# Proceedings of the first state-level stakeholder workshop on TEEBAgriFood Initiative in Assam, India

Discussion on scoping and scenario setting
for the TEEBAgriFood application in Assam



15 September, 2023 (Friday)
0900 Hrs onwards (IST), Hybrid mode (Physical and Virtual)
VENUE: National Institute of Rural Development & Panchayati Raj, NE, Regional Centre, Jawahar Nagar, Khanapara, Guwahati

# Proceedings of the stakeholder consultation to discuss the scoping and scenario setting for the TEEBAgriFood application in Assam- NIRDPR-NERC, Guwahati, 15<sup>th</sup> September 2023

The first stakeholder consultation on TEEBAgriFood Application in Assam under EUPI TEEBAgriFood Initiative in Assam was held on 15<sup>th</sup> September 2023 at the National Institute of Rural Development and Panchayati Raj, N. E. Regional Centre, Guwahati.  The hybrid mode of consultation was attended by about 49 fifty delegates representing major departments under the Government of Assam, Technical and Research institutions of international, national, and regional repute, various agencies, organizations, and progressive practitioners working in the field of Agroforestry and organic farming. Around 22 delegates also participated online during the consultation (Annexure: I).

At the outset, Dr. Malancha Dey, Sr. Scientist, South Asian Forum for Environment (SAFE) welcomed all the dignitaries and delegates. Dr. A. Arunachalam, Director, ICAR-CAFRI, while initiating the deliberations presented the overview and background of the TEEBAgriFood Initiative in Assam, which is funded under EUPI through UNEP.  He invited all the participating delegates to contribute meaningfully to the building of scenarios projected for upscaling organic farming and agroforestry, finalization of elements to be assessed in the four capitals, methodologies, and data sources, all specific to the state of Assam for preparation and finalization of scoping report and development of action plan for TEEBAgriFood Learning Landscape (TAFLL).

## Session I: Opening Remarks

## Prof. B.C Deka, Vice Chancellor, Assam Agricultural University

Prof. Deka provided a brief overview of the central role of organic farming and agroforestry in Assam and the entire north-east.  He further underlined the state-driven target of 10 crore plantations in the next two years. Prof. Deka also shared important developments related to agricultural practices and carbon credits in Assam, where AAU is collaborating with various institutions and organizations:

- In June 2023, Assam Agricultural University (AAU) entered into a memorandum of understanding (MoU) with TERI (The Energy and Resources Institute) and ReNew Power Synergy Private Ltd. based in Gurgaon to work on a project that enables farmers and individuals in Assam to sell carbon credits in both domestic and international markets, thereby generating additional income.
- Under the project, one crore (ten million) trees will be selected for cultivation on individual properties throughout Assam. The carbon credits generated by each of these trees can then be traded in international markets, offering a valuable source of revenue for the farmers.
- The project's successful execution will be a joint effort between TERI, ReNew Synergy, the research centers, and Krishi Vigyan Kendras affiliated with AAU. These entities will be responsible for identifying households across Assam where the trees can be planted.

In conclusion, Prof. Deka extended full support for the TEEBAgriFood project from Assam Agricultural University, as well as through the AICRP-Agroforestry Centre, which operates under AAU's

jurisdiction. He also expressed a willingness to provide the necessary scientists and experts from the university's main campus.

## Dr. Sonali Ghosh, IFS, CEO, Assam Agroforestry Development Board

Dr. Ghosh gave a concise overview of the Assam Agroforestry Development Board, a pioneering initiative in Assam aimed at promoting the value chain of agroforestry in the state. She also emphasized the significance of tree plantation outside the forest areas for Assam and highlighted the following developments taking place in Assam around this time-

- The Assam Forest Department has initiated a massive tree plantation drive, known as the Amrit Brikshya Aandolan, with the goal of planting one crore commercial trees. This initiative aimed to both increase the state's green cover and enhance the local economy by encouraging tree cultivation beyond forest boundaries.

- Furthermore, the Assam government has ambitious plans to plant 8 crore seedlings in the coming year and an additional 10 crore saplings by 2025, furthering their commitment to expanding tree cover and sustainable forestry practices in the state.

Dr. Ghosh stressed the importance of planting commercial trees, which are also crucial for meeting the livelihood needs of local communities. Moreover, she pointed out that this effort also provides a ground for potential collaborations with the TEEB project in the times ahead.

Dr. Arunachalam additionally discussed the financial aspects related to the promotion of agroforestry in Assam. He also conveyed to the participants that the Assam Forest Department serves as the nodal agency overseeing this initiative, highlighting the significance of inter-departmental coordination to facilitate the expansion of tree planting beyond forest areas.

## Dr. Sunil Kumar, Director, Indian Institute of Farming Systems Research – ICAR

Dr. Kumar provided an overview of the TEEBAgriFood application in Uttar Pradesh, outlining the project's objective to evaluate the impact of upscaling organic farming and agroforestry on ecosystem services. Using the modelling tools, various components of the four capitals- natural, social, produced, and human were evaluated and assigned monetary values to provide scientific evidence for the promotion of sustainable agricultural practices. Furthermore, Dr. Kumar elaborated on how the TEEBAgriFood project also assesses programmatic initiatives in the state, including the National Agroforestry Policy, Paramparagat Krishi Vikas Yojana, Namami Gange, and Har Med par Ped, among others.

Further, expanding on the project's scope, he delved into how the project helps in capturing not only tangible benefits but also those intangible and invisible in nature. He underscored the advantages of adopting sustainable agricultural methods and informed the participants about farmers undergoing training at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) on integrated farming and organic agriculture. He also informed that ICAR serves as a nodal agency responsible for initiating programs focussed on sustainable agricultural practices.

In his closing remarks, Dr. Kumar emphasized the importance of collaborating as research partners to establish an economic case for nature and conservation. He noted that through this project, avenues

can be created for supporting various national and international commitments. Lastly, he offered his support to ICAR-CAFRI for the implementation of the TEEBAgriFood initiative in Assam.

## Dr. Rajib Kr. Borah, Rain Forest Research Institute (RFRI), Assam

Dr. Borah provided an overview of the current status of agroforestry in the state and offered insights into the traditional Barees (Homestead Gardens) system in Assam, which hosts a variety of tree species. However, he also acknowledged the contrast in agricultural practices between upper and lower Assam.

Dr. Borah also mentioned that RFRI is actively assessing the suitability of tree species for Assam, offering key insights into the agroforestry systems suitable for Assam:

- High-yield agarwood (the most valuable wood) and bamboo-based agroforestry systems are the most suitable and preferable options. Nevertheless, integrating bamboo with other crops can be challenging due to the high silica content in bamboo leaves.
- Recommended specific tree species and crop combinations as part of the agroforestry models for Assam, suggesting alternatives such as growing turmeric and ginger with a minimum spacing of 5 meters or pairing Gmelina arborea with bamboo.
- Proposed several other agroforestry models, including white sandalwood combined with agarwood, particularly renowned in both Upper and Lower Assam for its high-value chain potential. He also highlighted *Parkia timoriana* in hill districts like Karbi Anglong, which is popular in states like Manipur, Mizoram, and Nagaland. Additionally, mentioned the rapid-growing sandalwood, particularly suited for hilly regions, and *Flemingia*, which serves as a host plant for lac cultivation.
- Emphasised the critical importance of obtaining high-quality planting materials.
- Shared information about four high-yielding bamboo species with 16 genotypes identified for Assam, contributing to a 16-20 percent increase in bamboo yield.

In closing, he extended his full support to the TEEBAgriFood project in Assam and offered assistance at the institutional level.

## Dr. R. Murugesan, Director, National Institute of Rural Development and Panchayati Raj-North East Regional Centre, Guwahati

Dr. Murugesan extended a warm welcome to the participants and expressed his appreciation for the ongoing work within the TEEBAgriFood Project. He emphasized the vital role played by organic farming and agroforestry in enhancing rural livelihoods and establishing sustainable systems. During the discussion, Dr. Murugesan highlighted the following key points:

- Discussed the mapping of 29 subjects listed under the eleventh schedule of the constitution, corresponding Sustainable Development Goals (SDGs), and localized sustainable development goals. These encompass various subjects, including poverty alleviation programs, agriculture, small-scale industries, health, sanitation, social welfare, women and child development, among others. He underscored how these objectives closely align with the objectives of the TEEBAgriFood project.

- Informed the participants that the National Institute of Rural Development and Panchayati Raj (NIRD-PR), as part of the Ministry of Rural Development, is actively involved in aspects related to agroforestry. NIRD is open to collaboration on agroforestry projects aimed at enriching human capital.
- Addressed pressing issues such as climate change and forest conservation from an economic perspective, emphasizing the importance of addressing demand-supply chain dynamics. In addition to building sustainable systems, he stressed the need to focus on revenue generation.
- Reflecting on the green revolution and its immediate needs, he urged a shift toward nature-based solutions and the rejuvenation of soils as a priority.
- Emphasised that in the context of the TEEBAgriFood project's evaluation of ecosystem services, the primary focus should be on farmers, with a focus on incentivizing them.

