaluate IFS, organic and natural farming at a Pan India level through AICRP-IFS/AINP-OF centres, basis the TEEBAgriFood application in Uttar Pradesh.
- The TEEBAgriFood Framework has been introduced in the B.Sc. (Hons.)-Natural farming syllabus by ICAR.

**Panel Discussion:**

**Mr Raj Shekhar, Secretary (Agriculture), Government of Uttar Pradesh** appreciated ICAR-IIFSR for undertaking the TEEBAgriFood assessments and indicated that the Directorate of Agriculture, Uttar Pradesh will use the findings from the TEEBAgriFood assessments for planning in the upcoming year. Further Mr Shekhar brought forward the following points:

- It is pertinent to note that Uttar Pradesh alone contributes to 25% of food production across various categories. Additionally, the state accounts for approximately 35% of the national livestock population.
- Over the past five years, there has been a noticeable imbalance in fertilizer usage trends in Uttar Pradesh. The Uttar Pradesh government appreciates the initiatives of the Government of India, particularly the PM-PRANAM scheme, which emphasizes the transition towards natural and organic farming. In line with the scheme, the UP government, for the current financial year aims to reduce fertilizer use by 2.4%. Project plans have been submitted to the MoAFW and strategies are being developed, with a focus on micro-level planning (MLP) at the district and block levels. Action taken reports are regularly submitted to monitor and curb the use of fertilizers, particularly urea, with the goal of reducing its usage on an annual basis, despite the increasing area under cultivation.
- Uttar Pradesh has made significant progress in the promotion of natural and organic farming over the last three years. As of the financial year 2021-2022, there were 61,180 hectares under organic farming. With the introduction of natural farming schemes in 2021-2022, the state has witnessed a gradual increase in area, reaching 85,000 hectares in 2022-2023. This positive trend has continued with a target of 1.25 lakh hectares under natural farming this financial year. While this constitutes less than 1% of the total cultivable area of 165 lakh hectares, the State will have effectively doubled the area under organic and natural farming in the last three years, reflecting substantial progress.
- The Uttar Pradesh state government is actively promoting the Gauhar Harit Krishi scheme. This initiative involves utilizing livestock waste to develop inputs for natural and organic farming practices in the region.
- The Chief Minister of Uttar Pradesh has outlined his vision to make Uttar Pradesh a 1 trillion dollar economy by 2027. Several policy changes have been made towards achieving this target, with agriculture development being a key component of the strategy. Emphasis has been placed on promoting Integrated Farming Systems, multi-cropping and encouraging millet cultivation.
- The UP Government has been strengthening digital infrastructure for agricultural planning, enabling the analysis of crop-wise and season-wise production and facilitating effective and informed planning.

**Mr N.K. Janoo, Chief Conservator of Forests (CCF), Meerut District** spoke of the initiatives to promote agroforestry in Uttar Pradesh and the challenges experienced in further boosting the pace of its adoption. He highlighted the following aspects related to agroforestry in UP:

- Uttar Pradesh has seen positive results with uptake of agroforestry practices observed particularly in Western UP region.
- Scaling agroforestry needs to be looked from the perspective of the farmer. Availability of landholding, access to quality planting material, technical know-how to implement successful

agroforestry practices, access to markets, and awareness on required permissions, especially in the case of tree crops are important factors. Although under the UP Tree Regulation Act, processes to obtain felling permits have been simplified, farmers still need to approach the government for necessary permissions.

- There is a preference for tree species with a short rotation period, such as poplar and eucalyptus, as it ensures cash flow. For instance, farmers have favoured sugarcane cultivation in Uttar Pradesh because it generates cash flow. Similarly, forestry crops that offer a quick income stream within a short span of 3-5 years needs to be promoted to boost the adoption of agroforestry practices.
- In the last two years, there have been efforts made to further incentivize agroforestry through carbon credits. Although carbon credits have been accessed through a tripartite arrangement with TERI and Verra, farmers are yet to receive their dues event after 1.5 years, amounting to $7 per cubic meter. Once these payments are received, it can serve as a good incentive to boost the pace of adoption of agroforestry.
- The ground situation reveals that there is much work to be done. The Forest Research Institute in Dehradun has recently introduced two species, namely *Dalbergia sissoo* (DS14) and *Melia dubia*. Despite extensive research, only two varieties have been made available. There is a need to offer farmers a larger selection, as indicated by interactions with farmers. The primary concern revolves around the economics of these options.
- The Uttar Pradesh government has taken proactive measures in the establishment of wood-based industries, particularly in Meerut and Saharanpur. Over 100 licenses for wood-based industries have been issued. The establishment of industries will facilitate value addition within the State, thereby boosting agroforestry activities.
- In the context of sustainable food systems, efficient water management is crucial. India is fortunate to have abundant forest areas, constituting 24% of its geographical area. Leveraging the monsoon precipitation through intensive water management in forest regions presents a significant opportunity. Direct injection wells, soil and moisture conservation, and scaling up initiatives for recharging underground aquifers are essential steps. For instance, in the Shivalik Forest Division, intensive efforts in this direction have yielded promising statistics.

**Mr Sanjay Kumar, Deputy Director General, Ministry of Statistics and Programme Implementation (MoSPI)** spoke about the engagement of MoSPI with UNEP and the TEEB process, citing that 12 pilot studies were undertaken to account for 3 ecosystem services in the 2010s which led to the recommendation of the Green Accounting System in India. He added that since 2018, MoSPI has been compiling environment accounts including extent accounts, condition accounts, services accounts and material flow accounts. He further highlighted the following developments on ecosystem service accounting in India:

- MoSPI is working to implement the System of Environmental-Economic Accounting (SEEA) framework taking into consideration the need to contextualize it at the national level. Additionally, MoSPI has also been encouraging States and Union Territories to develop their own sub-national accounts. Alongside this effort, MoSPI is actively monitoring progress toward several Sustainable Development Goals (SDGs), including SDG2 on zero hunger, SDG12 on responsible consumption and production, and SDGs 13, 14, and 15 related to climate action and biodiversity conservation.

- Of particular relevance, MoSPI has been engaged in discussions on indicators for SDG 2.4.1 – measurement of the "proportion of agriculture under productive and sustainable agriculture." Although a complex indicator, efforts are being made to develop indicators based on data on organic farming and Soil Health Cards. Further, FAO has proposed a proxy indicator at the global level which has been taken into consideration. The indicator also includes sub-indicators on productivity of agriculture including the GHG emissions intensity and the informal employment in agriculture
- Through the NCAVES project, MoSPI has had positive experience in engaging with UNEP and Indian counterparts on ecosystem services account. A close cooperation with the TEEB Initiative will be beneficial in improving systems on accounting for ecosystem services in India.

**Dr S. Bhaskar, Advisor, MoAFW** appreciated the efforts under the TEEBAgriFood initiative, making note of the scenarios developed and taking into account that five representative districts from UP were evaluated for assessing impacts of scaling organic farming and agroforestry. He highlighted that because Uttar Pradesh is a large state that contributes about 24% of food production as well as 33% livestock, the studies can be important in agricultural planning. Dr. Bhaskar added the following points:

- A thorough analysis is necessary prior to scaling implementation of recommendations to other regions in Uttar Pradesh and agro-ecologies. This involves evaluating various indices and models, considering coefficients used in the Indian context, and assessing their applicability on the ground. He highlighted that it becomes important to examine the data from each district, identify outliers, and ensure that the models take into account local variations.
- Currently, with limitations in data availability for every district, the existing model predictions under the TEEBAgriFood Initiative can be shared and utilized by the State Government. With the Secretary, Agriculture expressing interest in incorporating this data into their State Action Plans, the plans can be forwarded to the Centre for the allocation of funds under various schemes.
- While various sector schemes are in place, some introduced decades ago, to tackle biodiversity and ecosystem service concerns in the agriculture sector, achieving larger-scale adoption becomes challenging without providing incentives for practices like natural farming, organic farming, and agroforestry.
- The implementation of nature-positive agriculture initiatives at the national policy level involves coordination among various ministries. While the MoAFW plays a significant role, convergence of schemes under various ministries such as the Green Credits Programme under MoEFCC can significantly can further provide impetus to scaling adoption of such practices.
- Although the Sustainable Livelihood Security Index (SLSI) used for assessment of social and human capital has provided evidence based on economic efficiency, ecological security and social equity, the indicators used to evaluate economic efficiency should be made more robust.
- TEEB framework would be very important to assess the various models of agroforestry in boosting the pace of adoption of different models.

## Key Messages: Uttar Pradesh Technical Session

- The Chief Minister of Uttar Pradesh has outlined his **vision to make Uttar Pradesh a 1 trillion dollar economy by 2027**. Several policy changes have been made towards achieving this target, with **agriculture development being a key component of the strategy**. Emphasis has been placed on **promoting Integrated Farming Systems, multi-cropping and encouraging millet cultivation**.
- Uttar Pradesh has made significant progress in the promotion of natural and organic farming over the last three years. While area under sustainable farming practices represents less than 1% of the total cultivable area of 165 lakh hectares, the **State has effectively doubled the area under organic and natural farming from FY 2021-2022**, reflecting substantial progress.
- Uttar Pradesh has seen positive results with uptake of agroforestry practices observed particularly in Western UP region. **Scaling agroforestry needs to be looked from the perspective of the farmer.** Availability of landholding, access to quality planting material, technical know-how to implement successful agroforestry practices, access to markets, and awareness on required permissions.
- Ministry of Statistics and Programme Implementation (MoSPI) is working to implement the System of Environmental-Economic Accounting (SEEA) framework taking into consideration the need to contextualize it at the national level. **MoSPI has also been encouraging States and Union Territories to develop their own sub-national accounts.** Of particular relevance, MoSPI has been engaged in discussions on indicators for SDG 2.4.1 – measurement of the "proportion of agriculture under productive and sustainable agriculture."
- A **close cooperation with the TEEB Initiative will be beneficial in improving systems on accounting for ecosystem services** in India
- A **thorough analysis is necessary prior to scaling implementation of recommendations** to other regions in Uttar Pradesh and agro-ecologies. This involves **evaluating various indices and models, considering coefficients used in the Indian context**, and assessing their applicability on the ground.
- The implementation of nature-positive agriculture initiatives at the national policy level involves coordination among various ministries. **Convergence of schemes under various ministries can provide impetus** to scaling adoption of such practices.
- TEEB studies show that expanding the area under organic farming at a rate of 15% per year, reaching 23% of the Net Cultivated Area by 2050, along with allocating 33% of the area to agroforestry by 2050 (in an optimistic scenario) demonstrates **significant gains in natural, produced, social, and human capitals assessed.**
- **Payment of Ecosystem Services (PES) incentives to boost the pace of adoption** of agroecological measures can be carried out through the integration, linking and **convergence of existing schemes** and **informed by the TEEBAgriFood studies** conducted.
- **TEEB framework** would be very important to **assess the various models of agroforestry and organic farming in boosting the pace of adoption of different models.**

## Technical Session II: Uttarakhand

The session focused on presentation and discussion of the key findings of the TEEBAgriFood application in the State of Uttarakhand. The TEEBAgriFood application including the capitals assessed, scenarios developed, methodologies applied and key outcomes from the modelling and valuation studies in Uttarakhand was presented by **Dr J.P. Jaiswal, Director, Extension Education, GBPUAT** and Principal Investigator for the TEEBAgriFood application in Uttarakhand. This was followed by a panel discussion with key government stakeholders on opportunities for integration of results in agriculture policy and decision-making. The discussion was moderated by **Mr Reuben Gergan, Project Officer - TEEBAgriFood, UNEP**. The summary of the presentation of the application delivered by GBPUAT include:

