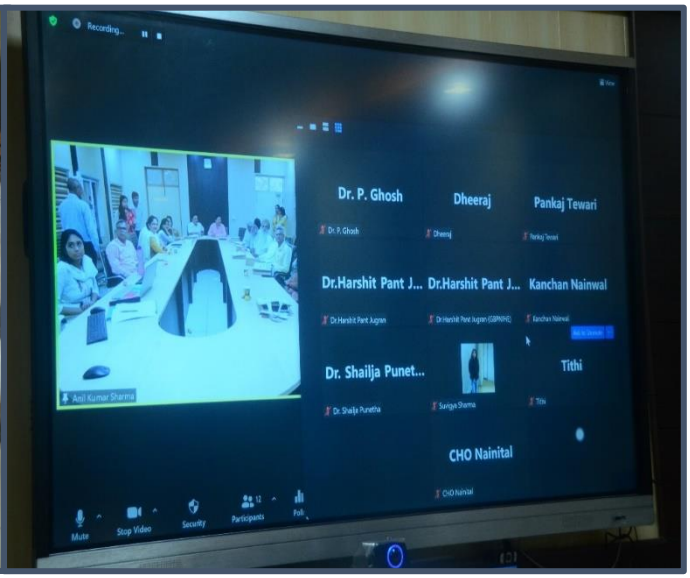
# Proceedings of the State-level Stakeholder Workshop on TEEB AgriFood Initiative in Uttarakhand, India

## Discussion on Scoping and Scenario Setting for TEEBAgriFood Application in Uttarakhand




27th September 2022, 10:30 am-4:30 pm IST, Conference Hall, Directorate of Extension Education, G.B Pant University of Agriculture and Technology, Pantnagar, Uttarakhand (Hybrid Event)

**Proceedings of the stakeholder consultation to discuss the scoping and scenario setting for TEEBAgriFood application in Uttarakhand**

**Background: TEEB AgriFood Initiative in India and its application in Uttarakhand**

The European Union-funded project entitled 'Economics of Ecosystems and Biodiversity: Promoting a Sustainable Agriculture and Food Sector' (TEEB Agriculture and Food Implementation) and hosted by the United Nations Environment Programme (UNEP) draws attention to the invisibility of nature in the economic choices made and captures and recognizes the value of nature in informing policy for agriculture and food sector in partner countries - Brazil, China, India, Indonesia, Malaysia, Mexico, and Thailand. After several meetings between a diverse group of national and international stakeholders where policy priorities in India on transitioning to sustainable food and agriculture systems were identified, the Project Steering Committee co-chaired by the Ministry of Agriculture and Farmers Welfare (MoAFW) and Ministry of Environment, Forest, and Climate Change (MOEFCC) recommended that the TEEBAgriFood assessments in India focus on studying the environmental and socioeconomic impacts of scaling organic farming and agroforestry in selected districts of Uttar Pradesh and Uttarakhand states in the Ganga basin.

In supporting the promotion of organic farming and agroforestry implemented through flagship programmes of the Government of India such as Paramparagat Krishi Vikas Yojana (PKVY), Namami Gange, National Agroforestry Policy, Trees on Every Bund (Har med par Ped) etc., in Uttarakhand, the TEEBAgriFood project is focussing on capturing and evaluating the significant hidden costs and benefits of organic farming and agroforestry interventions in the state. After the engagement of G.B Pant University of Agriculture and Technology (GBPUAT) as a research partner for Uttarakhand in 2021, GBPUAT in consultation with UNEP has completed the scoping exercise for the project including exploring policy entry options in the State of Uttarakhand. The Kosi and Kailash watersheds have been identified for scenario setting and analysis of natural, produced, human, and social capitals. The TEEBAgriFood assessments in the State are also supported by demonstration plot studies; the demonstration plots have been established to study the benefits of using organic inputs and technologies in the Nainital and Udham Singh Nagar districts of Uttarakhand and its linkages to natural, human, social and produced capital stocks while also building confidence amongst farmers on implementing organic farming and agroforestry practices in the districts.

**Proceedings of the Stakeholder Consultation:**

A stakeholder workshop on TEEB AgriFood Initiative in Uttarakhand was organized on 27 September 2022 between 10.30 to 16.30 hrs (IST) in hybrid mode (physical and virtual) at the Conference Hall, Directorate of Extension Education, GBPUAT to receive inputs on the scoping and scenario setting report and elements that should be captured under the TEEB Agrifood study in Uttarakhand. The proceedings of the workshop are captured in this report.