In conclusion, Dr. Murugesan highlighted the growing concern about drought in certain districts of Assam and the need for an approach tailored to these specific issues. Recognizing the shared objectives of the TEEB AgriFood project and NIRD, he expressed interest in participating in the project in Assam.

## Dr. C. M. Biradar, Country Director, CIFOR-ICRAF

Dr. Biradar expressed his appreciation for the initiative to quantify ecosystem services in economic terms and also underscored the growing attention towards agricultural productivity and the extensive use of synthetic inputs to meet the demands of a growing population. He pointed out that, we often neglect to consider the environmental and health consequences of these practices. Dr. Biradar, drawing upon his expertise in trees, addressed the following points:

- Highlighted the pillars of restoring broken food systems, which include biodiversity (crops, trees, livestock, soil), landscape diversity, and healthy soil. Healthy soil, with higher levels of organic matter, leads to improved water retention capacity and overall productivity. The presence of trees contributes to carbon sequestration and the overall well-being of the soil.
- Emphasised that the presence of trees can reduce fertilizer requirements by up to 30%. Excessive chemical fertilizer use can lead to soil compaction and reduced productivity.
- Reiterated the importance of connecting bioresources with economics, emphasizing the economic value of ecosystem services.
- Gender equity and social inclusiveness were discussed as crucial outcomes of sustainable agricultural practices.
- Discussed the concept of Payment for Ecosystem Services Plus (PES+), noting the current absence of a robust mechanism for accounting and providing payments for ecosystem services. He also discussed the fund component of the Convention for Biological Diversity (CBD).
- Highlighted that the Indian diet is predominantly protein-based and suggested the cultivation of perennial leguminous plants on bunds.
- Suggested studying and implementing riparian and dry Agroforestry models in Assam.
- Recognizing that one-third of Assam is trees deficit, he emphasized the significance of agroforestry in diversifying the food production landscape.

- Pointed out the need to address three critical aspects of the Indian farming system: rainfall patterns, excessive fertilizer use, and providing farmers with strong incentives. Reducing input costs can lead to increased income for farmers.

In conclusion, Dr. Biradar addressed the challenges faced by certain districts in Assam, referring to Dr. Murugesan's statement about addressing both hunger and thirst. Despite Assam being a floodplain, specific districts are experiencing drought-like conditions. Dr. Biradar reaffirmed his ongoing support for the TEEBAgriFood project in Assam.

## Session II: TEEBAgriFood Framework

### Mr. William Speller, Programme Manager, TEEB-UNEP

Mr. Speller presented the overview of the ongoing TEEBAgriFood assessment globally and in India. He informed about the ongoing application of the project across the globe and the UNEP TEEB Unit is working in 12 countries, seven of which are funded by this project by the European Union Partnership Instrument (EUPI). Mr. Speller in his discussion talked about the following-

- The TEEBAgriFood initiative aims at redefining the food metrics and assessing the impacts on food systems, going beyond simple productivity measurements like yield per hectare and the central aim of TEEB is to bridge the gap between science and policy-making, was underscored, with a strong emphasis on promoting robust environmental governance and economic policies. This involves the translation of science-based research into agriculture and food policies, especially in the economic domain, with the ultimate goal of making an economic case for sustainable agrifood systems.
- Environmental challenges that the world is facing today are interconnected processes, encompassing climate change, biodiversity loss, and pollution. The agriculture and food sector are the most affected by these crises and also contributes to each of these challenges.
- Highlighted the adaptability of the TEEBAgriFood framework to various contexts – these can be crop-specific or can also take on a landscape approach. Under the current project, in Mexico, the application is studying the coffee value chain, and in Thailand, rice and its value chain. It can also take a landscape approach where in China, the framework has been applied in the Tengchong province (southern China and Yunnan region) looking at the entire food production system and assessing policy interventions for transitioning towards sustainability. In Brazil, the framework has been applied to urban and peri-urban agricultural systems, highlighting the versatility of the framework in its application to urban settings.
- The concept of accounting for invisible benefits and externalities is an essential aspect of TEEBAgriFood. It was emphasized that this initiative aligns with various international policy agendas, including the Sustainable Development Goals (SDGs), the Global Biodiversity Framework (GBF), the United Nations Convention to Combat Desertification (UNCCD), ecosystem restoration efforts, and the priorities of the G20 presidency.
- Provided insights into FAO's major annual flagship publication- The State of Food and Agriculture (SOFA) Report which talks about the balanced and scientific-based assessments of agri-food systems, and addresses critical environmental and agricultural challenges.

## Mr. Reuben Gergan, Project Officer- TEEBAgriFood India

At the outset, Mr. Gergan introduced the principles of TEEB and the TEEB framework, highlighting the significance of capturing and acknowledging the often-overlooked socio-economic benefits derived from ecosystems and biodiversity in decision-making Additionally, he discussed key aspects of the project, such as scenario modelling and valuation of the four capitals. Mr. Gergan provided a comprehensive overview of the ongoing activities in Uttarakhand and Uttar Pradesh and elaborating on the project's objective, he explained the purpose of the valuation studies for accounting for the costs and benefits of organic farming and agroforestry in terms of social, environmental, and economic factors, all aimed at informing decision-making processes.

### Overview of the TEEBAgriFood Framework

- The TEEBAgriFood framework offers a structured approach to valuation that helps decision-makers recognize the wide range of benefits provided by ecosystems and biodiversity, demonstrate their values in economic terms, and where appropriate, capture those values in decision-making.
- The Framework includes four elements - stocks, flows, outcomes, and impacts- which capture the set of interactions in the food system. The stocks of eco-agri-food systems comprise the four different "capitals" – produced capital, natural capital, human capital, and social capital. These stocks underpin a variety of flows encompassing production and consumption activity, ecosystem services, purchased inputs, and residual flows. The framework captures the positive and negative impacts and externalities across the entire agri-food value chain and assesses its impacts on human, social, produced, and natural capital.
- It was developed to apply holistic systems thinking to the economics of agriculture, which is concerned with complex and extensive eco-agri-food value chains. This is because a majority of assessments conducted to examine the efficacy of the food and agricultural sector tend to be limited to farm-level assessments, and the policies are often evaluated through this narrow lens which tends to overlook the linkages between the environment and food system. If not amended, agricultural policies will have a long-term deleterious impact on food supply, human health, and nature and will leave out broader issues of sustainability and equity.
- This holistic strategy aims to align with both national and international commitments, including the sustainable development goals, and establish an efficient true cost accounting system. This approach considers environmental, social, cultural, and economic costs and benefits, leading to a more comprehensive understanding of consumption and production costs. Under the TEEB project, efforts are focused on integrating global initiatives with state and local-level efforts.
- The TEEBAgriFood application in India started in 2019 and ends in December 2023. The application of the TEEBAgriFood framework in India assesses organic farming and

agroforestry in the Ganga basin region of India, i.e., the two States of Uttar Pradesh and Uttarakhand, and now the state of Assam.

- The project is guided by the Project Steering Committee (PSC) co-chaired by the Ministry of Agriculture and Farmers Welfare and the Ministry of Environment, Forests and Climate Change.

- As per the guidance of the PSC, the TEEBAgriFood application is assessing the impacts of government policy and programmatic interventions on organic farming and agroforestry including: Paramparagat Krishi Vikas Yojana (PKVY), National Programme for Organic Production (NPOP) and third-party certification under APEDA, Namami Gange Initiative, National Agroforestry Policy and the Sub-mission on Agroforestry (SMAF), Mission Organic Value Chain Development – Northeast Region (MOVCD-NER), and National Bamboo Mission.

- The project also aligns with some of the national priorities including Doubling Farmers' Income (DFI), crop diversification, and carbon sequestration.

- In Assam, the project aims to inform planning processes by providing comprehensive scientific evidence to support food and agriculture policies with the help of modeling and valuation conducted for various scenarios developed in accordance with the policy interventions for upscaling organic farming and agroforestry by 2050. The scenarios are being modelled for 2050 under three scenarios i.e., business as usual (BAU), optimistic and pessimistic at RCP 4.5 taking 2020 as the base year.

- The determination of prioritized elements of natural, produced, social, and human capital being assessed under the project will be finalized through the consultation and regarding the spatial scale, considering the unavailability of district-level data and taking into account the suggestions made during the meeting with the state officials, the CAFRI team decided to conduct the study at the state level.

Lastly, Mr. Gergan emphasized on prioritizing the elements of the four capitals for assessments and determining the key focus areas for Assam. He shared that Assam stands out with its robust agroforestry component, distinguishing it from the other two states. In Assam, new elements are proposed to be taken into account, so for instance under produced capital, assessment of markets, post-harvest infrastructure is proposed. It was noted that obstacles and challenges associated with the adoption of sustainable agricultural practices in Assam are important and needs to be addressed.