- The TEEBAgriFood study in Uttarakhand seeks to conduct the valuation of ecosystem services, exploring scenarios for expanding organic farming and agroforestry across various capitals, including natural, human, social, and produced. The study offers technical insights, featuring on-field demonstration plot results as a distinctive element to support the scientific evaluation of the impacts associated with the growth of agroforestry and organic farming on ecosystem services.
- There is significant increase in the certified organic farming area in the State, rising from 26,496 acres in 2015 to 1.28 lakhs in 2019 and currently standing at 2.3 lakhs. 41% of the certified organic farming area falls under the Paramparagat Krishi Vikas Yojana (PKVY), 36% is covered by the Rashtriya Krishi Vikas Yojana (RKVY), and 23% is under the Namami Gange initiative. TEEBAgriFood Initiative in the state contributes scientific evidence support not only to these policies but also to the National Agroforestry Policy and the Uttarakhand Vision Document 2030, which aims to transform Uttarakhand into an organic state by 2030.
- The biophysical modelling and valuation studies was undertaken in the Kosi and Kailash watersheds of Uttarakhand. The Kosi watershed covers two districts (Almora and Nainital), includes 897 villages, encompassing significant areas like Jim Corbett National Park and Binsar Wildlife Sanctuary. Notably, the Kosi River originates from Dharpani Dhar, irrigating agricultural land primarily engaged in terrace farming. In contrast, the Kailash watershed spans three districts (Udham Singh Nagar, Champawat, and Nainital), with 92 villages and includes the Champawat and Haldwani forest divisions.
- Results of scenario modelling and valuation of natural capital include several components such as water yield, soil erosion, nutrient delivery ratio, and physical and chemical analyses of soil health. The presentation also covered the Net Present Value (NPV) for timber provisioning and crop provisioning services. Noteworthy findings from the presentation include:
    - Soil erosion: The average soil erosion rate in the Kosi watershed stands at 18.44 tons per hectare, valued at a cost of USD 8.2 million for soil erosion control services. Projections for 2050 indicate a potential escalation up to 29.83 tons/ha under the pessimistic RCP 4.5 scenario and 30.74 tons/ha under the pessimistic RCP 8.5 scenario, with the associated cost for soil erosion control services rising to USD 13.3 – 13.7 million. However, the implementation of agroforestry and organic farming interventions in the future exhibits a positive impact on soil erosion rates in the watershed. These measures are anticipated to lead to a reduction of 4.4% to 6.29% in the soil erosion rate under the optimistic policy scenario. Similar outcomes were observed in the Kailash watershed.
    - The soil erosion in the Kosi watershed is higher than that in the Kailash watershed, indicating that the hilly terrain of Uttarakhand experiences significant loss of fertile soil.

Results presented showed that the expansion of agroforestry can significantly reduce the loss of soil and nutrient export from the watersheds.

- Water yield: Changes in precipitation have a significant impact on water discharge, volume, and availability. Kosi watershed has a current water yield of 851.29 mm. Future projections suggest an increase in water yield, particularly during monsoon months, indicating a potential rise in precipitation under various RCP scenarios. This heightened rainfall could influence crop growth, soil erosion, and nutrient export indicating the need for soil and water conservation practices in the watershed. In the pessimistic scenarios for the Kosi watershed by 2030, a water yield increase is predicted, but little change from the current scenario is expected by 2050. Monthly water yield changes in the Kailash watershed indicate decreased stream flow from March to June but increased water yield during July and August, indicating more frequent and intense future rainfall events. Recognizing agroforestry's potential in mitigating these effects by retaining water and reducing surface runoff underscores the urgency to expand agroforestry initiatives in the state.
- Carbon sequestration: The results of scenario modelling and valuation indicate that in the optimistic scenario, a comparison between 2030 and Business-as-Usual (BAU) 2030 revealed an increase of 0.09 and 0.19 million tons in the carbon stock for the Kailash and Kosi watersheds, respectively. The social cost of carbon was estimated at USD 43.1 million and USD 95.6 million for the Kailash and Kosi watersheds, respectively, in 2030 under the optimistic scenario. Furthermore, there is a projected increase of up to 93% in the social cost of carbon by 2050 compared to BAU, underscoring the significance of expanding organic farming and agroforestry.
- Timber provisioning services: The outcomes pertaining to timber provisioning services illustrates that that the current NPV of agroforestry timber in 2020 (at 32,170 INR/ha/yr), covering an area of 230.12 ha in the Kosi watershed, is INR 100.4 lakh, while for Kailash watershed, covering an area of 159 ha is INR 70 lakh. With increase in area under agroforestry for Kosi and Kailash watersheds, the NPV is expected to rise to 333 lakh INR and 127 lakh INR respectively under the BAU scenario. Under the optimistic scenario driven by positive policy measures, the expansion of agroforestry area will result in a 105% increase in the NPV of timber for the Kosi watershed and a 26.7% increase for the Kailash watershed compared to the BAU scenario.
- Demonstration plot study: The demonstration plot study focused on Sunkiya village in the hilly terrain of Nainital district and Bidaura village in the plains of Udham Singh Nagar, aiming to showcase the benefits of organic farming without compromising crop yield. Trials encouraged farmers to produce their own organic inputs and use high-quality biofertilizers and biopesticides. Comparing pea and onion farming yields in both villages under conventional and organic practices, the demonstration field exhibited approximately 5-6% higher pea yield and 4-5% higher onion yield compared to conventional farming methods. Benefit-to-Cost ratio for pea (2.75 for demonstration and 2.2 for current farmer practices) and onion cultivation (2.84 for demonstration and 2.59 for farmer practices), despite the same market price fetched for organic produce, still resulted in a higher benefit to cost ratio due to zero chemical input costs.

- The soil health parameter studies from the demonstration plot reveal a significant increase in soil microbial activity and organic carbon levels in both Biduara and Sunkiya villages. A 5.04-fold rise in soil microbial activity and a 3.45-fold increase in Bidaura village was found after adoption of organic farming practices introduced by GBPUAT.
- Women Empowerment in Agriculture Index: Using the Abbreviated Women's Empowerment in Agriculture Index (AWEAI), the findings reveal variations in empowerment levels between hilly and plain regions. Specifically, the results indicate lower empowerment scores for both Sunkiya and Bidaura villages in Uttarakhand, with Sunkiya (a village in the hill region) scoring lower compared to Bidaura. The primary constraints identified in this evaluation were related to workload, group membership, and control over income utilization contributing to drudgery for women.
- TEEBAgriFood application in Uttarakhand indicates that while Farmer Producer Organizations (FPOs) provide support, strengthening market linkages is crucial for the effective functioning of the existing structure. Further, emphasizing agroforestry is essential, given the absence of specific growth targets for agroforestry in Uttarakhand's Vision 2030 document.

**Panel Discussion**

Building on Dr. Jaiswal's presentation, Mr. Gergan reiterated that unique component of TEEBAgriFood assessment in Uttarakhand is that, in coordination with diverse evaluations and prioritized components of natural, produced, social, and human capital identified by the state for future modeling, a demonstration plot was executed to further validate and offer proof for expansion of organic farming in Uttarakhand. The demonstration plot's benefit-cost ratio indicates a noteworthy improvement in organic farming, particularly in the enhanced nutritional health of the soil, with a threefold increase in microbial population.

It was highlighted that Uttarakhand has progressive policies, as outlined in the Uttarakhand Vision document, aiming to achieve 100% organic farming in the state by 2030. The comprehensive assessments conducted under the TEEBAgriFood study show enhancement in natural capital and women's empowerment and produced capital. Nevertheless, the challenges in the adoption of organic farming and agroforestry in the state would need more attention. Mr. Gergan directed a question to Dr. C. Biradar regarding the perceived challenges and obstacles to upscaling agroforestry in the state, and how TEEB assessments can contribute to the expansion of agroforestry initiatives.

**Dr Chandershekhar Biradar, Country Director - India, CIFOR-ICRAF** emphasized that agroforestry represents the future of food systems, noting that trees, often seen merely as a source of timber, play multifaceted roles. He further pointed out:

- There is a loss of green cover in India as farmers have let go of traditional farming practices, particularly evident in hilly regions such as Uttarakhand where land abandonment, ranging from 20-34%, is occurring in areas previously dedicated to conventional agriculture. The belt experiencing abandonment stretches from Nepal to the Terai region to the Shivalik belt. This trend has led to the migration of youth and the prevalence of monocropping systems. Mr. Biradar identified issues such as high input costs and labour demand as the key drivers for migration.

- Soil degradation is a major challenge resulting in soil compactness. Excessive fertilizer use further contributes to the loss of tree cover and biodiversity.
- Agroforestry is not merely the cultivation of trees but the integration of diversified cropping systems, including trees and livestock beyond traditional cattle. Integrating these components, can result in restoration of biodiversity, leading to increased soil organic carbon sequestration, particularly in the Greater Himalayan areas.
- Value chains need to be considered comprehensively; while farmers receive benefits based on what they sell in terms of direct income, additional benefits related to functional parameters, such as the impact of a single tree on soil erosion mitigation, increased soil sponge, enhanced soil microbial content, and carbon sequestration are often overlooked.
- There is a need to address challenges of limited farmer-market linkages and the important role of source sustainability in this regard. He observed a growing trend of increasing consciousness in communities of the origins of their food and the willingness to procure from distant locations. Creating demand for essential food items in urban areas and meeting that demand through sustainable practices is a need of the hour.
- Responding to a question regarding how TEEBAgriFood studies can help with the calculation of the Gross Environment Product (GEP) introduced by Uttarakhand, it was emphasized that forests need to be managed sustainably, considering both the reduction of costs and the importance of obtaining a fair price. The TEEBAgriFood study, he mentioned, contributes by focusing on accounting for biodiversity, water, and sequestration across the agriculture value chain and the importance of accounting for the cost of inaction, especially with regards to future scenarios can be insightful.

**Dr R.B. Sinha, Senior Policy Advisor, FAO** drawing from FAO's ongoing project in Pauri district, Uttarakhand indicated that a baseline survey conducted under the project revealed that the primary causes of outmigration shared by the community are livelihoods and the lack of health and education facilities. Explaining the issues pertaining to farming activities in the state, he added:

- In the hills, despite 80% of farming activities being carried out by females, the income is disproportionately benefiting males, creating further vulnerability for women. He stressed the importance of considering the value chain, aligning with the direct input-to-value chain approach advocated by TEEBAgriFood.
- The need to implement initiatives based on community interests and the sustainability of agrobiodiversity.
- Introduced a valuable tool called Rural Invest being utilized by FAO, aimed at developing investment plans. The approach involves collaborating with existing Farmer Producer Organizations (FPOs) and community organizations, reinforcing their capacity and injecting capital without creating new structures. The survey results from their work underscore a significant concern: despite women contributing more, the financial benefits are directed towards men creating added vulnerability of women. The need to comprehensively understand the entire value chain before promoting any specific commodity was brought forward.
- For initiatives to be successful the economics need to align, stressing that Uttarakhand has not adequately addressed this aspect. He noted the lack of awareness on the value of trees in forest areas, suggesting that setting up wood-based industries in the hills could create local demand and

incentivize tree planting. There is a need to clearly communicate the economic benefits for farmer livelihoods at the community level.