## Dr. Alka Bhargava, Senior Policy Advisor, TEEB-UNEP

Dr. Bhargava began by providing the background for the TEEBAgriFood initiative in India and its application in three states. The TEEB principles were initiated by UNEP with the sole purpose of 'making nature's invisible values visible' because this invisibility is a key driver of the ongoing depletion of ecosystems and biodiversity. The TEEB India initiative was launched in 2011 focusing on forests, inland wetlands, and marine and coastal ecosystems. Hence, she informed the participants that the project is perhaps the first of its kind to address food systems – organic farming and agroforestry being the mainstay in the India project. During her discussion, she emphasized the following:

- Conservation and development can go hand in hand (co-existence) towards meeting the SDGs.

- Change of land use pattern is a major area of conflict and hence sustainable agriculture with increased productivity is the key

- Referring to "The Assam Trees Outside Forests (Sustainable Management) Rules 2022 it was elaborated that 54 species are exempted in Schedule I, and 14 shade species in Schedule II-Schedule III exempts agar and white sandalwood when they are meant for consumption within Assam. Hence it is evident that a major boost has been given to agroforestry in Assam, together with the establishment of the Assam Agroforestry Development Board.

- Timber-based agroforestry is not the only option; since a small farmer can't wait for even the shorter rotation species. Hence a bouquet of species – bamboo, medicinal, fruits, silk host, lac host, oil seeds, short and long rotation timber, green fodder for livestock, etc

- Need to incorporate the study of post-harvest activities also in organic farming, so that the impact of the complete value chain can be analyzed. A lot of post-harvest infrastructure and FPOs have been formed under MOVCDNER and hence inputs of PMU will be very important

- Keeping in view the extremely conducive climatic and edaphic factors in Assam there is huge potential of transitioning towards integrated organic farming systems together with agroforestry for making agriculture in Assam more climate resilient.

- Outlined the objectives of the proposed TEEB AgriFood Learning Landscape, as well as underlined the uniqueness of the Assam project.

- A recent NITI Aayog paper "Green Revolution to Amrit Kaal" is a very useful document for guiding the Project planning for both organic farming and agroforestry as well. This can be used to substantiate one thematic area where the results can be applied – which is crop diversification. This positively correlates with improved soil health and groundwater levels and overall ensures high productivity. For example-

    I. The States with the highest productivity of land are not the States with the highest productivity of rice and wheat. Rice and wheat productivity is highest in Punjab followed by Haryana, but the top three States in terms of aggregate land productivity are West Bengal, Himachal Pradesh, and Andhra Pradesh.
    II. The States that have shifted their area allocation and crop pattern in tune with changing demand patterns perform much better compared to those that have remained more or less rigid.

Assam agriculture is largely associated with paddy cultivation, though it has a high potential for scaling up oilseeds and pulses as well to contribute to India's basket of these 2 key commodities. The range of vegetables termed as 'exotic' on other parts of India is amazing. Floriculture, and medicinal plants – these are some of the other crops in which Assam can carve a niche.

In conclusion, Dr. Bhargava highlighted the potential of transitioning towards integrated organic farming systems with agroforestry in making agriculture more climate resilient. She emphasised that looking at food systems through the TEEB lens will enable greater appreciation of the impacts on the economy by way of valuation and monetization of the impacts on other capitals in addition to only yields.

## Dr. Vijay Kumar Sharma, Project Manager-TEEBAgriFood, CAFRI: Scoping and Scenario Setting Report for agroforestry and organic farming in Assam

Dr. Sharma delivered a presentation that began with an introduction to the Central Agroforestry Research Institute (CAFRI) and the various areas of focus that the institution is actively engaged in, along with the collaborating partners involved in the project. Additionally, he offered an in-depth background on the TEEBAgriFood initiative in Assam, emphasizing that the scoping process is currently underway at the state level. The expected outcomes of this workshop include scenario setting for the expansion of organic farming and agroforestry activities up to the year 2050, finalizing the elements to be evaluated across the four key capitals, and identifying the parameters and action plan for the TEEBAgriFood Learning Landscape. The context for Assam was mapped based on the secondary sources, and based on these sources, the three policy scenarios were projected. A concise summary of his presentation covering the study area and other project components is provided below:

- The physiography of Assam was discussed. It was highlighted that approximately 80% of the total area consists of plains, providing opportunities for expansion of sustainable agricultural practices.
- Assam elevation map was presented, revealing that 55% of the land lies below an elevation of 100 meters. Moving from east to west, the elevation gradually decreases, and the western parts, in particular, are more susceptible to flooding due to their lower elevations. These factors play a crucial role in identifying suitable areas for scaling up organic farming and agroforestry initiatives.
- Assam aspect and slope map were presented- around 74% of the land has medium to low slope. Analyzing the aspect and slope ratio is instrumental in assessing the suitability of areas for expanding agroforestry practices.
- Regarding soil health in the state, it was observed that there is a deficiency of macro-nutrients in most parts of Assam. This deficiency offers a greater scope for soil enrichment practices through organic farming.
- The land use land cover map of Assam was discussed, water bodies account for 4.7% of the region, vegetation covers 37%, cropland occupies 35% of the area, rangelands encompass 4.3%, and 14% is under built-up land. In the lower Brahmaputra and hilly zones, the forest cover is decreasing, and the incidence of forest fire is also increasing. Hill areas are prone to various degradational forces.
- 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.
- Assam holds a distinctive position concerning its agro-climatic conditions, and to capture the heterogeneity of the agroclimatic zones, the project was extended to Assam.

Assam Agroclimatic Zone Map
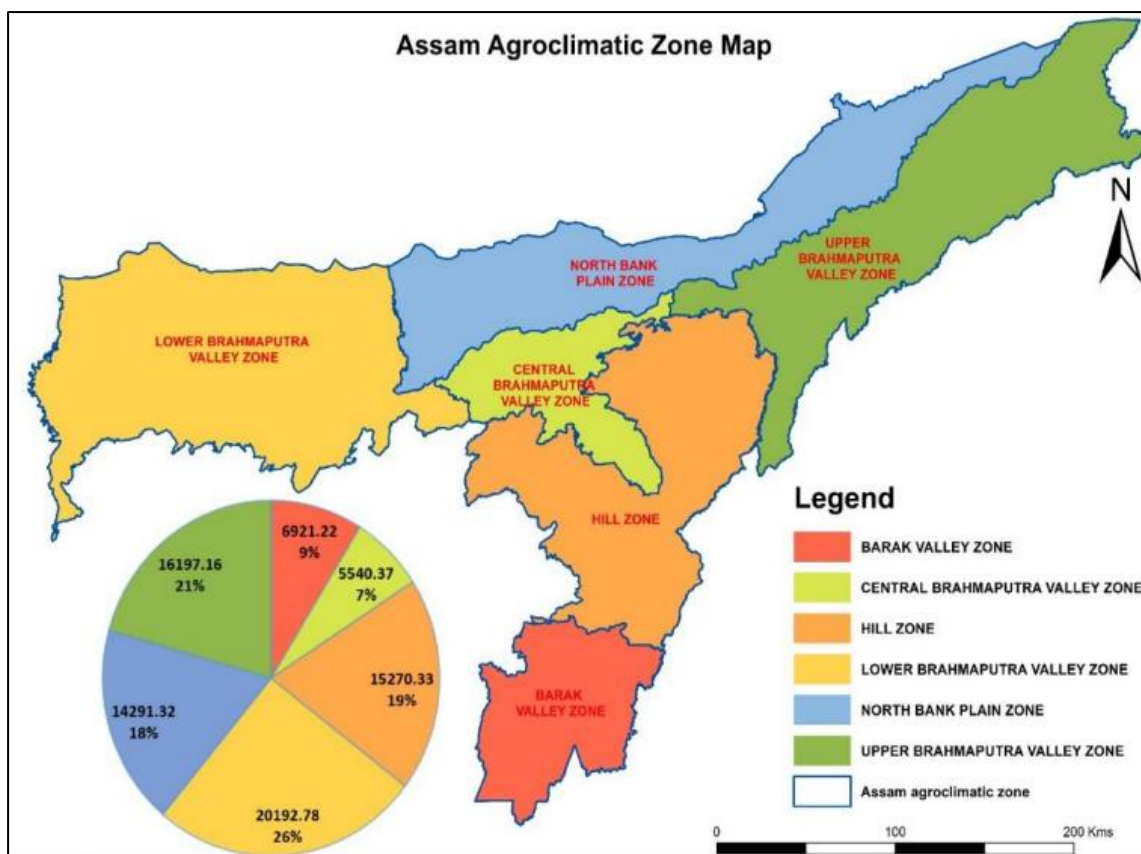
- Land degradation poses a significant issue in Assam, primarily driven by water erosion and waterlogging. Waterlogging has been increasingly contributing to the occurrence of floods.
- Assam's wasteland comprising of underutilized dense scrub, and open scrub has great potential to be utilized for adopting 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 state of human health in Assam is relatively poorer than the national average.
- The agricultural scenario in Assam was discussed, covering various aspects including the total net cropped area, gross cropped area, horticulture crop area, production and yield of major oilseed crops, as well as the livestock population.
- The area under traditional shifting cultivation in Assam accounts for 0.07% of 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. Prominent agroforestry models including Gamhar, Agar, Jati, Neem, Sissu, Teak based agroforestry systems were discussed.