**Mr Vinay Kumar, Managing Director, Uttarakhand Organic Commodities Board (UOCB)**, responding to a question regarding achievability and barriers to Uttarakhand's target for a 100% organic state by 2030, shared his insights on the current situation of organic farming in the state and the actions taken to achieve the organic expansion goals of the state. The following points were brought forward:

- Currently, 40% of the land in Uttarakhand, totalling 2.23 lakh hectares, is organic farming certified. The target for 2025 is 50% which will be a combination of natural, organic, and chemical-free farming. Areas targeted under different sustainable agriculture practices are based on soil and farm conditions.
- With regards to the challenge of market linkages, Mr. Kumar outlined UOCB's efforts including the promotion of an organic Uttarakhand brand and the establishment of organic outlets led by farmers, addressing the issue of small and scattered land through the adaptation of cluster-based programs like PKVY. Mr. Vinay Kumar acknowledged these challenges but expressed optimism about improvements in the next 4-5 years.
- With regards to outmigration trends in the state of Uttarakhand, Mr. Vinay Kumar, Managing Director, Uttarakhand Organic Commodities Board (UOCB) added that efforts are being made to assist youth in acquiring entrepreneurial skills, accompanied by organic support prices to deter migration. He further added that the transition from conventional to organic farming doesn't result in decreased yields in the hill regions, however, in plain areas, there is a yield penalty in the initial 1-2 years for which compensating farmers for the yield penalty needs to be considered.
- Responding to a question from **Dr. N Ravishankar, Principal Scientist, ICAR-IIFSR** regarding lessons learnt from Sikkim's transition to organic farming and its applicability to Uttarakhand, particularly the co-benefit of crop diversification, Mr. Kumar highlighted that Uttarakhand has introduced an Organic Farming Act, closely resembling Sikkim's legislation, which prohibits both the use and sale of pesticides. He further added that there is a distinction in Uttarakhand's Act, where the ban applies only to the sale of chemicals, effective from April 2024. It was explained that farmers opt for organic farming primarily due to the premium price, and only third-party certification can ensure a 25% higher price, surpassing the certification price of the Participatory Guarantee System (PGS). He advocated for a phased approach, expressing the government's confidence in achieving a combination of organic, natural, and chemical-free farming in Uttarakhand by 2030.

**Mr Manoj Chandran, Additional Principal Chief Conservator of Forests (APCCF), Uttarakhand** provided insights on the benefits observed in soil and water retention when agroforestry is scaled up in watersheds, agroforestry in Uttarakhand and how TEEBAgriFood could contribute to addressing these challenges. He discussed the following points:

- Over 70% of Uttarakhand is designated as forest area, constituting a completely organic environment where villages harvest fodder. With regards to the remaining 30%, 13% is recorded as agricultural land, with half of it transformed into forests due to outmigration, particularly in hilly areas. Human-wildlife conflict has arisen as agricultural land diminishes increasing the livestock load on the remaining patches.

- It was pointed out that agroforestry which involves growing trees for industries, may not be entirely environmentally friendly, highlighting that villagers already have existing agroforestry systems in place with numerous forestry trees.
- He highlighted the "vann (forest) panchayat" institution in Uttarakhand, a local self-governance body managing forests in collaboration with the forest department. Despite this system, communities have not fully benefited from it in mainstream agriculture. The natural capital from the forest area remains underexplored. Products such as fodder, saplings, nurseries, fertilizers, pine seeds, pine pollen, cinnamon, bamboo seeds, and tuber crops from the forest contribute to the community's well-being. Certification by the organic board has extended to sugarcane, benefiting not only humans but also animals like elephants. Mr. Chandran emphasized the success of this approach as it reduces input costs, creating a win-win situation for organic farming and agroforestry initiatives.
- Emphasized the need to address the role of middlemen who currently act as commission agents, hindering the direct benefits to producers and consumers.
- Stressed the importance of the Biodiversity Act and the need for stronger enforcement of Access and Benefit Sharing Mechanism.
- Highlighted the economic aspects of ecosystem services, noting that while water is seemingly free, the infrastructure cost for its procurement, such as dam preparation, should be considered in the overall economics of cultivation.

## Key Messages: Uttarakhand Technical Session

- TEEBAgriFood Initiative in Uttarakhand contributes scientific evidence to support the State's vision for agriculture outlined in its Vision Document 2030 aimed at transforming Uttarakhand into an organic state by 2030.
- There is **significant increase in the certified organic farming area** in the State, rising from 26,496 acres in 2015 to 1.28 lakhs in 2019 and currently standing at 2.3 lakhs. 41% of the certified organic farming area falls under the Paramparagat Krishi Vikas Yojana (PKVY), 36% is covered by the Rashtriya Krishi Vikas Yojana (RKVY), and 23% is under the Namami Gange initiative.
- Currently, **40% of the land in Uttarakhand, totalling 2.23 lakh hectares, is organic farming certified**. The target for 2025 is 50% which will be a combination of natural, organic, and chemical-free farming. Areas targeted under different sustainable agriculture practices are based on soil and farm conditions.
- The average **soil erosion rate in the Kosi watershed** stands at 18.44 tons per hectare, valued at a **cost of USD 8.2 million** for soil erosion control services. Implementation of agroforestry and organic farming interventions in the future exhibits a positive impact on reducing soil erosion rates in the watershed. These **measures are anticipated to lead to a reduction of 4.4% to 6.29% in the soil erosion rate** under the optimistic policy scenario.
- Future projections suggest an increase in water yield, particularly during monsoon months, indicating a potential rise in precipitation under various RCP scenarios. This heightened rainfall could influence crop growth, soil erosion, and nutrient export indicating the **need for soil and water conservation practices** in the watershed.
- **A 5.04-fold rise in soil microbial activity** and a 3.45-fold increase in was found in demonstration plot sites at Sunkiya village (hills) and Biduara village (plains) after adoption of organic farming practices

- The social cost of carbon was estimated at USD 43.1 million and USD 95.6 million for the Kailash and Kosi watersheds, respectively, in 2030 under the optimistic scenario for organic farming and agroforestry expansion.
- Under the optimistic scenario driven by positive policy measures, the expansion of agroforestry area will result in a 105% increase in the NPV of timber for the Kosi watershed and a 26.7% increase for the Kailash watershed compared to the BAU scenarios.
- Future TEEBAgriFood studies can importantly take into consideration the **accounting for the cost of inaction**, especially with regards to future scenarios which can be insightful for the State.
- **Uttarakhand has introduced an Organic Farming Act**, closely resembling Sikkim's legislation on organic farming, which prohibits both the use and sale of pesticides. The distinction in Uttarakhand's Act, however is that the ban applies only to the sale of chemicals, effective from April 2024.
- FAO's work on agriculture in Uttarakhand underscores a significant concern: **despite women contributing more (80% of farming activities), the financial benefits are directed towards men** creating added vulnerability of women. There is a need to address this concern through policy measures.
- With regards to the Biodiversity Act, there is a need for **stronger enforcement of Access and Benefit Sharing (ABS) Mechanism** in Uttarakhand.

## Technical Session: Assam

The session focused on presentation and discussion of the key findings of the TEEBAgriFood application in the State of Assam. **Dr Ayyanadar Arunachalam, Director, Central Agroforestry Research Institute (CAFRI)** and **Dr Vijay Sharma, Project Manager – TEEBAgriFood Assam, CAFRI** presented the TEEBAgriFood application in Assam. The presentation included discussion on the capitals assessed, scenarios developed, methodologies applied and recommendations for a way forward. This was followed by a panel discussion with key government stakeholders on opportunities for integration of results in agriculture policy and decision-making. The discussion was moderated by **Dr Alka Bhargava, Senior Policy Advisor, TEEBAgriFood - UNEP**. The summary of the presentation of the application delivered by CAFRI include:

- Assam as a state has unique ecological features and challenges as it is prone to flowing for over 5-6 months annually. The total geographical area of Assam is approximately 78,438 square kilometers, with a predominantly rural landscape comprising around 60%, or nearly 98% of the total area.
- The scoping study was carried out during July 2023 by engaging various partners involving World Agroforestry, Tocklai Tea Research Institute, Doon University, South Asian Forum for Environment, Assam Agriculture University, Agriculture Technology Application Research Institute, State Line Departments, other institutions, and agencies.
- The study considered different national and state-level policies and programmes for upscaling organic farming and agroforestry such as MOVCD-NER, PKVY, NPOP, Watershed Development, DAY-NRLM, MGNREGA, etc. Besides, the establishment of Assam Agroforestry Development Board (AADB) as a nodal agency for agroforestry under Rashtriya Krishi Vikas Yojana (RKVY), State

Bamboo and Cane Policy, Tree Outside Forest (Sustainable Management) Rules (2022), Assam Wood Based Industries (Promotion and Development) Rules (2022) etc. provide a greater future scope for addressing some of the challenges in upscaling of agroforestry and organic farming.

- Given the limited timeframe for application of the TEEBAgriFood initiative, the team relied on secondary information available, however, the project also aims to go for primary-level assessments in the next phase, to validate the results.
- The following points were brought forward to discuss the study area profile for the state of Assam:
    - Regarding soil health in the state, it was observed that there is a deficiency of macro-nutrients in most parts of Assam. This deficiency can largely be attributed to the heavy use of chemicals in farming or the absence of fertilizers and organic methods to enrich the soil. However, the per-hectare fertilizer use in Assam is significantly lower compared to the national average.
    - Over the past seven to eight years (from 2014 to 2021), there has been a notable decrease in the net sown area, while the areas left fallow and those unavailable for cultivation have expanded. The state government is making continuous efforts to address these issues and cover these areas through various initiatives.
    - Land degradation poses a significant issue in Assam, primarily driven by water erosion and waterlogging. Waterlogging has been increasingly contributing to the occurrence of floods.
    - Assam's wasteland comprising of underutilized dense scrub, and open scrub has great potential to be utilized for adopting sustainable agricultural practices. Under-utilized degraded forest areas also offer a great scope to be used for upscaling of agroforestry.
    - 60% of the vulnerable districts of India are in Assam and are prone to extreme weather events such as floods, rain, drought, thunderstorms, wind, and dust storms resulting in loss of life and properties.
    - The area under traditional shifting cultivation in Assam accounts for 0.07% of the total geographical area. According to data from 2015-2016, the current *jhum* cultivation area accounts for only 52.60 square kilometers, a decrease from 160.15 square kilometers recorded in 2005-2006. During the same period, the abandoned *jhum* cultivation area has slightly increased from 79.41 square kilometers in 2005-2006 to 82.09 square kilometers in 2015-2016.
    - According to data from ICAR-CAFRI, the present agroforestry status in Assam indicates that it covers 0.09% of the total geographical area and encompasses 25% of the net cropped area. The state of human health in Assam is relatively poorer than the national average, hence enhancing the food basket becomes important.
    - Variation in spatial distribution of different land use classes determine the potential for expansion of organic farming and agroforestry under the prevailing climate challenges with the flood alone affecting nearly 23 out of 33 districts and 67 percent of the population in Assam.
- Human capital was thoroughly examined under the study, including population demographics and health, with a special focus on the significant number of Self-Help Groups (SHGs) registered under DAY-NRLM. It was noted that 3.3 lakh SHGs are registered under NRLM, and 0.7 million women farmers are covered under agroecological interventions.

- For projecting organic farming and agroforestry under three scenarios viz. BaU, Optimistic and Pessimistic, the time series data available with the Agricultural & Processed Food Products Export Development Authority (APEDA) was used. Further, the projections for the agroforestry area were carried out using remote sensing data by overlaying layers of flood occurrence, forest cover, trees outside the forest, and tree deficit landscape.
- The study estimates that around 10 percent of the total geographical area has been identified as potential agroforestry zones under riparian (High Flood Frequency but not permanent water bodies) and restoration (Tree Deficit Located within Wastelands/Highly Degraded Areas).
- The future climate scenario projection using RCP 4.5 indicated that the spatial distribution of annual precipitation is anticipated to increase by 2050. This will have more devastating effects on the western part (Lower Brahmaputra Valley Zone, and Barak Valley Zone with some parts of the Central Brahmaputra Valley Zone), which experiences maximum flood events and hence would require a policy-oriented and futuristic planning perspective, emphasizing the need to mitigate the impact of increasing climate change conditions.
- The mean maximum and mean minimum temperature will also observe some variations at the macro level with significant changes at the micro level at various locations. The trend assessments indicate that Assam can witness an increase in gross cropped area to organic cultivated area from a minimum of 0.97 percent under the pessimistic scenario to 4.94 percent under BaU to the highest 20 percent under the optimistic scenario by 2050. This can result in a corresponding level of increase in the organic farm production as well as soil organic carbon stock from 3 to 37 and 59 million Mg. Ha-1 under different scenarios.
- The area under agroforestry can increase from the current 0.70 million hectares to the projected 0.80 million hectares by 2050 with a significant positive impact on the soil carbon stock to 63 million tonnes by the year 2050 under optimistic scenario. Further analysis under RCP 4.5 reveals spatial variations with both positive and negative impacts on agroforestry at various locations.
- The need for assessment and documentation of the Baree system in the state was emphasized, given that roughly 80.82 million hectares of land are under Baree cultivation.
- Rice (major food crop), Tea (commercial crop), and Bamboo (traditional crop) were considered for projections under different scenarios with valuation under produced capital. The potential of crops like rice, tea, and bamboo to contribute to the existing initiatives is high as the trends coming out of the assessment are encouraging.
- Past trends in the growth of Self-Help Groups (SHGs) (under DAY-NRLM) and FPOs in the state have been considered for projecting future scenarios, which shows a significant scope under all scenarios at varied growth rates under social capital. Scenario planning for agriculture gross value added and agriculture workforce and literacy elements have been taken into consideration for assessing respective category of human capital.
- Policy mainstreaming opportunities included the development of the TEEBAgriFood Learning Landscape Action Plan, fostering targeted investments, enabling convergence, development of skills, development of market clusters in potential areas for upscaling of agroforestry and organic farming. It was explained that the TEEB Agrifood Learning Landscape initiative in Assam is a unique initiative and an important element of the project. Strategies outlined for landscape development underscore the importance of a partner-centric, people-centric, and eco-friendly approach towards promoting organic farming and agroforestry.