- The human capital status was thoroughly examined, 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 lakhs SHGs are registered under NRLM and 0.7 million women farmers are covered under agro- ecological interventions.

- Organic farming and agroforestry in the state Forest Policy and Agriculture Policy were discussed in depth, which emphasise on the elements of sustainable agriculture practices covering both organic farming and agroforestry in the state.

- The status of produced capital was discussed, encompassing components such as the trends in the area and production of food grains, pulses, fruits, tea, rubber, coffee, and more. The growth of livestock, patterns in fertilizer consumption, organic fertilizer production, agroforestry area, proposed agroforestry models, trends in organic farming, and insights from MOVCD-NER were also discussed in depth.

- It was observed that the per-hectare fertilizer use in Assam is significantly lower compared to the national average, which signifies the potential for organic farming.

- Assam tea agroforestry was discussed in detail- a substantial source of income and a significant contributor to carbon stock.

- The need for assessment and documentation of the baree system in the state was emphasized, given that roughly 0.82 million hectares of land are under baree (traditional homestead gardens).

## Session III- Panel Discussion

### Dr. A. A. Ahmed, Retired OIC, AAU-AICRP on Agroforestry

Dr. Ahmed shared his valuable insights regarding the state of agroforestry in Assam, focusing his presentation on the significant issues and challenges associated with it. These key points can be summarized as follows:

- The history of the agroforestry system in Assam traces back to the 17th century during the Ahom Kingdom. At that time, the chief of the revenue office, Momai Tamuly Borbaruah, reconstituted villages to enhance revenue collection. He made the cultivation of Baree (a traditional agroforestry system) compulsory for each household, effectively turning it into a self-sustaining system that contributed to the economic upliftment of farming families.

- During this period, the designated area for each Baree was set at 533 square meters by the chief of revenue. As a result,2.7 million Barees were established. However, in the present context, the majority of land holdings are small and marginal, accounting for 85.57% of the total. Consequently, the size of individual Barees has significantly decreased. Nevertheless, the overall number of Barees has increased to 6.4 million today, largely due to the prevailing trend of land fragmentation.

- Addressing the initiatives aimed at documenting these traditional systems, Dr. Ahmed discussed previous and ongoing surveys conducted to assess the state's existing agroforestry systems. He also shared insights into the proposed scientific interventions aimed at modernizing traditional Barees.

- Dr. Ahmed outlined several agroforestry models recommended for Assam based on considerations of land type, climate, and soil suitability. Additionally, he provided

information about agroforestry models suited for Char (floating islands) and Chaporis (low-lying flood-prone riverbanks), involving water-susceptible species.

- Dr. Ahmed presented a few agroforestry models including homestead and summer rice, institutional tree plantation, bamboo in field boundary, fish cum paddy culture, and plantation in pond dyke. He also mentioned horticulture species- Pineapple with *Bambusa balcooa*, banana with *Bambusa tulda*, *Michelia champaca* in boundary, pineapple with areca nut plantation, etc.
- Bringing attention to certain issues, he discussed the high rates of silt deposition and erosion that are altering land use patterns, ultimately resulting in the loss of ecosystem services.

In conclusion, Dr. Ahmed recommended conducting a comprehensive study of agroforestry models and comparing them with agroforestry practices in both baree and open agroforestry systems.

Mr. Reuben Gergan inquired about the possibility of accessing the studies that have already been conducted on areas under the Baree system and other agroforestry models for further assessment under the TEEBAgriFood project.

## Dr. Hemen Kalita, Principal Scientist, AAU-Zonal Research Station, Shillongani

Dr. Kalita shared his valuable insights on the current status and future prospects of organic farming in Assam. His presentation revolved around key issues, emerging trends, and the challenges associated with organic farming in Assam, summarized as follows:

- Discussed the six agro-climatic zones within Assam, providing insights into the net cropped area and cropping intensity within each zone.
- Presented a comprehensive overview of food grain production trends since 2010, projecting the requirement of 89.86 lakh million tons of food grain by 2025-26 as per Agri Vision 2025.
- Current consumption patterns of chemical inputs in Assam's farming practices were highlighted. During the Kharif season, chemical consumption stands at 38.76 Kg/ha, rising to 97.29 Kg/ha during the Rabi season. This represents a significant increase compared to the NPK consumption in the year 2000, which was at 29.30 Kg/ha.
- Trends in the consumption of chemical fertilizers and bio-pesticides were presented to underscore the growing relevance of organic farming as a means of maintaining environmental harmony while sustaining farmers' livelihoods.
- Emphasized the critical importance of addressing food security in light of the expanding population and limited resources. He emphasized that production must be increased sustainably.
- While sustainable agricultural practices may appear to be a comprehensive solution, Dr. Kalita outlined the various challenges associated with the adoption of organic farming. These challenges include the absence of adequate market facilities, limited exposure to high-quality organic products from Assam in both domestic and international markets, a lack of access to organic seeds, insufficient storage facilities, issues related to weed management, the impact of floods and climate change, farmers' limited experience, a lack of financial, technological, and infrastructural support, inadequate advertising and brand development, and the bulkiness of many organic inputs, among others.

The potential for organic farming in Assam was discussed in detail, with an emphasis on the increasing shift toward organic products driven by health and environmental concerns. Additionally, the following significant points were highlighted as reasons why Assam serves as a promising hub for the expansion of sustainable agricultural practices:

- Organic cultivation of crops such as turmeric, ginger, oranges, black pepper, chili, Assam lemons, and pineapple has gained momentum in Assam.
- The growing demand for organic tea, recognized for its medicinal properties, has inspired small and marginal tea farmers in Assam to venture into organic tea production. Consequently, a total of 45 organically growing tea estates are found in Assam, which accounts for the highest number of organic tea Estates in the nation.
- The Assam Seed & Organic Certification Agency (ASOCA) plays a crucial role by providing institutional support for certifying organic produce.
- Availability of rock phosphate in Assam and plenty of naturally available water facilitate the adoption of sustainable agricultural practices among local farmers. Sociological and cultural factors also contribute to the popularity of such practices.
- Government statistics reveal that, out of the total cultivated area of 4.3 million hectares, approximately 3.092 million hectares have never been exposed to chemical or inorganic fertilizers in Assam.
- Several agricultural products from Assam, including ginger, litchi, joha rice, boka chaul, kaji nemu, and chokuwa rice, have been granted Geographical Indicator (GI) tags, recognizing their unique quality and origin.

In addition, Dr. Kalita discussed a range of national and sub-national initiatives aimed at promoting organic farming in Assam. These initiatives also proved instrumental in formulating three policy scenarios for the state, including Business as Usual (BaU), Optimistic, and Pessimistic scenarios. These initiatives included:

- Under the 'Chief Minister's Organic Farming Scheme' a total of 300 hectares of land have been brought under organic cultivation.
- The state agriculture department initiated a pilot scheme jointly with the government of India in 2004 for organic farming in the districts of Udalguri, Sonitpur, and North Lakhimpur. This initiative covered an area of 91 hectares and involved 154 farmers.
- The conversion of 8100 hectares of land in the state to organic production through the Paramparagat Krishi Vikash Yojana (PKYV) and Mission Organic Value Chain Development in North East Region (MOVCDNER) schemes.
- Dr. Kalita also mentioned initiatives by the Assam Agricultural University (AAU), including the mass production of biofertilizers and pesticides, organic seed production, and engagement with farmers through Krishi Vigyan Kendras (KVKs).

Following the presentation, the UNEP-TEEB team requested reports of the studies conducted on pesticide and fertilizer consumption on farms and its potential correlation with health outcomes.

## Prof. Kanak Haloi (Retd.) CMD, Foundation for Integrated Support & Solutions (FISS)

Prof. Haloi discussed prospecting jhum cultivation through diversification options in the context of making nature's invisible values visible. He initiated his discussion by explaining the fundamental aspects of jhum cultivation including the duration of cultivation, the fallow period, conservation strategies, crop variety, farmers' approaches, types of crops cultivated in jhum fields, and the harvest season. Prof. Haloi also addressed the common narrative around jhum cultivation, which is often criticized for forest clearing and nutrient depletion. However, it was emphasized that this practice actually enhances soil fertility (if the jhum cycles are long enough).

The key points regarding the prospects of jhum cultivation are summarized as follows:

- The jhum cultivation starts in March-April and ends in December-January with the harvesting period extending from May to December or possibly even January.
- The land is left fallow for a duration of 6 to 9 years before being utilized for cultivation for a period of one to two years. However, the duration of fallow is currently reducing.
- Conservation measures include the construction of crossbars and vegetative barriers on slopes to mitigate soil erosion.
- This practice doesn't involve the use of chemical fertilizer.
- It incorporates mixed and multi-storied cropping practices.
- The crops that can be cultivated on the jhum fields include cereals, pulses, oilseeds, leafy and non-leafy vegetables, spices, and fruits.

Dr. Haloi briefly touched upon the Baree system in Assam and defined it as a homestead concept, representative of a micro-habitat of plants, crops, and water bodies besides the dwelling unit and representative of a unit of diversified land-use-land-cover practices (vegetable, fruits, spices, bamboo, timber –fuel-fodder, fish pond).

Lastly, he discussed the wetland ecosystem found in the plains. The Beel (wetland) offers an array of hidden ecosystem services in addition to tangible services. The total area covered by Beels in Assam spans 1400 square kilometers, with a total count of 3000 Beels. However, these wetlands confront significant challenges, primarily stemming from encroachment, siltation, conversion into agricultural land, invasion of weeds, and pollution.

## Mr. Neelam Dutta, Progressive Farmer, Pabhoi Greens, Sonitpur

Mr. Dutta provided an overview of Pabhoi Greens, which has emerged as a central hub for supplying organic seeds in the country. Established in 1976, Pabhoi Greens has garnered expertise in producing, processing, storing, and packaging organic seeds, holding a certified organic farming status. It has formed two international partnerships, one with Sativa, a Swiss organic seed-breeding company, and another with Reinsaat, an Austrian organic firm.

Mr. Dutta then delved into the activities conducted by Pabhoi Greens:

- Propagating over 500 varieties of organic vegetable seeds successfully.

- Engaging in research and development to create locally adaptable, climate-resilient, high-yield organic seeds that can rival F1 hybrid seeds in terms of yield, size, taste, nutrition, and diversity. This reduces reliance on inorganic F1 hybrids and chemical inputs.

- Empowering farmers through seed preservation techniques to promote sustainable agriculture.

- Implementing a community-supported model (CSA) that fosters a direct connection between consumers and producers, eliminating intermediaries.

- Utilizing bamboo structures and eco-friendly double-storied raised bed nurseries for soil-free germination of seedlings.

- Maintaining a gene pool of 200 rice varieties and practicing fish-cum-paddy cultivation based on traditional Apatani community methods.

- Advocating for landraces, green manuring, crop rotation, and agricultural diversity in farming practices.

- Engaging in vermicompost production, bio-pesticides, mushroom cultivation, apiculture, tissue culture, and bio-dynamic preparations.

- Managing a 2-hectare organic tea garden.

- Conducting training and community-building initiatives since 2008, focusing on seed conservation, production, breeding, fishery, organic farming, and more.

- Establishing three farmers' cooperative societies in Nagaland and supporting women-led field-level research stations in Nagaland and Arunachal Pradesh, where women actively participate in learning about sustainable brassica, herb, and carrot seed breeding.

Lastly, Mr. Dutta addressed the challenges hindering the expansion of area under organic cultivation, citing the lack of reliable data. He emphasized the need to educate and change the mindset of farmers towards adopting organic farming.

## Moderator's Comment- Dr. D.K. Rajkhowa, Former Joint Director, ICAR, Research Complex for NEH Region, Medziphema, Nagaland

Dr. Rajkhowa summarised the session and addressed some of the prominent challenges faced by the entire nation, including issues related to invasive species and the accumulation of heavy metals in crops. Given Assam's unique attributes such as abundant water resources, fertile soil, biodiversity, and agro-biodiversity, he emphasized the necessity of adopting organic farming approaches to specific locations and crops, as a one-size-fits-all framework is not applicable universally. He highlighted the fact that 50% of bamboo species are found in Assam, underlining the promising prospects for agroforestry within the state. Noting that agroforestry is not a new concept in Assam. Dr. Rajkhowa made several key points:

- Emphasized the importance of conserving and propagating agricultural biodiversity, with the potential for creating a gene pool.

- Highlighted the role of "composite agriculture" in adapting to changing climatic conditions, particularly in the context of organic farming systems.

- Identified various plant and multipurpose tree species with significant potential in Assam, including jackfruit, moringa, and multipurpose woody species.

- Addressed the existing challenges related to marketing and storage infrastructure.

- Mentioned a few ongoing jhum improvement programs in hill districts.

- Discussed the transformation of Beel and swampy areas into economically viable organic farming or agroforestry, underscoring the crucial role of water as a precious natural resource. He called for improved water efficiency, sustainable utilization, water harvesting, and effective management of residual moisture. Dr. Rajkhowa also noted that certain districts are experiencing drought-like conditions due to limited moisture availability.

- Concluded the session by discussing the creation of a value chain, tackling infrastructure issues, and the North-East Vision Document 2047.

In summary, Dr. Rajkhowa provided insights into the specific challenges and opportunities in Assam's agricultural landscape, highlighting the need for specific approaches and sustainable practices to address these issues effectively.

## Session IV: Panel Discussion-II

### Dr. Rupanjali Baruah, Tocklai Tea Research Institute (TTRI)

Dr. Baruah began by addressing the topic of tea within the context of TEEB. She provided a brief introduction to the Tocklai Tea Research Institute, established in 1911, which plays a pivotal role in the research and development of 75% of Indian Tea. Dr. Baruah highlighted the primary challenges confronting tea production, which include the direct and indirect impacts of climate change, along with declining labor productivity.

She proceeded to discuss the availability of data pertaining to tea at TTRI, summarizing the key points as follows:

- TTRI possesses comprehensive ground-level climatic data dating back to 1980. This data reveals a consistent increase in rainfall, exceeding 220 mm since the 1980s, and a significant temperature rise of 1.3 degrees Celsius starting from 1923.

- Simulation studies have been conducted to foresee the future of tea cultivation in the state, indicating a significant temperature increase in major tea-growing areas. The Cachar district is particularly vulnerable.

- Emphasized the fluctuation in rainfall patterns, with maximum rainfall occurring during the monsoon season, leading to potential flood-related issues. She pointed out that while total rainfall remains constant, the overall distribution will be impacted, disrupting the tea production cycle.

- She also discussed the suitability of tea-growing areas, suggesting that current regions may not remain suitable in the future, with a possible shift towards higher altitudes. Presently, Upper Assam is deemed suitable for tea cultivation.

- In addressing biotic and abiotic stresses, Dr. Baruah underscored the extensive use of pesticides and fertilizers in the state, which necessitates careful assessment.

- Regarding the prospects of organic farming and agroforestry, she highlighted the significant proportion of land dedicated to tea cultivation in the region. Organic tea farming holds great potential, although challenges such as declining productivity, soil degradation, pH levels, and

local conditions need to be considered. Planting trees around tea gardens, a common practice for tea protection also presents opportunities for agroforestry.

- Dr. Baruah mentioned that 19 tea estates in Assam have already transitioned to organic farming, covering an area of approximately 6,000 hectares.

In conclusion, she emphasized the need to identify degraded areas suitable for upscaling agroforestry. Additionally, there is a necessity to pinpoint areas suitable for organic tea cultivation. The management of shade trees and shelter belts represents a promising avenue for sustainable agricultural practices.

## Dr. Ujjwal Kumar, Assistant Professor, School of Environment and Natural Resources, Doon University, Dehradun

Dr. Kumar presented his research regarding the impact of climate change on the Agroforestry system in Uttarakhand, using a neural network modeling approach. His presentation primarily focussed on the analysis of the distribution of agroforestry areas in Uttarakhand, including future expansion projections. The variables taken into account for this study encompassed factors such as altitude, slope, aspect, NDVI (Normalized Difference Vegetation Index), temperature, precipitation, and soil type. The climatic scenario adopted for this study was RCP 4.5. A similar study is proposed for Assam with the aim of assessing potential agroforestry expansion and evaluating climate change impact using the SSP (Shared Socio-Economic Pathway) scenario. The assessment in Assam will include the following aspects:

- The neural network model developed for Assam will be applied in conjunction with the SSP scenario and the agroforestry distribution will be simulated under the changed climatic conditions.
- Another significant aspect to be explored involves the simulation of aerosol distribution and its impact on vegetative productivity in Assam.

The TEEB India team provided insights into ongoing work in the other two states where scenarios are built, taking into consideration both policy interventions and climatic factors. Additionally, they requested studies on ozone and its effects on crop yields within the context of aerosol modeling.

## Dr. Diganta Sharma, TOFI program in Assam (MoEFCC & USAID project)

Dr. Sharma provided an overview of the Trees Outside Forests in India (TOFI) initiative, a joint project between the United States Agency for International Development (USAID) and the Ministry of Environment, Forest and Climate Change (MoEFCC) of the Indian Government. This five-year project running from 2022 to 2027, aims to expand tree coverage outside forest areas to benefit both livelihoods and the ecosystem. Dr. Sharma discussed various policy measures and actions taken by the state related to tree planting and made the following contributions to the discussion:

- Mentioned the significant impact of the Godavarman case, which led to the definition of forests and the implementation of strict rules and regulations regarding tree felling. Management plan became mandatory for tree felling, but recently, several state governments have relaxed their felling policies to encourage commercial tree plantation.