**Panel Discussion**

Building on the presentation by CAFRI, Dr. Bhargava provided an overview of initiatives supporting sustainable agriculture practices and emphasized that Assam has witnessed a surge in efforts to promote organic farming and agroforestry. The establishment of the Assam Agroforestry Development Board signifies the State's commitment to this field as establishment of such a dedicated board for agroforestry is unique for the country. Simultaneously, measures have been taken to simplify procedures, rules and regulations, for addressing issues faced by farmers in tree felling and transit. Rules governing these activities have been streamlined, and incentives have been introduced for wood-based industries, with a focus on encouraging captive plantations. In essence, Assam provides a fertile environment for both organic farming and agroforestry. She also informed about externally-aided projects, such as the Trees Outside Forests Initiative (TOFI) being implemented by MoEFCC and USAID are ongoing in the state.

**Mr Franklin Khobung, Joint Secretary (NRM), Ministry of Agriculture and Farmers' Welfare (MoAFW)** discussed the contribution of the TEEBAgriFood studies and its alignment with efforts on natural resource management in the agriculture sector. He further discussed the relevance of the studies to Assam and northeastern states and how these practices could be scaled up to other regions. The following points were brought forward by Mr. Khobung:

- Referring to the ministry's role in natural resource management and its support for crucial components of sustainable agriculture, Mr. Khobung discussed the alignment with the National Mission for Sustainable Agriculture. He emphasized the integration of these elements into the ministry's mandate and outlined the potential for scaling up these practices through government policies and programmatic interventions nationwide. He informed that the impact of such initiatives extends beyond the central government, influencing state policies and programmes as well and urged State governments to thoroughly examine the TEEBAgriFood reports as it holds immense potential for integration into the policies and programmes of the State government, particularly in the agricultural and forestry sectors.
- Since 2013, there has been a concerted effort to align all government schemes and programs with underlying sustainability principles. He stressed the realignment of schemes to incorporate sustainability elements which is crucial, and how economics play a pivotal role in shaping these policies.
- In regions like Northeast India, Uttarakhand, and other parts of the country, it is essential to communicate the natural resource benefits associated with sustainable farming systems to the local communities in simple explainable terms. This includes highlighting advantages such as water conservation or soil preservation or benefits to the overall environment, and other elements that are valued immensely by farming communities.
- With the new agroforestry scheme under RKVY, the focus has shifted to supplying quality planting material. Instead of providing incentives to farmers, the emphasis is on certified seedlings and nursery accreditations. Ensuring the quality of seedlings is considered the best incentive for farmers to engage in agroforestry. The certification of planting material has shown promising results.
- Drawing from experiences in heading the forest department on wood-based industries in Gujarat and accelerating the adoption of agroforestry, Mr Khobung emphasized that the liberalization of the sector was one of the key elements in promoting agroforestry or social forestry, and this

approach is applicable nationwide, whether in a state like Gujarat or Assam. He put forward the example from Gujarat for consideration:

  - Liberalization took place on two fronts in Gujarat to promote agroforestry and wood-based industries, i.e. cutting and transit. 87 species were liberalized in Gujarat. In Assam, a similar liberalization effort involved around 50-60 species. Interestingly, this has occurred in a state with 36% forest cover.
  - It was observed that the liberalization in Gujarat did not negatively impact forest production. On the contrary, people were motivated to grow more as they were no longer facing hurdles in obtaining permissions for cutting and transportation. In a short span, there was a noticeable increase in demand for seedlings, as informed by the Social Forestry Department.
  - Another significant aspect was the liberalization on the industry and demand side. The registration process was decentralized for wood-based industries, eliminating licenses, and allowing district-level officials to register and initiate industries. Over three years, more than 800 such industries emerged, accompanied by an increase in seedling demand and wood supply from farmers' trees. The positive response in terms of prices and demand within just a few years underscores the need to explore this further.

- Considering intangible environmental and social benefits alongside the demand for hard cash by farmers is crucial. TEEB's emphasis on accounting for natural capital and other capitals aligns with the larger perspective and global issues of climate change and biodiversity loss.

Setting the context for discussion on social and human capital assessments in Assam under the project, Dr. Bhargava emphasized that while the focus on natural capital in agriculture and forestry is still widely acknowledged, there is also a need to recognize the importance of human and social capital, which often goes unnoticed in impact analyses. She suggested that alongside policy changes and market linkages, integrating social and human capital perspectives can contribute to greater equity by enhancing farmer's income.

**Dr A. Arunachalam, Director, ICAR-CAFRI** discussed the efforts under the TEEBAgriFood project in Assam to integrate social and human capital elements. He reflected on the need for reconsidering and possibly revising the current policy definition of agroforestry. Dr. Arunachalam made the following points:

- The Ministry of Agriculture and Farmers Welfare has shown proactive engagement with agroforestry, unlike the progress seen in organic and natural farming across the country. Numerous educational programs, extensive research and development, and on-ground interventions are actively being carried out. Scientifically recommended, profitable, promising, and bankable agroforestry models, endorsed by the Central Agro-Forestry Research Institute and its network of partners through the All India Coordinated Research Project on Agroforestry are now playing a significant role.
- TEEB can help bring awareness to the diverse contributions of agroforestry, ranging from livelihood improvement to meeting industrial requirements and enhancing climate resilience. The ongoing mission for climate resilience emphasizes a need for a holistic approach where integrating societal and human capital into the evaluation process would be important.

- Given that the study shows the potential for expansion in Assam and other parts of the country, he stressed that there is a need for preparedness and immediate action is required meet the impending quantum of requirement of quality planting material.
- The ministry is focusing on translating policy into action, ensuring that economics align with ecology in agroforestry. This alignment is essential for conservation, benefiting both biodiversity and human well-being.

**Dr. S.K Sharma, Additional Director General (HRM), ICAR** given ICAR's decision to introduce the TEEBAgriFood framework into the B.Sc. Honors (Natural Farming) curriculum of ICAR discussed the benefit that awareness and education on valuation methodologies and true-cost accounting can bring to agricultural policy and programme design. Dr. Sharma brought forward the following points:

- Currently, given the global issue of changing climate and biodiversity loss, every country is aiming to take steps for decarbonizing and building resilience in agriculture, with a focus on mitigation and adaptation. In this regard, he placed importance on the need to percolate these concepts to small and marginal farmers, who constitute 86.2% of the farming population.
- Given the efforts of the Indian government on sustainable agriculture, ICAR has been taking steps to promote sustainability into agriculture practices. Discussing the three pillars required for upscaling organic farming and agroforestry - Productivity, Market, and Policy, he highlighted that it is important that there is an increase in the investment in key components ensuring upscaling, and in research and training.
- Efforts have been made by ICAR in formulating the BSc. Honors in Natural Farming programme, particularly designing the components and structure of the course. Introduction to scenario modelling and valuation methodologies including the TEEBAgriFood framework forms an important component of the new course initiated by ICAR. The programme will be rolled out in all four central universities in 2023, with plans to extend to more than 51 State universities from the next academic year. The process involved transforming extensive content from the global landscape to a local landscape into a comprehensive curriculum for natural farming to make it relevant for the local context.
- The success of the programme will be assessed considering the level of interest and engagement among the youth. Additionally, ICAR's involvement in the technical programmes aims to enhance the global reach of these initiatives, attracting students from both India and abroad. Dr. Sharma advocated for the importance of capacity building and handholding for mass upscaling of such practices.
- Increased research investment to enhance productivity of sustainable agriculture practices through the National Mission for Sustainable Agriculture and other initiatives is required.
- The focus should be to shift the mindset towards nature-positive agriculture practices, promoting a sustainable ecological livelihood. Data-driven scientific evidence generated by studies such as TEEBAgriFood studies can further strengthen policy and decision-making.

**Ms Deepika Saini**, **Vice President (Social Sector Practice), Ernst & Young** discussed the implementation of the Mission Organic Value Chain Development for North-East Region (MOVCD-NER), and its overall impact to date. She emphasized the synergies between conservation and development, citing on-the-ground examples as the most effective way to set future models. The following points were presented and discussed:

- MOVCD-NER envisages the transformation of 1.73 lakh hectares of land into organic farming in Northeastern States, including Sikkim that will benefit 189,000 farmers. The programme has engaged with various stakeholders, including farmer producer organizations, and women participants, and identified 11 crops for value chain studies across eight states. This also includes 40 entrepreneurial units involving 22 service providers.
- Over the last four years of programme implementation, the programme generated a demand of INR 150 Crore (USD 1.8 million) and has been able to support the export of 50 million tonnes of high-value produce.
- Despite challenges such as the impact of COVID-19, extensive online and physical training and assistance to farmers in identifying optimal harvest times and resources have been provided. Youth from remote areas earning significant revenue through the primary processing of ginger and turmeric is an example of success of the interventions.
- EY has also supported the government in developing a vision for organic farming in NER-2030, partnering with relevant ICAR agencies, for example, the Indian Institute of Sugarcane Research (IISR), Indian Institute of Horticulture Research (IIHR), Central Agriculture University (CAU) and conducted specific studies on agro-logistics, farm mechanization etc.
- MOVCD-NER has taken a holistic approach to organic value chain development and contributes to improvement in all four capitals outlined in the TEEBAgriFood framework:
    - Enhancement of human capital has occurred through skill development interventions - farmers are provided necessary skills to move up the value chain while youth have been included in business decision-making, strengthening linkages between rural and urban markets and linkages with the rest of the country.
    - Enrichment of natural capital through organic farming has reduced the use of chemical inputs, while promotion of practices such as multi-cropping, adopting micro-irrigation, rainwater harvesting and agroforestry has benefited soil health and also has the co-benefit of reducing soil erosion in the region.
    - The produced capital base has been enhanced through infrastructure development including value addition infrastructure, entrepreneurial assets and digital infrastructure.
    - Enhancement of social capital has occurred through the formation of organic Farmer Producer Organizations (FPOs) which ultimately aims to ensure community involvement and empowerment, innovation and adaption, policy advocacy, women empowerment, resilience, and sustainability through management of organic certification.

**Key Messages: Assam Technical Session**

- The study considered different national and state-level policies and programmes for upscaling organic farming and agroforestry such as MOVCD-NER, PKVY, NPOP, Watershed Development, DAY-NRLM, MGNREGA, etc.
- **Rashtriya Krishi Vikas Yojana (RKVY), State Bamboo and Cane Policy, Tree Outside Forest (Sustainable Management) Rules (2022), Assam Wood Based Industries (Promotion and Development) Rules (2022)** etc. provide a greater future scope for addressing some of the challenges in upscaling of agroforestry and organic farming.
- Over the last four years of **MOVCD-NER programme implementation**, the programme generated a **demand of INR 150 Crore (USD 1.8 million)** and has been able to support the **export of 50 million tonnes of high-value produce**.