- Highlighted that in Assam, several plywood and sawmill operations had been shut down, resulting in the migration of many mill workers from Assam to Yamunanagar in Haryana and other states in search of mill-based employment.

- Mentioned that earlier this year, 57 tree species were deregulated, and planting beyond 5 kilometers of reserved forest areas was made allowed without strict regulations. However, online registration and certain processes are still required for permission to fell trees within the 5-kilometer radius of reserved forest areas. TOFI has also identified specific tree species for commercial planting.

- Dr. Sharma noted that the mills in Assam source their raw materials from Meghalaya, Andhra Pradesh, and Gujarat, leading to high expenditure costs.

- Identified the districts of Jorhat, Sivsagar, Tinsukia, Dibrugarh, Naogaon, and Morigaon as those covered under TOFI.

- Discussed planting of 1 lakh seedlings in various locations in Assam after consulting with stakeholders and raising 10 lakh nursery seedlings in Kamrup (rural and metro) and other areas.

In conclusion, he highlighted TOFI's collaboration with AADB (Assam Agroforestry Development Board) and its efforts in capacity building and awareness programs for farmers and the general public. TOFI is actively working with farmers in Jorhat, Golaghat, and Sivsagar to plant seedlings. The initiative promotes Medicinal agroforestry schemes, legumes, and intercropping in many areas. Agarwood agroforestry is also being promoted in Jorhat, Titabor, and Golaghat. Institutional schemes are being developed for stakeholders such as Public Good Schemes for the Indian Army.

## Dr. Dipayan Dey, South Asian Forum for Environment, Moderator's comment

Dr. Dey provided a summary of the session and reiterated several key points from the discussions:

- The potential for incorporating tea within the two verticals of the TEEBAgriFood study, emphasizing the need to thoroughly examine parameters influencing the expansion of tea production and other crops as part of the assessment.

- Building upon Dr. Kumar's presentation on modeling approaches, Dr. Dey emphasized the importance of validating simulation models with policy scenarios. Overlaying policies and climate scenarios onto aerosol modeling aligns with the strategies being undertaken by the other two states under the TEEBAgriFood initiative.

- The example of Majuli Island and its unique attributes to be considered when developing a roadmap.

In conclusion, Dr. Dey emphasized the necessity for collaboration among various partners, individuals, and institutions in conducting this scoping exercise for the state of Assam. He underscored the expertise of individuals from institutions such as ICRAF, IWMI, Doon University, Tocklai Tea Research Institute, and others would be required and would add value to this scoping exercise.

# Session V: Open Forum Discussion

## Mr. Bishak Roy Choudhury, Sr. Project Consultant, and Mr. Chinmoy Hait, Project Consultant, MOVCD-NER

Mr. Choudhary provided an overview of Mission Organic Value Chain Development in the North-East Region (MOVCD-NER) which is a Central Sector Scheme, a a component of the National Mission for Sustainable Agriculture (NMSA), launched by the Ministry of Agriculture and Farmers Welfare for implementation in the north-eastern states. The discussion is summarised below-

- The MOVCD-NER scheme is primarily focused on developing value chains in the northeastern states. As of now, there are 379 Farmers Producer Organizations (FPOs) and over 1.8 lakh registered under the scheme. Additionally, more than 1.73 hectares of land in the entire northeast have received third-party organic certification. In Assam specifically, 40 FPOs/FPCs are operating in 8 districts, covering 20,000 hectares of land with 19,701 registered farmers.

- The Assam State Organic Mission Agency (ASOMA) is responsible for promoting organic practices in Assam.

- The scheme encompasses various components, from production to products reaching consumers. It provides subsidies for planting materials and establishes collection centers for aggregation, small-scale processing units, integrated packaging houses, and transportation. These components contribute to the development of the organic chain in the northeastern region.

- The MOVCD-NER team highlighted several crops in high demand at national, sub-national, and international markets. Farmers involved in FPOs are able to directly export their products overseas, fetching good returns for their value-added goods. For instance, Assam lemons are exported to London, while pineapples from Lakhimpur reach Lulu Mall in Dubai. There is an increasing demand for organic spices from the northeast, especially for crops like Suganmantri and aromatic and medicinal plants from forest areas. Perila, a crop with higher oil content than other oilseed crops, is also in demand, especially in South Asian countries. Additionally, specific qualities of northeastern commodities, such as premium North East turmeric and high-quality ginger from Mizoram, cater to unique market preferences.

- MOVCD-NER engages in contract farming with reputable buyers who seek assurance of produce buyback and those who engage in commercial farming are also getting secure markets for their produce. The initiative has started promoting produce in Middle Eastern countries due to less stringent regulations compared to the EU, even the Indian market has huge potential. The team also emphasized the fact that organic exports have seen growth post-COVID.

- When questioned about the self-sufficiency of FPOs without MOVCD-NER support, the team indicated that the process has already begun. Some FPOs have achieved turnovers exceeding 5 crores, with 40-50 FPOs out of 379 having turnovers exceeding one crore. While support for organic certification is still needed from the ministry, some older FPOs are renewing their certificates independently.

- Regarding the significantly lower number of FPOs in Assam compared to the rest of the northeast, the MOVCD-NER team explained that Assam has identified and certified the first

500 hectares of organic land, and ministries are extending support to potential FPOs, encouraging more farmers to engage in organic farming. The team also noted a positive response to organic farming adoption in the state. Farmers are incentivized to transition to organic practices as they receive a three-year period for organic certification, followed by the option to renew independently. FPOs are encouraged to pursue Participatory Guarantee Systems (PGS) for crops consumed locally and third-party certifications for export-oriented crops.

- The team also informed that MOVCD-NER supports FPOs in marketing and value chain aspects, facilitating their integration into ONDC (Open Network for Digital Commerce), e-commerce platforms, and partnerships with entities like Walmart. Training programs for farmers are conducted in phases, with the first 20 FPOs and subsequent groups receiving such training. The team highlighted that baseline data, including information on packaging houses, transportation, and infrastructure, is available on the MOVCD-NER official website, which can be used for modelling and valuation purposes.

## Dr. Sarat Saikia, Assam Agricultural University

Dr. Saikia, referring to the agroforestry systems in Assam, mentioned that many ecosystems in the state have naturally developed due to farmers' practices. Over 50 agroforestry ecosystems are dispersed throughout the hilly and central regions. He also discussed the research in the field of environmental economics and conveyed the following:

- When discussing the economics of ecosystems, he noted the limited number of publications in this particular domain. Dr. Saikia listed some research conducted in areas such as Goalpara, Guwahati City, and Barak Valley.

- Noted the absence of comprehensive assessments regarding ecosystem services. He emphasized the need for both short-term and long-term strategies, along with district-wide missions, to evaluate these ecosystem services thoroughly.

- These studies play a crucial role in educating and informing the public, attracting policies, and encouraging initiatives aimed at conservation and nature-based solutions.

## Dr. Jiten Malakar, Former Director, Soil Conservation Department

Dr. Malakar discussed the watershed management program of 2000, particularly the National Watershed Development Programme for Rainfed Areas (NWDPRA), and highlighted initiatives like Amrit Sarovar. He articulated the following points during his discussion:

- Referred to the two primary components, the production system and livelihood within the natural resource system.

- Recommended the adoption of plantation methods and tree species that align with the main crops.

- Emphasized the importance of transforming cultural wasteland into arable land. Once the fertility of the wasteland is somewhat restored, efforts should be directed toward

implementing climate-resilient water management practices, livestock management, integrated farming, and more such practices.

- Referring to the statistical data, shared that approximately 10 lakh hectares of wasteland could be utilized for developing agroforestry systems.

- Stressed the potential for developing agroforestry ecosystems alongside the cultivation of cash crops like turmeric and ginger, with a focus on climate-resilient systems.

- Additionally, suggested that marshy and swampy lands, as well as areas abandoned after jhum cultivation, could be targeted for such sustainable agricultural practices.

## Ms. Preeti Buragohain, Deputy Conservator of Forests, Forest Department, Assam

Ms. Buragohain, representing the Assam Agroforestry Development Board provided an introduction to AADB, a Section 8 company registered under the Companies Act of 2013. The Board of Directors is headed by the Chief Secretary and comprises representatives from various departments, including Panchayat and Rural Development, Environment and Forest, Agriculture, Industries, and Commerce. Their primary focus is on the production of Quality Plantation Material (QPM). She also discussed the key areas of AADB's work, which include:

- Quality Planting Material for native species, with a preference for commercial and fast-growing species.
- Standardizing plantation techniques, such as block bunding and intercropping.
- Revitalizing traditional systems like Barees.
- Providing capacity building, training, and awareness programs.
- Collaborating with policies like the National Afforestation Program (NAP) and Paramparagat Krishi Vikas Yojana (PKVY), especially in the agroforestry component.
- Utilizing funds from Corporate Social Responsibility (CSR) initiatives.
- Promoting the tree economy.

In response to a question about the potential expansion of agroforestry by 2030 and the preferred species, Ms. Buragohain mentioned that farmers tend to favor fast-growing species that are in demand by industries. AADB has also developed a website, where all wood-based industries are registered, and additional steps are being taken to expand agroforestry.

## Session VI: Scenario Setting and TEEBAgriFood Learning Landscape

The TEEBAgriFood framework offers a structured approach to valuing ecosystem services, with the goal of recognizing, capturing, and demonstrating their value, and integrating them into decision-making processes. In India, our efforts are concentrated on organic farming and agroforestry. Last year, a decision was made by the Project Steering Committee to expand the project to Assam. In the other two states, under the TEEBAgriFood initiative, the two research partners have been evaluating interventions like Namami Gange, Paramparagat Krishi Vikas Yojana (PKVY), and several others. With regard to the Northeast, the project aims to assess the Mission Organic Chain Development in the North-East Region (MOVCD-NER) and the National Bamboo Mission.

CAFRI has developed a draft scoping report and scenarios that encompass three policy scenarios. The Business-As-Usual (BAU) scenario is based on past trends and it aims to evaluate the ecosystem services until 2050 if organic farming and agroforestry continue to expand at their current growth rates. In the Optimistic scenario, policy support, market linkages, and infrastructure development are taken into account, and projections are based on this. Conversely, the Pessimistic scenario considers a lack of policy support. The aim is to assess the feasibility of these projections in Assam. Based on the modeling exercise and assessments, further economic valuations will be carried out.

Another important component of the project in Assam is the learning landscape, where the aim is to implement an action plan that incorporates the best sustainable agriculture practices. The workshop is convened to seek input to determine the most suitable physical landscape for these practices.

The three scenarios proposed by the CAFRI team are as below:

| |
|---|
| Scenario 1 (BAU + RCP 4.5 Climate Scenario) <br><br> Organic Farming – Expansion of organic certification @ 4%/year) – <br><br> Agroforestry – 25% of the net cropped land (0.70 million hectares)- as per the ICAR-CAFRI data |
| Scenario 2 (OPTIMISTIC POLICY + RCP 4.5 Climate Scenario) <br><br> Organic Farming – Expansion of organic farming @10% growth rate/year) which will make the entire state organic in 2050 – <br><br> Agroforestry – 5 % annual growth rate to the base area of 0.70 million hectares |
| Scenario 3 (PESSIMISTIC SCENARIO + RCP 4.5 Climate Scenario) <br><br> Organic Farming – Reduction of the area under organic farming @ 5% per annum which will reduce the net cultivated area under organic farming (OF & Conversion) to 2.18% of the net sown area. Agroforestry – no increase/no decrease in area under agroforestry - RCP 4.5 – Medium GHG Emissions Scenario |

During the consultation, these three scenarios were presented to the stakeholders. Following extensive discussions and receiving a diverse range of opinions/suggestions on the projected figures for all three policy scenarios, it was decided that a committee would be formed post-consultation to carefully review and revise the scenarios, taking into consideration the existing data available from both government and private entities. The CAFRI team informed participants that these projections will serve as inputs for modelling to assess ecosystem services in monetary terms as sustainable agricultural practices are expanded in the state.

Here are some key points that emerged during the consultation:

- In a business-as-usual scenario, organic farming is expected to grow by 4% annually. This growth will include both PGS and third-party certification.

- The agricultural profile of Assam was discussed to determine the possibility of upscaling organic farming.

| Total cultivable land | 30.16 lakh hectares (98.77% rural) |
|---|---|
| Net cropped area | 28.11 lakh hectares (36 % of geographical area) |
| Gross cropped area | 40.99 lakh hectares |

- Representatives from MOVCD-NER mentioned that Assam has a gross cropped area of approximately 4 million hectares. Currently, the land under organic farming is 20,000 hectares, which accounts for less than 1% of the total cropped area. Given this context, the proposed 4% expansion rate in the business-as-usual (BaU) scenario appears quite ambitious. Consequently, they suggested that, after a thorough examination of the available data with the state government, it might be more reasonable to reduce the growth rate to 2% in the BaU scenario. They also pointed out that baseline data for organic certification could be utilized for this analysis.

- During the discussion, it was noted that there is a need to highlight areas with the potential for organic farming and identify the crops that can be given priority for organic farming. Additionally, it was stressed that the determination of the total area for conversion into organic farming should be carried out thoughtfully. Dr. Rajkhowa highlighted examples like Nagaon and Morigaon, noting that these districts have the highest pesticide usage and as a result, it could pose significant challenges if these areas were chosen for a complete transition to organic farming.

- It was requested that the data from the MOVCD-NER website be reviewed, as it appears to indicate that the area under organic farming is 1.8 million hectares, which does not align with the actual data. The area under organic farming is 20,000 hectares in Assam.

- Dr. Vijay Kumar Sharma inquired about the data used for projections, pointing out that government documents indicate that approximately 72% of the net cultivated area, or 30.93 lakhs or 4.3 million hectares, has never been exposed to chemical or inorganic fertilizers. However, clarity on the certification is needed, if these areas are certified or not. It was emphasized that data regarding organic certification, whether through PGS or a third party, should be taken into account for the projections.

- Dr. Saikia pointed out that at the state level, there would be areas/ districts with high, medium and low levels of input intensity. Therefore, the projections should take into account such data when assessing the scaling up of organic farming. The TEEB-India team responded that IIFSR's report on identifying the potential area for organic farming is being taken into consideration for this purpose.

- Mr. Sazzad Alam, Joint Secretary, Industries and Commerce department, suggested that from a policy perspective, it is important to determine the quantity of biopesticides that can be supplied to farmers. He stressed the importance of ensuring a sufficient supply because if large-scale availability cannot be guaranteed, farmers might opt for more readily accessible alternatives. He pointed out that in organic farming, there are relatively fewer choices available to farmers for pest and disease management compared to conventional farming.

The discussion on agroforestry brought up several significant points-

- Non-forest geographical areas should be targeted for the purpose of expanding agroforestry systems, and projections should be in accordance with the available non-forest and wasteland areas.

- Approximately around 10 lakh hectares of land are categorized as wasteland and homestead gardens and this information should be considered for projections.
- Jhum abandoned area and area for development projects should be targeted for expanding agroforestry activities.
- It was noted that homestead gardens and trees on farmlands or backyards are not properly documented; hence, appropriate projections should be made keeping these non-documented data in mind.
- While bamboo primarily exists in forests, farmers are not incentivized to cultivate bamboo. It was discussed that besides timber, medicinal and aromatic trees should be considered, as these commercial trees have a growing demand in international markets. Additionally, fruit-bearing trees can address nutritional needs.
- It was also noted that forest bamboos are difficult to access because of policy restrictions. As a result, many mills have been shut down.

Regarding the Optimistic scenarios, it was decided that further discussions regarding state policies are necessary to support these projections. MOVCD-NER confirmed the data showing a decrease in fertilizer use per hectare, which should be taken into account as supporting evidence for the optimistic projection. It was collectively agreed that a 10% annual growth rate expansion appeared to be quite ambitious.

- Dr. Sharma informed that in the state agriculture policy- organic farming has been separately talked about with the vision of transforming Assam into an organic hub, and such policies were taken into account while projecting the scenarios.

- Regarding the optimistic projection of turning the entire state into organic farming by 2050, it was emphasized that the shift to organic from conventional should be in a phased manner and not all at once. There was also a recognition that the idea of achieving 100% organic farming is a subject of debate, as it could potentially have counterproductive effects, citing the example of Sri Lanka.

- Under the 'Chief Minister's Organic Farming Scheme' a total of 300 hectares of land have been brought under organic cultivation and 8100 hectares of land of the state have been converted to organic production under the scheme of Paramparagat Krishi Vikash Yojana (PKYV) and Mission Organic Value Chain Development in North East Region (MOVCDNER) involving 11923 in different districts of Assam- this should be considered for projecting optimistic scenario of upscaling organic farming.

**Summary of discussion regarding scenario building is as follows-**

- Under **BAU** scenario for organic farming, careful rate of growth must be selected in the range of 1-2 percent / year. The area under MOVCD-NER may be cross checked with actual figures.

- Under **BAU** scenario for agroforestry the current assessment of 7 lakh hectare may continue but the proportions need to be of the gross cropped area.

- Under **Optimistic** Scenario for organic farming the rate of growth needs to be re-worked out as the 10 percent growth is exceptionally high.

- Under **Optimistic** Scenario for agroforestry the rate of growth by 5 percent to the base area of 0.7 million hectare seems reasonable.

- Under **Pessimistic Scenario** for organic farming the rate of negative growth may be kept in consonance with the rate under BAU scenario.

- Under **Pessimistic Scenario** for agroforestry negligible growth in area seems reasonable keeping in view of various natural processes causing degradation.