- Over the past seven to eight years (from 2014 to 2021), there has been a **notable decrease in the net sown area**, while the areas left fallow and those unavailable for cultivation have expanded.
- Assam's wasteland comprising of **underutilized dense scrub, and open scrub** has great potential to be utilized for adopting sustainable agricultural practices. **Under-utilized degraded forest areas** also offer a **great scope to be used for upscaling of agroforestry**.
- The study estimates that around **10 percent of the total geographical area** has been identified as **potential agroforestry zones** under riparian (High Flood Frequency but not permanent water bodies) and restoration (Tree Deficit Located within Wastelands/Highly Degraded Areas).
- The trend assessments indicate that Assam can witness an increase in gross cropped area to organic cultivated area from a minimum of 0.97 percent under the pessimistic scenario to 4.94 percent under BaU to the highest 20 percent under the optimistic scenario by 2050. This can result in a corresponding level of **increase in the organic farm production as well as soil organic carbon stock from 3 to 37 and 59 million Mg/Ha** under different scenarios.
- **Area under agroforestry can increase** from the current 0.70 million hectares to the projected 0.80 million hectares by 2050 with a significant positive impact on the **soil carbon stock to 63 million tonnes by the year 2050 under optimistic scenario.**
- The impact of initiatives such as TEEBAgriFood extends beyond the central government, influencing state policies and programmes
- In regions like Northeast India, Uttarakhand, and other parts of the country, it is **essential to communicate the natural resource benefits** associated with sustainable farming systems to the local communities in simple explainable terms. This includes highlighting advantages such as water conservation or soil preservation or benefits to the overall environment.
- TEEB can help bring awareness to the diverse contributions of agroforestry, ranging from livelihood improvement to meeting industrial requirements and enhancing climate resilience. The **mission for climate resilient agriculture** emphasizes a need for a holistic approach where **integrating social and human capital into the evaluation process would be important**.
- Efforts have been made by ICAR in formulating the **BSc. Honors in Natural Farming programme**, particularly designing the components and structure of the course. Introduction to scenario modelling and valuation methodologies **including the TEEBAgriFood framework** forms an important component of the new course initiated by ICAR.

## Session: True Cost Accounting applications in the AgriFood sector in India

The session aimed to showcase the extensive applicability of True Cost Accounting (TCA) methods in the agriculture and food sector in India, demonstrating the important role that TCA can play in advancing conversations on food systems transformation. The range of TCA applications carried out in India were presented and opportunities for scaling up such work discussed through a panel discussion moderated by Mr William Speller, Programme Management Officer, UNEP-TEEB.

**Natural Farming through a wide-angle lens – Andhra Pradesh Community-managed Natural Farming**

**Mr Anupam Ravi, Senior Vice President, GIST Advisory** and **Mr Karan Peer, Manager, GIST Advisory** presented the TEEBAgriFood study on the Andhra Pradesh Community-managed Natural Farming (APCNF) practices. The study examines economic, social and health impacts of Andhra Pradesh Community-managed Natural Farming (APCNF) vs. three prevalent farming systems (low input montane forested

tribal, low input rain fed semi-arid, and high input Krishna-Godvari delta). Quantitative evidence across all the dimensions was produced through the study. The aim of the study was to provide holistic analysis of four capitals (natural, financial, social and human) to capture contemporary food system externalities (both positive and negative).

The assessment utilized primary studies including crop-cutting experiments (to evaluate yield) and a large household survey (2020-2022) across 3 districts of Andhra Pradesh where CNF is practiced. The study covered 12 villages and includes data collected from 562 farming households, representing about 10% of total households in villages across 3 agroecological zones. The average farm size sampled was small (1-2 Ha), indicating that farm size has not been an impediment in the transition to natural farming.

***Key insights on the impacts to agricultural productivity with regards to APCNF and Counterfactual Practices:***

- After the adoption of APCNF, yields for 10 crops (cereals, fiber, vegetables, and fruit) increased in all districts and systems on average by 11% from status quo ante, and farmer net income rose by 49%
- APCNF farms demonstrate 88% higher diversity (particularly in tribal and low-input regimes). Adoption of APCNF resulted in an average increased from 2.1 crops to 4 crops
- APCNF farms demonstrate 20% higher labour use. Whilst adding costs, this dimension could be viewed as an advantage at community and regional level, allowing for increased employment in rural landscapes
- APCNF farms demonstrate lower input use and input costs of production (i.e. pesticide, fertilizer, machinery, seeds etc.). The use of pesticides and fertilizers reduced by 56% and 73%
- Transitions to APCNF from all three agroecosystems (high-input chemical, low-input rainfed, and tribal) generated benefits, even though APCNF farmers began adoption from different cultural and agricultural departure points
- Returns on public investment to support transition APCNF are positive

***Key insights on the health dimension of APCNF***

- APCNF has lower on-farm health risks and human health impacts are compared to chemically-intensive farming. Reported loss of 121-days by APCNF farmers as compared to 189 person-days by chemical-intensive farmers.
- APCNF farmers incurred approx 26% lower average health costs as compared to chemically-intensive farmers in the same region.
- It is important to address the lack of proper information and awareness in following proper handling and disposal practices in order for farmers to mitigate instances of ill health as well as economic impacts of ill health due to exposure from agricultural inputs
- The household dietary diversity score (HDDS) shows that the average household diet of farmers surveyed has more macronutrient diversity as compared to an average Andhra Pradesh food plate, indicating that these farmers have access to a wider range of food crops
- APCNF farming households consume higher amounts of fruits and vegetables as compared to counterfactual households
- For APCNF households quality is the biggest driving factor (74%) followed by the nutritional content (10%) and price/value for money (9%) when deciding family diet

- There is a lack of correlation of household income growth with any increase in consumption of meat, eggs, and fish in diets pointing to a strong role of cultural habits (i.e. vegetarianism) in determining local diets in Andhra Pradesh

Furthermore the study also analytically quantified social capital using a comprehensive multi-dimensional index among CNF adopters and non-adopters at the farmer household level. The estimates provide a baseline for monitoring social capital under APCNF. This analysis was able to evaluate if the adoption of CNF enhanced the social capital of villagers, examined the correlation between social capital and farm productivity and assessed the involvement and impact of women in adoption of natural community farming.

***Key insights on social capital gains through adoption of APCNF practices***

- In CNF villages, trust and support have the highest incidence frequency among the distribution of social capital scores
- Among the components of social capital, the scores for Trust and support, community cohesion, and risk reduction rank high
- The aggregate social capital indicator is high in villages where CNF is active
- Relationship between social capital and productivity gains - Social capital positively influences farm productivity. It helps overcome hurdles related to physical capital, high quality seeds, technical know-how, and irrigation facilities and thus contribute to productivity gains.
- The higher the agricultural land owned, the lower the social capital index. Increased CNF land holding correlates with elevated social capital levels on the other hand. Crop value has no impact on social capital formation, while the gender of the household head and membership in a farming group and SHG positively and significantly influence social capital.
- Role of women in influencing social capital and productivity – women's active role is evident through SHG membership, perceived participation, and gender. They significantly enhance household social capital, influencing family decisions, particularly men adopting CNF through SHG provided information

**Transforming the yardstick used to measure benefits from the farm sector: Moving beyond per-hectare yield (TCA and Documentation of Influential Interventions)**

**Dr Madhu Verma, Chief Economist, IORA Ecological Solutions** presented the WRI-India TEEBAgriFood study conducted in the Barkhedi Abdulla panchayat, Madhya Pradesh. The study was undertaken to assess how farmer's income can be improved and used a micro-analysis approach utilizing the TEEBAgriFood Evaluation Framework along with WRI's Ecosystem Services Guide for Decision Makers and the Department for International Development's (DFID's) Sustainable Livelihood Framework to account for all the visible and invisible flows of the varied ecosystem services provided by agricultural systems across the entire value chain. The study looked at agroecological practices and how the values change when you incorporate the value of the ecosystem services and how you can take forward the values through incentives, rewards, compensation. 89 different elements from the TEEB categories were selected, and values were then assigned to ecosystem elements such as carbon sequestration, pest biocontrol, water retention and conservation, crops, agricultural land, and livestock. Key insights from the study presented include:

- The basis for the study was to work out an effective mechanism for on-ground implementation of the Dalwai Committee report. This occurred simultaneously with the launch of the TEEBAgriFood framework in 2018 in Delhi.
- Madhya Pradesh as the second largest state in India in terms of area and a highly diversified ecology was selected for the study. The State has witnessed remarkable agricultural growth during the past decade with 55% of the population engaged in agriculture as compared to the national average of 47%.
- Low income level of farmers need to be enhanced by capturing the intangible elements (costs + benefits) limiting agricultural systems to achieve sustainability. As such, the study looked both at yield based productivity but also assessed the environmental benefits that can be monetized through fiscal and economic instruments.
- The economic valuation of the area studied showed that adopting ecologically sustainable agricultural practices yielded net benefits estimated at Rs. 473 million annually for a net sown area of 688 hectares. This is an underestimated valuation because some of the values were not captured.
- For an average household farm of 1.1 ha, the per capita benefits from adopting agricultural best practices were an estimated Rs. 0.75 million annually compared with the current Rs. 0.12 million annually (NSO 2021).

In addition to the TCA analysis, the study also captured influential stories to further make the case for the adoption of agro-ecological best practices to enhance farmers' incomes. 80 case studies on influential interventions across the value chain in 11 agroecological zones were document and serves as a data repository on agroecological indicators for supporting decision making and steps taken towards achievements of national and international targets on biodiversity conservation and climate action.

**Promoting Millets in the Public Distribution System (PDS)**

**Dr Raghav Puri, Postdoctoral Associate, Tata-Cornell Institute** presented the TCA study on promotion of millets in the Indian Public Distribution System. The study estimates the true cost of the current PDS food basket, particularly estimating the true cost of procuring and distributing rice, wheat, and millets through the PDS and the savings from promoting decentralized procurement. The study is funded by the Rockefeller Foundation. The following points were presented:

- Trends in production of PDS food grains from (2021-2022) indicate that only 4% of millet (bajra, jowar, ragi) is procured by the government as compared to rice (44%) and wheat (40%t). This is also partly because of the low production of millets the procurement is also low
- Northern and eastern regions of the country (Indo-Gangetic Plains) contributes significantly to the rice and wheat production and procurement in the country. However, over the last 4 years there has been a shift in the production of rice and wheat with Madhya Pradesh now contributing significantly to the procurement of rice and wheat. Punjab and Haryana contributed to 45% of the rice and wheat to the PDS basket which has now come down to 38%. This provides a good example of decentralization over time
- Western and southern regions of the country are areas of maximum production of millets including the States of Rajasthan, Maharashtra and Karnataka. However the procurement of millets is largely undertaken by Karnataka (80% of millet is procured and distributed)

- Millet have reached comparable yields and production to what rice and wheat yields and production was 50 years ago – any intervention to include millets in the PDS basket would require significant investments in procurement, in developing better varieties and introducing better varieties to the Indian farmers.
- When policy makers think of procurement of cereals for the PDS, costs associated with Minimum Support Price, storage and distribution are primarily considered (currently approximately Rs. 38/kg for rice and Rs. 28/kg for wheat, and Rs. 32/kg for millets). The main aim of TCA study was to account for the hidden costs – taking into account unsustainable water use (estimated at 25% of irrigated water use is unsustainable and to be differentiated from total water use) and GHG emissions.
- The study revealed that the true cost of rice is much higher than the true cost of millet when you account for unsustainable water use and GHG emissions and consider a kilogram to kilogram replacement of rice/wheat with millets.
- The study will further account for power subsidy, fertilizer subsidy and soil erosion
- Replacing 1 kg of rice with 1 kg of millets for one quarter of PDS beneficiaries (approx. 200 million) every month can result in:
    - 6396 crores (770 million USD) saving in true cost due to a decline in GHG emissions and unsustainable water use
    - 940 crores (110 million) savings in financial cost – when we mill rice a lot of rice is lost so the cost of rice is higher compared to the cost of millets (1% of the food subsidy – small savings) but we are looking at what are the ways the system can be made more sustainable
    - There are different ways to make the system more sustainable – moving toward sustainable rice and wheat production
    - This scenario would require procurement of an additional 2.4 million tonnes of millets
- People in the state who benefit from the Public Distribution System (PDS) show a clear preference for rice and wheat. Therefore, the notion that these staples can be replaced for everyone is unlikely. It is anticipated that states currently cultivating millets will be among the first to consider introducing them as alternatives.

**Panel Discussion:**

**Rituj Sahu, Food Systems Policy Consultant, Asia Regional Office, Rockefeller Foundation** discussed opportunities for embedding TCA into policy in India. He highlighted that with ICAR training its professionals on the TEEBAgriFood framework, it is a clear sign that the journey has begun where TCA can effectively be used to inform agricultural planning. Mr. Sahu offered the following points to make TCA more meaningful for policymakers and other key audiences:

- Demonstration of the value of TCA needs to go beyond a technical or academic exercise
- There is a need to breakdown the complexity of TCA studies into messages that are clear, simple and actionable for different members of the audience
- It is evident that the metrics used to gauge various aspects of food production, processing, and consumption do not accurately represent the true cost of food. This discrepancy arises from an asymmetry in information, leading to a lack of alignment in regulatory or financial incentives. TCA will need to be used to realign incentives and rewards. An important message that we need to

bring to the policymaker is that costs are already being incurred and there is a need to realign or repurpose those costs

- TCA can be made more meaningful by realizing that the messaging is as important as the message. Connecting the True Cost Accounting (TCA) messages to existing government schemes involves integrating insights into initiatives aligned with the government's objectives and priorities.
- Leveraging the demand side to influence the supply side is a crucial strategy. Communicating TEEB messages to consumers can create a pull effect, influencing their choices and subsequently driving changes in the supply side. Making TCA messaging more consumer-friendly is essential for widespread adoption and positive behavioral changes.

**Bhaskar Mitra, Associate Director, Tata-Cornell Institute** highlighted the need to recognize the interplay between people, policies and politics. In his remarks, it was brought forward that:

- Notable shifts have occurred in paddy and wheat production and procurement patterns since the 2008-2009 food crisis. There has been a substantial increase in the procurement of paddy and wheat from central and eastern States of India. In contrast, procurement from northern Indian States such as Punjab has either stagnated or declined. Bihar, as an example, commenced with 500 lakh tons of paddy procurement and has currently reached 4.5 million tonnes. Chattisgarh, on the other hand, stands at 10 million tonnes of procurement. On the contrary, it is observed that Punjab's procurement has witnessed a decline; there are notable shifts in other states such as Madhya Pradesh. Further, the Government of India has recently announced the continuation of free-of-cost PDS distribution for the next 5 years.
- There is currently a lack of clarity in the existing agriculture policies; while we are trying to promote organic farming and millets, we also have other states expanding on rice and wheat procurement. The lack of adequate consideration for ecological principles in States like Chattisgarh, Bihar, Uttar Pradesh, and Madhya Pradesh raises concerns about the potential emergence of similar ecological challenges, as seen in Punjab, in these states in the next 10-15 to 20 years. This observation underscores the necessity to draw lessons from the adverse externalities associated with the Green Revolution in Punjab.
- Caution is essential when suggesting policy reforms. They are easy to introduce but extremely difficult to reverse and repeal. Once a policy has been introduced, it becomes challenging to retract or annul it. For instance, today Public Distribution System (PDS) policies cannot be taken back.
- The recommendation for the TEEBAgriFood work is to conduct field trial, incorporating a Randomized Controlled Trial (RCT) component to ensure that findings are beyond question. Additionally, there is a need to focus on the Payment of Ecosystem Services (PES) and how to ensure the continuity of its benefits. This can provide a clear demonstration, beyond numbers, of actionable points, serving as a message on the practical workings of agroecological initiatives.

### Key Messages: True Cost Accounting applications in the TEEBAgriFood sector in India

- There is a **need to breakdown the complexity of TCA studies into messages that are clear, simple and actionable** for different members of the audience
- TCA will need to be used to **realign incentives and rewards**. An important message that we need to bring to the policymaker is that costs are already being incurred and there is a need to realign or repurpose those costs.
- TCA can be made more meaningful by realizing that the **messaging is as important as the message**.
- The lack of adequate consideration for ecological principles in States where there are notable shifts in procurement of cereal grains **needs to take into account the concerns on potential emergence of ecological challenges** as observed in Punjab, particularly considering the next 10-15 to 20 years.
- **TEEBAgriFood work can further strengthen evidence through conducting field trials**, incorporating a Randomized Controlled Trial (RCT) component to ensure that findings are beyond question. Additionally, there is a **need to focus on the Payment of Ecosystem Services (PES) and how to ensure the continuity of its benefits.**
- The true cost accounting study conducted by the Tata Cornell Institute highlighted that the true cost of rice is much higher than the true cost of millet when unsustainable water use and GHG emissions and a kilogram to kilogram replacement of rice/wheat with millets is considered.
- The true cost accounting study conducted by WRI-India in Madhya Pradesh highlighted that the economic valuation of the area studied showed that adopting ecologically sustainable agricultural practices yielded net benefits estimated at Rs. 473 million annually for a net sown area of 688 hectares.
- The true cost accounting study conducted by GIST-Impact on Andhra Pradesh Community Managed Natural Farming revealed that all three agroecosystems (high-input chemical, low-input rainfed, and tribal) generated benefits, even though APCNF farmers began adoption from different cultural and agricultural departure points. APCNF has lower on-farm health risks and human health impacts are compared to chemically-intensive farming. Reported loss of 121-days by APCNF farmers as compared to 189 person-days by chemical-intensive farmers. Increased CNF land holding correlates with elevated social capital levels.

## Session: TEEBAgriFood for Business

As part of the project 'The Economics of Ecosystems and Biodiversity for Agriculture and Food (TEEBAgriFood)' funded by the European Union, the TEEBAgriFood business platform has collaborated with businesses to adjust agri-business models by assisting them in comprehending and managing risks and dependencies on nature. Capitals Coalition, the global partner on the project, along with the Centre for Responsible Business (CRB) have worked towards this goal. This session provided insights from the TEEBAgriFood for Business work in India and discussed possible entry-points for public and private sector agribusinesses to adopt a capitals approach for sustainable food systems.

**Mr Rijit Sengupta, CEO, Centre for Responsible Business** presented the outcomes and learnings from the implementation of the TEEBAgriFood for business component in India. The following aspects were shared:

- Partnership between CRB and the Capitals Coalition was aimed at engaging businesses in the TEEBAgriFood project since 2021. Although impacted by COVID-19, business roundtables and several rounds of trainings were held on adopting a capitals approach for sustainable food systems and advocating for the integration of nature-related considerations into core operations. Stakeholder engagement was additionally conducted through sessions on Capitals Valuation at CRB annual conferences in both 2022 and 2023.
- Three case studies were carried out under the TEEBAgriFood for Business work package in India which include:
    - **Arvind** – TEEBAgriFood Business guidelines was applied to the cotton production value chain to assess impacts of water use efficiency, local environment and human health. This contributed to a sustainable cotton sourcing strategy for the company
    - **Go4Fresh** – TEEBAgriFood Business guidelines was applied to the fresh fruits and vegetables value chain to assess the impacts on food loss and waste, livelihoods, and reduction in chemical use (and costs). The results led to a business strategy review
    - **ATK + Baghodia FPO** – women FPO (organic food) assessed socioeconomic and environmental impacts of organic food project. ATK management found the approach useful.

***Learnings from Business Engagement***

- The TEEBAgriFood framework has a wide spectrum of applications, as demonstrated by examples ranging from large individual businesses like Arvind to Farmer Producer Organizations (FPOs), encompassing various types and nature of businesses.
- Capitals Valuation is often considered retrospectively, assessing the impacts of business interventions on various capitals after the intervention has taken place. This process then has led to strategic adjustments based on the findings and contributed to shaping business strategies (across the value chain).
- Engagement not just with businesses, but also sectoral think-tanks/consultants - it is crucial to comprehend the current landscape of sustainability initiatives within the private sector. Presently, there are diverse suite of sustainability tools and frameworks, including certifications and the national Business Responsibility and Sustainability Reporting (BRSR) disclosure framework. Unfortunately because only few individuals are engaged within a business to deal with sustainability issues, when new tools are introduced, there is a mix of curiosity and indifference. There will be a need to collaborate with organizations that also engage with businesses.
- Promoting a Culture vs. Choice of Tools/Metrics/Methodologies - It is crucial to foster a culture within businesses to recognize their dependence on and impacts on various capitals. Objective assessments of these dependencies and impacts should be integral to business decision-making processes.
- Localization of content - TEEBAgriFood Guidelines for Businesses
    - CRB launched the India Capitals Hub in 2022 with an aim to propagate the methodology and creating a culture of promoting collaboration. The aim of the hub is to:
        - Increase collaboration, awareness, and uptake among business, finance, government, civil society, science and accounting & standards
        - Share and support the application and learning of approaches, tools and techniques

        - Provide feedback on guidance materials developed by the Coalition
    - TEEBAgriFood Guidelines for Business will be discussed at a webinar in the first quarter of 2024 with case studies from India. This will further be supplemented with specific capacity building workshops in 2024.
- The evolving international legislations emphasize the importance of traceability. Significant capacity-building efforts are needed throughout the value chain, spanning from producers and processors to plantations in certain crops. Due diligence is also necessary on both social and environmental fronts, with the Capitals Approach proving to be a valuable method for assessing impacts and dependencies. The TEEB guidelines offer a robust framework for conducting such assessments.
- It's crucial to focus on the demand side, generating consumer interest and creating a pull in the market. Various agencies report that a significant percentage, ranging from 77% to 82%, are willing to pay extra for products with positive impacts on climate and environmental footprints. Agriculture sector companies have an opportunity to leverage this consumer sentiment, emphasizing the importance of effective storytelling.
- G20 Think20 Communique developed under the Indian Presidency has communicated the need to adopt approaches to natural capital valuation, payment for ecosystem services and development of nature markets, in an effort to address global environmental challenges, mobilise investments, create new opportunities and deliver sustainable livelihoods.

**Panel discussion:**

**Mr Amit Vatsyayan, Partner and Leader, EY** who has played an important role within the Project Management Unit (PMU) for the implementation of MOVCD-NNER emphasized the need to think towards a systems-based approach to ensure that various elements work together cohesively, enabling farmers to effectively implement and benefit from sustainable agricultural practices. The following points were brought forward:

- The challenges arising from diverse regulations in tree-based industries, particularly in the context of timber transit, highlight the need for more streamlined and harmonized policies. Although a national transit system has been initiated, the practical ease of use may still pose challenges, as seen in cases like Tamil Nadu, which restricts the transit of timber outside the state.
- Although the Saathi Portal for Quality Planting Material has been launched, there is a need to enhance integration and experience for service providers, buyers, and farmers. Efforts should be directed towards creating a cohesive platform that allows for smoother interaction and engagement across different stages of the agricultural value chain.
- The Government of India's initiative to build digital public infrastructure, such as the Agri Stack, reflects a commitment to leveraging technology for the benefit of the agriculture sector. Agri Stack aims to provide a digital platform that facilitates collaboration among various stakeholders, enabling them to utilize data and digital services for the improvement of agriculture in India
- Agri-Stack is building three sets of registries including 1) Farmer Database 2) Georeferenced Land Map 3) Crop survey which is done twice every year. Currently implemented at the central level, these initiatives will be open for state-level contributions. Together, these efforts alleviate some of the existing barriers that markets encounter when connecting with farmers.