Discussion on prioritised elements of four capitals for assessment

The table below presents the proposed elements for study and tools proposed for the study.

| Capital | Elements | Methodology |
|---|---|---|
| Natural | Carbon Sequestration<br>Soil Health and Erosion<br>Flood regulation<br>Water Yield<br>Agro-biodiversity | InVEST suite of models, Soil and Water Assessment Tool (SWAT) |
| Produced | Rice and Tea Yield (economic yield)<br>NTFP Provisioning Services (Bamboo) Post harvest infrastructure (some key illustrative ones for this phase like cold chain, storage) | Econometric Models |
| Human | Population<br>Literacy & Skills<br>Human Health | Sustainable Livelihood Security Index (SLSI) |
| Social | FPOs<br>SHGs<br>Women Empowerment | Women Empowerment in Agriculture Index (WEAI) |

The elements of the four capitals and methodology presented were broadly agreed by the delegates. However, a few important points were noted-

- Crops having additional benefits of being produced organically can be taken in the produced capital. Turmeric and Ginger were suggested.
- Suggestions were made to include groundwater and irrigation projects in the study. In response, the TEEB and CAFRI teams indicated that they could provide scientific reasoning on these aspects by assessing water yield.
- Baseline data on post-harvest infrastructure is available with MOVCD-NER which can be useful for the assessment of produced capital.

## Discussion on TEEBAgriFood Learning Landscape (TAFLL)

TEEBAgriFood Learning Landscape (TAFLL) is proposed to be established in Assam as part of the exit plan of the project to showcase best practices for sustainable food systems based on the results emerging from the analysis in the project and also provide study area for further research, capacity

building of farmers for climate resilient agriculture. This is also to make full use of the learnings gained during the entire project in the three states- two in the Ganga Basin and one in Assam.

The establishment of TAFLL in Assam will provide an opportunity for cross-state learning. Given Assam's distinctiveness, encompassing six agroecological zones, there is potential to extend the underlying principles to various regions within these states and to other agroecological zones across India. The two verticals of the project- organic farming and agroforestry, will remain central themes in this landscape, serving as a valuable future reference for shaping policy and programmatic interventions.

The focus has largely been on the production process, with no major emphasis on the post-production process. Therefore, the focus within the TAFLL will be on bringing sustainability elements into the primary processing, transport, storage facilities, cold chains, and marketing. Farmers would be aggregated into Farmer Producer Organizations or Cooperatives for the purpose of economies of scale to facilitate the adoption of technology, optimization of resources, and bargaining power for better prices including by contract farming.

For the purpose of learning landscape, the suggested criteria for area selection are as follows -

- presence of active clusters/FPOs established under MOVCD-NER
- Convergence with SHGs and/ or cooperatives
- Areas having the potential for establishing IOFS models
- Areas having potential for holistic development for robust agri value chains.

Mr. Bhaskar Pegu, Director, Agriculture, Government of Assam, suggested an area in Majuli that was focused on being developed as a carbon-neutral district can be targeted for this purpose. During the discussion, Kamrup (rural) was also suggested to be considered for setting up the TAFLL where a lot of initiatives have been taken for the plantation of trees outside forests, livelihoods of communities, as well as organic farming. The support of Assam Agriculture University Kahikuchi station at Guwahati, Krishi Vigyan Kendra would be easily available.   A note is to be prepared for discussion with senior officers of Govt of Assam

## Concluding Remarks

### Mr. Sazzad Alam, Joint Secretary, Industries and Commerce Department, Assam

Mr. Alam shared insights regarding the industrial aspect of agroforestry and offered several suggestions, including:
- Identifying the need for comprehensive development of a strong agricultural value chain, particularly in bamboo and agar.
- Highlighting the high waste production associated with bamboo and recommending its consideration.
- Recognizing the severity of stubble burning in the northern region and suggesting its utilization.

Overall, Mr. Alam recommended that the project should promote the concept of a circular economy.

## Dr. Arunachalam, Director, CAFRI

While pitching the implementation of the TEEB Initiative in Assam, it was stressed that the participation of diverse stakeholders was crucial in the finalization of the scoping report. Dr. Arunachalam briefed on the partnership of various institutions and individuals in shaping up the scoping report such as Tocklai Tea Research Institute, Jorhat; Doon University, Dehradun; ICRAF-India Office, New Delhi, Assam Agricultural University, South Asian Forum for Environment and many such others through letter of agreement. This collaborative effort was endorsed given the importance to ensure the timely delivery of project outcomes.

Dr. Arunachalam also informed that a detailed action plan for the TEEB AgriFood Learning Landscape would also be prepared for further discussions.

## Action Points

- The corrected information on the organic area under MOVCD-NER shall be collected– **Action by ICAR-CAFRI and EY Representatives.**
- Scoping scenario building and analysis using various models and tools with the help of the UNEP Team and other partners by ICAR-CAFRI. A core committee may be constituted to facilitate the finalisation of report. - **Action by ICAR-CAFRI.**
- Finalisation of the scoping report - **Action by ICAR-CAFRI**
- Development of Action Plan for TEEBAgriFood Learning Landscape (TAFLL) with the help of different partners, stakeholders, and UNEP – **Action by ICAR-CAFRI and UNEP TEEB**

# List of Delegates

## (Physical Mode)

| Sl. No. | Name | Organization |
|---|---|---|
| 1. | Dr. C. Biradar | Country Director ICRAF, New Delhi |
| 2. | Dr. A. Arunachalam | Director, ICAR-CAFRI, Jhansi |
| 3. | Mr. Abhishek Singha | Founder, All & Sundry NGO, Golaghat |
| 4. | Dr. Kanak Haloi | F & CMD, FISS, Guwahati |
| 5. | Ms. Preeti Buragohain Afs | Forest Dept. Assam |
| 6. | Dr. Rajib Kumar Borah | ICFRE-RFRI, Jorhat |
| 7. | Mr. Jiten Malakar | FISS, Guwahati |
| 8. | Dr. Alka Bhargava | TEEB-UNEP |
| 9. | Mr. Reuben Gergan | TEEB-UNEP |
| 10. | Ms. Shivani | TEEB-UNEP |
| 11. | Dr. A. K. Handa | ICAR-CAFRI, Jhansi |
| 12. | Mr. Kusumbor Bordoloi | Tocklai Tea Research Institute, Jorhat (TRA) |
| 13. | Dr. Rupanjali D. Baruah | Tocklai Tea Research Institute, Jorhat (TRA) |
| 14. | Dr. Dipayan Dey | SAFE |
| 15. | Mr. Pushkal Bagchie | CIFOR-ICRAF |
| 16. | Mr. Diganta Sarma | CIFOR-ICRAF |
| 17. | Dr. Vijay Kumar Sharma | ICAR- CAFRI, Jhansi |
| 18. | Mr. Suresh Ramanan S | ICAR-CAFRI, Jhansi |
| 19. | Dr. Madhusuadanpaul | SAFE-Kolkatta |
| 20. | Mr. Wasim Ahmed | SAFE-Assam |
| 21. | Mr. Deepu Kumar Deka | CIFOR-ICRAF, TOFI |
| 22. | Dr. Ujjawal Kumar | SENR, Doon University, Dehradun |
| 23. | Supriya Maity | SAFE, Kolkatta |
| 24. | Dr. Hemen Kalita | AAU |
| 25. | Mr. Mamalendu Barman | Director of Agriculture Assam |
| 26. | Dr. S.K. Majhi | ICAR-CIFRI |
| 27. | Dr. D. Debnath | ICAR-CIFRI |
| 28. | Mr. Ashim Kumar Borah | NFDB- NERC, Govt of India |
| 29. | Mr. Sanginkt Shyam | DEO, NERC, NFDB |
| 30. | Mr. Bishak Roy Choudhury | Project Management Unit MOVCDNER |
| 31. | Dr. Kaberi Mahanta | AAU-HRS, Kahikal |
| 32 | Pabitra Kalita | SIPRD, Assam |
| 33. | Chinmoy Hait | Project Management Unit MOVCDNER |
| 34. | Dr. D. J. Rajkhowa | Ex. Director, ICAR- Nogal |
| 35. | Dr. Reeta Choudhury | Forest. Dept. |
| 36. | Dr. A. A. Ahmed | AAU |
| 37. | Mr. Washim Datta | Farmer |
| 38. | Mr. Manas Kumar Bhattacharya | ARANYA |
| 39. | Dr. N. Mohan | ICAR-NRCM |

| 40. | Dr. V. Suresh Babu | NIRD PR-NERC |
|---|---|---|
| 41. | Dr. A. Simachalam | NIRD PR-NERC |
| 42. | Amitabh Borthakur | We care foundation |
| 43. | Er. Sanjit Kumar Ghosh | NIRDPR-NERC |
| 44. | Dr. S. Saikia | AAU |
| 45. | Dr. Neelam Datta | Pabhoi gram Biswanath- Assam |
| 46. | Mr. Krishna Sarma | Aie care foundation |
| 47. | Bhaskar Pegu | Director of Agriculture, Assam |
| 48. | Dr. R. Murugesan | Director, NIRD PR-NERC, Guwahati |
| 49 | Dr. Malancha Dey | SAFE, Kolkatta |

## [Delegates with Virtual Presence)

# Photographs of the First Stakeholder Consultation at Guwahati on 15th September, 2023.