- In areas where the establishment of agroecosystems is necessary, such as the northeast region, the supply side constraint poses a significant challenge. While companies do want to work upstream, currently systems do not exist by which companies are able to get information at low transaction prices. Some states, like Uttar Pradesh, have initiated efforts to address this issue, exemplified by the UP FPO Shakti Portal, enabling the publication of FPO information and facilitating collaboration with companies. However, this initiative is not uniformly available across all states and need to consider taking similar measures.
- There is currently a gap in obtaining comprehensive feedback from states and the industry on the effectiveness of Quality Planting Material
- While farmers understand the benefits of ecosystem services gained through adopting agroforestry, there is also a need to establish assured buy-back. Determining contracting modalities, whether to use options contracts or direct contracts requires consensus-building. A common forum for farmers is essential in addressing these issues.
- Government schemes are crucial in facilitating private sector involvement, especially considering the high upfront costs for investments. The Rashtriya Krishi Vikas Yojana (RKVY) is a significant government programme that has been made more flexible, enabling states to plan effectively. However, collaboration between states and industry partners is crucial to accelerate the implementation of agroforestry initiatives under such schemes.
- In the organic sector in India, particularly among companies closely linked to retail, there is a growing trend of responsible sourcing. Notable examples of large-scale players engaging in responsible sourcing include Unilever and Big Basket.

**Dr Tarun Bajaj, Director, APEDA** provided an overview of organic farming certification in India and discussed how confidence can be built among consumers through labelling, block-chain technology towards scaling demand for organic commodities and products both domestically and internationally. The points brought forward in the intervention included:

- Agricultural and Processed Food Products Export Development Authority (APEDA) hosts the National Programme on Organic Production (NPOP) and took the pioneer role of scaling organic commodities in India.
- India boasts 2.4 million farmers affiliated with NPOP and 1.5 million farmers under Participatory Guarantee System (PGS) certification schemes. India has approximately 9.4 million hectares under organics out of which 40% is wild cultivation.
- There is a significant increase in group certification and the associated concept of Internal Control System (ICS). Current trends indicate 500,000 ICS groups. 1500 Individual farmers with large land holding have also come forward for organic certification.
- The total value of exports has significantly increased since the launch of the National Programme for Organic Production (NPOP), rising from USD 50 million to USD 1 billion. Presently, the total export value stands at USD 700 million.
- The COVID-19 crisis has led to substantial shifts in the domestic organic market, with a heightened awareness on the linkages between human health and food choices.
- India stands out with regards to consumer confidence in organic sector internationally. India was the only country to introduce a traceability system in organics when other nations faced challenges. Despite criticism regarding farmer incomes, India has remained resolute in upholding

the regulations it had introduced. India is now also exploring the implementation of traceability using block chain technology in the organic sector.

- India has been successful in exporting agricultural commodities, reaching a total of 53 billion dollars in the past year. However, there is a recognized need for increased value addition in the sector. While the country ranks seventh globally in agricultural exports, the majority of these exports are in the form of commodities. The true value addition in the agricultural sector, including organic agriculture, is estimated to be around 18-19% of the total.
- The average landholding of farmers in India is around 2 hectares, and the cost of certification is consistent regardless of whether it's a large or small holding. To address this, the Internal Control System (ICS) has been implemented, allowing farmers to get certified collectively, thereby reducing the cost per farmer.

## Key Messages: TEEBAgriFood for Business

- The TEEBAgriFood framework has a **wide spectrum of applications**, as demonstrated by examples ranging from large individual businesses to Farmer Producer Organizations (FPOs), encompassing various types and nature of businesses.
- **Capitals valuation** with Indian agri-businesses has been found **often to be considered retrospectively**, assessing the impacts of business interventions on various capitals after the intervention has taken place. This process then has led to strategic adjustments based on the findings and contributed to shaping business strategies (across the value chain)
- **Promoting a Culture vs. Choice of Tools/Metrics/Methodologies** - It is crucial to foster a culture within businesses to recognize their dependence on and impacts on various capitals. Objective assessments of these dependencies and impacts should be integral to business decision-making processes.
- Presently, there are diverse suite of sustainability tools and frameworks, including certifications and the national Business Responsibility and Sustainability Reporting (BRSR) disclosure framework. Unfortunately because only **few individuals are engaged within a business to deal with sustainability issues.** There will be a need to collaborate with organizations that also engage with businesses.
- **It is crucial to focus on the demand side, generating consumer interest and creating a pull in the market.** Various agencies report that a significant percentage, ranging from 77% to 82%, are willing to pay extra for products with positive impacts on climate and environmental footprints.
- The Government of India's initiative to build digital public infrastructure, such as the Agri Stack, reflects a commitment to leveraging technology for the benefit of the agriculture sector. **Agri-Stack is building three sets of registries including 1) Farmer Database 2) Georeferenced Land Map 3) Crop survey which is done twice every year.**
- There is **currently a gap in obtaining comprehensive feedback from states** and the industry on the **effectiveness of Quality Planting Material**
- In the organic sector in India, particularly among companies closely linked to retail, **there is a growing trend of responsible sourcing.** Notable examples of large-scale players engaging in responsible sourcing include Unilever and Big Basket.
- There is a significant increase in group certification and the associated concept of **Internal Control System (ICS).** Current trends indicate 500,000 ICS groups. 1500 Individual farmers with large land holding have also come forward for organic certification.

- India is now also exploring the implementation of traceability using **block chain technology** in the organic sector.
- India has been successful in exporting agricultural commodities, reaching a total of 53 billion dollars in the past year. However, there is a **recognized need for increased value addition in the sector.** While the country ranks seventh globally in agricultural exports, the majority of these exports are in the form of commodities. The true value addition in the agricultural sector, including organic agriculture, is estimated to be around 18-19% of the total.

## Concluding Session

This session concluded the workshop bringing together the key messaging from the two-day workshop. The session was moderated by **Dr Divya Datt, Programme Management Officer, UNEP India Office**. Summing up the sessions, it was highlighted that there is enough evidence that we need to start looking at True Cost Accounting including air pollution, crop residue burning, ecological concerns in the agricultural systems, and the need to start considering the ecological factors in economic decision making. The session discussed opportunities to realign policies and also recommendations for the next phase of TEEBAgriFood in India.

**Dr G.N. Hariharan, Executive Director, MS Swaminathan Research Foundation (MSSRF)** highlighted that as the architect of the Green Revolution in India, Dr MS Swaminathan envisaged a transition from a Green Revolution to an 'Evergreen Revolution' that can be achieved through harmonization of the efforts of policymakers, scientists and farmers. It was highlighted that a transition towards sustainability in agriculture required strengthening research and significantly scaling the production of bio-inputs. The introduction of new scientific developments can significantly enhance productivity while minimizing ecological impacts. Further important technological developments such as remote sensing, GIS and digital technologies have provided tools to make well-informed decisions on such a transition. It was also highlighted that revival of traditional practices and wisdom of localized practice are crucial to a transition, citing the example of saline tolerant rice and shrimp cultivation in the Uttar Kannada district of Karnataka. Dr. Hariharan emphasized that the aspirations of farm families should be at the forefront of considerations. Ensuring better incomes and reducing drudgery for farming families is crucial to retain people in the farming sector.

**Dr. Sunil Kumar, Director, Indian Institute of Farming Systems Research** (ICAR-IIFSR) discussed the mandate of IIFSR and the various models developed for Integrated Farming Systems, Organic Farming and Natural Farming by the institution, which can play instrumentally if barriers to increase adoption of agroecological practices are removed. In his remarks he highlighted that IIFSR has developed 71 models through different institutions under the AICRP-IFS and AICRP-OF network which also have taken into account the GHG emission reduction potential. Farmer's incomes have been the main focus of the development of these models and have observed that with the adoption of the models developed, incomes can be enhanced by 3-5 times. Further he highlighted that the organic sector has taken the shape of an industry, however the value chain needs to be improved, bridging all gaps between production and consumption. He also highlighted that generating awareness among producers and consumers of the ecological, social and human health benefits needs to be strengthened to which TCA is integral. Dr Kumar also highlighted the insufficient availability of organic inputs and lack of quality control as current barrier.

Further the need to compensate for initial years of yield penalty through policy interventions can significantly boost the pace of adoption of agroecological practices.

**Dr. Alka Bhargava, Senior Policy Advisor, TEEBAgriFood India, UNEP** discussed the promotion of millets in India, emphasizing that the narrative revolves around the concept that millets are "good for the farmer, the consumer, and the environment." The challenge lies in changing the cultural mindset around coarse cereals, and initial entry points, such as mid-day meal schemes, can facilitate this change. Drawing from the example of legislation in Brazil, which mandates a percentage of food grains for school feeding programs to be procured from small farmers with a 30% price premium, she suggested that similar measures could accelerate the transition. Creating awareness about thinking locally is crucial among consumers.

**Shivi Sheoran, Country Liaison Manager, IKEA Foundation**, reflecting on what is important for the IKEA Foundation highlighted that the foundation's focus is on people and the key factors influencing a better life over the long term. He underscored the significance of addressing biodiversity loss and promoting sustainable food systems, stating that without tackling these issues, people will face challenges in achieving the expected quality of life. It was brought forward that with TEEB as a partner, the UN mandate provides a unique position to lift good on-ground work and make large scale change happen. Additionally in his remarks he highlighted the vision for a Phase 2 of the TEEBAgriFood project in India adding that:

- Food systems transformation is a complex undertaking, representing more than a minor shift but a fundamental change. To ensure its success and sustainability, the transformation should be approached and managed as a comprehensive change management process.
- From a process perspective there is need to identify where we are at in the process: 1) need for change (problem statement) 2) defining the change (hypothesis) where invisible costs need to be visible and integral part of decision making 3) Building a case for change - defining the what and how will lead to change 4) Implementation 5) Replication and Expansion. It was assessed that globally, we are at the crux of building the case and implementation of change.
- There is a need to move from a high level of confidence to a high level of conviction.
- Aligning with other existing policies and frameworks such as the campaign on millets will be important to gain traction of change.

**Dr. Salman Hussain, TEEB Coordinator and Head a.i., TEN Unit, UNEP**, concluded the meeting by emphasizing the need for reflect on the ambition of the work in the next phase of the TEEBAgriFood project in India given that food systems transformation in a fundamental change. He stressed the importance of learning from existing datasets, avoiding duplication, and understanding feasibility. It was further brought forward that engaging with policymakers and relevant stakeholders to identify additional information needed for bringing about change will form an important activity. He conveyed enthusiasm about the support of the IKEA Foundation on furthering the TEEBAgriFood objectives and anticipated building momentum in the forthcoming years.

## Key Messages – Concluding Session

- **Food systems transformation is a complex undertaking**, representing more than a minor shift but a fundamental change. To ensure its success and sustainability, the transformation should be **approached and managed as a comprehensive change management process.**
- Globally, **we are at the crux of building the case for change and implementation of change**. There is a need to move from a high level of confidence to a high level of conviction.
- **Aspirations of farm families should be at the forefront of considerations on a transition.** Ensuring better incomes and reducing drudgery for farming families is crucial to retain people in the farming sector.
- The organic sector has taken the shape of an industry, however the **value chain needs to be improved, bridging all gaps between production and consumption.**
- The **challenge of a food systems transition lies in changing the cultural mindset.** Identifying key entry points are crucial in facilitating this change.

## Annexure 1: Agenda

**National Symposium for**

**The Economics of Ecosystems and Biodiversity for Agriculture and Food Project**

**(TEEB AgriFood – India)**

**Dr Ambedkar International Center, New Delhi, 16-17 November 2023**

***Agenda***

**Day 1: 16 November 2023**

| | | |
|---|---|---|
| 0930-1000 | Registration | |
| 1000-1005 | Welcome | Mr Atul Bagai, Head, UNEP India Country office |
| 1005-1020 | Reflections on TEEB AgriFood India project and Role of TEEB AgriFood in Transforming Global Food Systems | Dr Salman Hussain, Coordinator UNEP-TEEB & Head *a.i.* - Economics of Nature Unit |
| 1020-1025 | Film on TEEB AgriFood India project | |
| 1025-1030 | Address | Mr Christopher Garroway, Senior Economist, UN Resident Coordinator's Office, India |
| 1030-1040 | Address | Dr Michael Bucki, Counsellor, EU Delegation in India |
| 1040-1050 | Trees Outside Forests for Environment and Livelihoods | Mr Bivash Ranjan, IFS, Additional Director of Forests, Ministry of Environment Forests and Climate Change |
| 1050-1100 | India's Initiatives for Sustainable Agri Food Systems | Mr Manoj Ahuja, IAS, Secretary, Department of Agriculture and Farmers Welfare, Govt of India |
| 1100-1115 | Key Note Address | Prof Ramesh Chand, Hon'ble Member, NITI Aayog |
| 1115-1145 | ***Tea/Coffee break*** | |
| **Presentations of Project States** | | |
| 1145-1155 | TEEBAgriFood Initiative in India | Mr William Speller, Programme Management Officer, UNEP |

| | | |
|---|---|---|
| 1155-1300 | Technical Session 1: Uttar Pradesh | • Presentation of TEEBAgriFood application: Indian Institute of Farming Systems Research (IIFSR)<br>• Panel Discussion<br>  • Mr Raj Shekhar, Secretary (Agriculture) – Government of Uttar Pradesh<br>  • Mr Naresh Kumar Janu, IFS Chief Conservator of Forests, Meerut<br>  • Dr S. Bhaskar, Advisor NRM-CC, Dept of Agriculture and Farmers Welfare<br>  • Mr Sanjay Kumar, DDG, Ministry of Statistics and Programme Implementation (MoSPI) |
| 1300-1345 | ***Lunch*** | |
| 1345-1445 | Technical Session II: Uttarakhand | • Presentation of TEEBAgriFood application – GB Pant University of Agriculture and Technology<br>• Panel Discussion<br>  • Dr C. Biradar, Country Director - India, CIFOR-ICRAF<br>  • Dr R.B. Sinha, Senior Policy Advisor, FAO<br>  • Mr Vinay Kumar, Managing Director, Uttarakhand Organic Development Board<br>  • Mr Manoj Chandran, APCCF, Uttarakhand |
| 1445-1545 | Technical Session III: Assam | • Presentation of TEEBAgriFood application – Central Agroforestry Research Institute (CAFRI)<br>• Panel Discussion<br>  • Mr Franklin Khobung, IFS, Joint Secretary (NRM), DoAFW<br>  • Dr S.K. Sharma, ADG (HRM), ICAR<br>  • Dr Arunachalam, Director, Central Agroforestry Research Institute – ICAR<br>  • Ms. Deepali Saini, Vice President (Social Sector) EY |
| 1545-1600 | ***Tea/Coffee break*** | |

**Day 2: 17 November 2023**

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|---|---|---|
| 1000-1100 | True Cost Accounting applications in the AgriFood sector in India | ***Presentations***<br>• Andhra Pradesh Community Managed Natural Farming (CMNF) – Mr Anupam Ravi & Mr Karan Peer, GIST Impact<br>• Moving beyond "per hectare yield" in Madhya Pradesh – Dr Madhu Verma<br>• Revealing the Hidden Production Costs of India's Public Distribution Systems – Dr Raghav Puri, Tata Cornell Institute<br><br>***Panel Discussion:***<br>• Mr Anupam Ravi, Senior Vice President – GIST Impact<br>• Dr Madhu Verma – Chief Economist, IORA Ecological Solutions<br>• Dr Bhaskar Mitra – Associate Director, Tata Cornell Institute<br>• Mr Rituj Sahu, Rockefeller Foundation<br><br>Moderator – William Speller, Programme Management Officer, UNEP |
| 1100-1115 | ***Tea/Coffee break*** | |
| 1115-1215 | TEEBAgriFood for Business | ***Presentation***<br>Adopting a Capitals Approach for Sustainable Food Systems – Rijit Sengupta, CEO Centre for Responsible Business<br><br>***Panel Discussion***<br>• Mr Tarun Bajaj, Director, Agricultural and Processed Food Products Export Development Authority (APEDA)<br>• Mr Amit Vatsyayan, Partner Social Sector Ernst & Young<br>• Mr Rijit Sengupta, CEO, Centre for Responsible Business<br><br>Moderator – Dr Alka Bhargava, Senior Policy Advisor, TEEBAgriFood India, UNEP |

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| 1215-1330 | Valedictory High Level Panel<br><br>Discussion on Road Ahead | ***Discussion***<br><br>• Dr Salman Hussain, TEEB Coordinator and Head a.i., TEN Unit, UNEP<br>• Dr Alka Bhargava, Senior Policy Advisor, TEEBAgriFood – India, UNEP<br>• Dr Sunil Kumar, Director, ICAR-IIFSR<br>• Dr G.N. Hariharan, Executive Director, MSSRF<br>• Mr Shivi Sheoraan, Country Liaison Manager, IKEA Foundation<br><br>Moderator - Dr Divya Datt, Programme Management Officer, UNEP India |
| 1330-1340 | Closing Remarks | Dr Salman Hussain, Coordinator UNEP-TEEB &<br><br>Head *a.i.*, Economics of Nature Unit |
| | ***Lunch*** | |

## Annexure 2: List of Participants

| S. No. | Title | Name | Organisation |
|---|---|---|---|
| 1. | Mr. | Amit Vatsyayan | Ernst Young |
| 2. | Mr. | Anupam Ravi | GIST Impact |
| 3. | Mr. | Arghadeep Saha | Good Foods Institute |
| 4. | Dr. | Arunachalam | Central Agroforestry Research Institute |
| 5. | Mr. | Atul Bagai | UNEP |
| 6 | Dr. | Bhaskar Mitra | Tata Cornell Institute |
| 7 | Mr. | Bivash Ranjan | MoEFCC |
| 8 | Dr. | Chandrashekhar Biradar | CIFOR-ICRAF |
| 9 | Mr. | Christopher Garroway | UN India |
| 10 | Ms. | Divya Datt | UNEP |
| 11 | Mr. | Elisabeth Faure | WFP |
| 12 | Mr. | Faiz Ahmed Kidwai | MoAFW |
| 13 | Dr. | Hariharan | MSSRF |
| 14 | Dr. | Jai Prakash Jaiswal | GBPUAT |
| 15 | Mr. | Karan | GIST Impact |
| 16 | Mr. | Kulpreet Sokhi | MoSPI |
| 17 | Dr. | M. Shamim | ICAR-IIFSR |
| 18 | Dr. | Madhu Verma | IORA Ecological Solutions |
| 19 | Dr. | Manish Anand | Integrated Policy Analysis Division |
| 20 | Mr. | Manish Wasuja | UNICEF |
| 21 | Ms. | Meenal Pahuja | IUCN |
| 22 | Dr. | Meraj Alam Ansari | ICAR – IIFSR |
| 23 | Mr. | Michael Anderson | |
| 24 | Mr. | Michael Bucki | European External Action Service |
| 25 | Mr. | Naresh Kumar Janu | IFS CCF, Meerut |
| 26 | Mr. | Nishant Jain | |
| 27 | Mr. | Piyush Gupta | NMCG |
| 28 | Mr. | Pratik Pradhan | GIST Impact |

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|---|---|---|---|
| 29 | Mr | Raghav Puri | Tata Cornell Institute |
| 30 | Dr. | Raghuveer Singh | ICAR - IIFSR |
| 31 | Dr. | Raghavendra K J | ICAR – IIFSR |
| 32 | Dr. | Rajarshi Dasgupta | IIT Delhi |
| 33 | Mr. | Rakesh Sinha | FAO |
| 34 | Dr. | Ramesh Chand | NITI Aayog |
| 35 | Mr. | Rijit Sengupta | Centre for Responsible Business |
| 36 | Mr. | Rituj Sahu | Rockefeller Foundation |
| 37 | Ms. | Rohini Mukherjee | Naandi |
| 38 | Dr. | S. Bhaskar | MoAFW |
| 39 | Dr. | Salman Hussain | UNEP |
| 40 | Mr. | Sanjay Kumar | MoSPI |
| 41 | Mr | Sanjay Tomar | GIZ |
| 42 | Ms. | Seema Bhatt | FAO |
| 43 | Dr. | Seema Yadav | WRI India |
| 44 | Ms. | Shaguna Gahilote | UNWOMEN |
| 45 | Mr. | Shivi Sheoran | IKEA |
| 46 | Mr. | SK Sharma | ADG (HRM), ICAR |
| 47 | Dr. | Sunil Kumar | ICAR – IIFSR |
| 48 | Ms. | Tania Bhattacharya | Celestial Earth |
| 49 | Dr. | V.K. Sharma | CAFRI |
| 50 | Mr. | Vinay Kumar | UOCB |
| 51 | Mr. | William Speller | UNEP |
| 52 | Ms. | Tithi Dutta | GBPUAT |
| 53 | Ms. | Therese Thomas | CEEW |
| 54 | Dr. | Vivin | MoRD |
| 55 | Mr | B. Bejraya Pathak | MoRD |
| 56 | Ms. | Johanna Mansson | EU Delegation |
| 57 | Dr. | Ujjwal Kumar | Doon University, ICAR – CAFRI |
| 58 | Ms. | Aishwarya Joshi | CEEW |
| 59 | Ms. | Nikhtha | CEEW |

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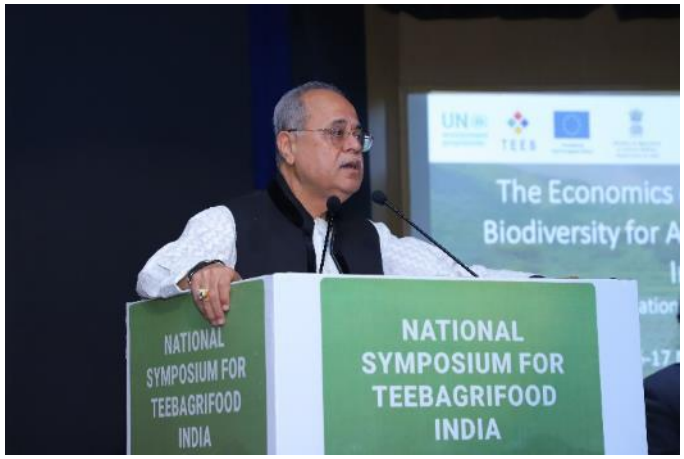
|---|---|---|---|
| 60 | Mr. | Manoj Chandran | CCF Uttarakhand |
| 61 | Ms. | Deepika Saini | EY |
| 62 | Mr. | Gulzar Hussain | WFP |
| 63 | Mr. | Swapan Mehra | IORA |
| 64 | Ms. | Aakriti Wanchoo | IORA |
| 65 | Mr. | Arihant Jain | IORA |
| 66 | Ms. | Charu Tiwari | IORA |
| 67 | Mr. | Ashok Kumar Yadav | MoAFW |
| 68 | Dr. | Tarun Bajaj | APEDA |

## Annexure 3: Photographs of the TEEBAgriFood India National Symposium, Dr Ambedkar International Centre, New Delhi

**Inaugural Session**





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Making the economic case


Agriculture Dep...

**Technical Session: Uttarakhand**





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Workshop


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The Economics of Ecosystems and Biodiversity for Agriculture and Food India
National Workshop


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GIST IMPACT
NATURAL FARMING THROUGH A WIDE-ANGLE LENS
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The Economics of Ecosystems and


The Economics of Ecosystems and
Biodiversity for Agriculture and Food
India
National Workshop

**Session: Concluding Session**








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New Delhi, India