**Welcome remarks and briefing on the stakeholder workshop:**

**Prof Anil Kumar Sharma, Principal Investigator & Director, Directorate of Extension Education, G.B. Pant University of Agriculture & Technology, Pantnagar** welcomed participants from various sectors including public authorities, scientists from SAU and ICAR, representatives of the Agri-food sector, NGOs and farmers attending the state level stakeholder workshop virtually and physically. He extended his greetings to Mr. Atul Bagai, Country Head – UNEP, India Office, Dr. Salman Hussain, Head – The Economics of Nature Unit and

Coordinator TEEB, UNEP, Mr. William Speller, Programme Management Officer – UNEP, Dr Michael Bucki – Counsellor and Head of Section, Delegation of the EU to India, Mr. Rajpal - Kisan Ayog Adhyaksh, Mr. Atul Chaturvedi (Retd. IAS), Mr. Yogesh Pant, District Magistrate Udham Singh Nagar, Vice-Chancellor G. B. Pant University of Agriculture & Technology, Pantnagar, Director Experiment Station, G.B. Pant University of Agriculture & Technology, Pantnagar and high-level speakers in the first session. Dr. Sharma set the context for the workshop introducing the TEEB study in Uttarakhand; he briefly explained the growing concerns over climate change in the State of Uttarakhand and its impact on the environment and agricultural production and explained how the TEEBAgriFood framework could be crucial in understanding the importance of ecosystem and biodiversity. In his remarks, he mentioned that the TEEBAgriFood study in Uttarakhand will focus on organic farming and agroforestry, and that the GBPUAT project team has developed scenarios for biophysical modelling and valuation in the state, particularly in two districts, Nainital (Hill) and Udham Singh Nagar (Plain). He explained that the study will be beneficial in informing policy and development of interventions within the study area. He also highlighted that the TEEBAgriFood study will be complemented by a demonstration plot trial study to identifying the key challenges and barriers for the growth of organic farming among local people and organic farmers while building confidence of farmers to transition towards the adoption of organic farming and agroforestry practices.

**High-Level Opening Remarks:**

**Dr Salman Hussain, Head, Economics of Nature Unit and Coordinator, TEEB, UNEP**, officially opened the state level stakeholder workshop by thanking European Union for the funding and welcoming Dr. Michael Bucki**,** Head of Department, European External Action Services, EU delegation to India. Dr. Salman explained the TEEBAgriFood framework and highlighted that the current project was envisaged by UNEP and EU in 2018 in order to scale transition to sustainable agriculture practices through the process of quantifying, documenting, and valuing the wide range of externalities, impacts and dependencies across the entire agri-food value chain. He mentioned the critical role of technical research necessary for making policy change. He further elaborated that UNEP and EU through the TEEB project in India seek to demonstrate the value of ecosystems and biodiversity in the agriculture sector and whether we can achieve widescale uptake of increase of organic production and agroforestry in the state as a result of the economic case that TEEB process will bring about. While setting the context of the project, Dr Hussain mentioned that India is amongst the seven countries worldwide and five in the Asia-Pacific region where TEEBAgriFood evaluations have been funded through the EU because of the large populace and mega diversity of the countires. He highlighted that the studies conducted should make people understand that livelihoods and income are closely interlinked with nature and the importance of opting for pro-nature choices such as organic farming and agroforestry. Speaking of TEEB study process as a part of global initiative of UNEP and EU, Dr Hussain highlighted strategies and commitments on the global platform including the EU Farm to Fork strategy, the post-2020 Global Biodiversity Framework, commitments under the United Nations Framework convention on Climate Change (UNFCCC) - deforestation free supply chain monitoring and UN commitments to transform human impacts on three pillars demarcated by UNEP, i.e. nature, climate and pollution action. Dr Hussain shed light on the importance of the stakeholder workshop and its core idea to identify the solution from the technical side of discussion to fill in the gap required for policy change. He concluded his remarks by providing a brief on the steps involved in measuring the value of capital stocks and emerging results from TEEB studies being undertaken in other countries.

**Mr Atul Chaturvedi, Secretary**, **Department of Animal Husbandry & Dairying (Retd.)** began his remarks by appreciating the implementation of the TEEBAgriFood project in India and its importance for the policy change in the agriculture and food sector. He highlighted the decline in the per capita of land in India (from 0.5 ha in1951 to >0.1 ha) and hence the need or reforms in agriculture systems. He further stated that the development of agriculture technologies for providing adequate employment and income generation for small and marginal farmers is a need of the hour. Mr Chaturvedi further explained the benefits of integrated farming and the critical role of integrating livestock and crop farming which can reap several benefits for the farmers, specially the marginal farmers. He added that replacement of off farm inputs can provide sustainable income for small and marginal farmers while having co-benefits of reducing the adverse impacts on the environment. Emphasis was placed on the use of biofertilizers and the role of the government in scaling the production of biofertilizers as an important source of income. He added that making biofertilizers available as a subsidized product can a policy directive beneficial in achieving the sustainability goals in the agriculture sector. Mr Chaturvedi highlighted that milk production is a major contributor for income generation for farmers in India; milk production is estimated to generate Rs.700000 Crores, more than wheat and paddy combined. He also added that use of livestock waste can form an important source for energy generation and cited the example of a milk processing plant in Varanasi where electrical and thermal power is generated through animal dung; co-benefits include the use of residues from the processing plant as biofertilizers. Such prototypes can set the stage for using such models in other parts of India where industrial food processing can performed using biomass. He also drew linkages of the TEEBAgriFood project with One Health and how the interconnected aspects of the health of the environment, wildlife, livestock, and human population needs to be considered collectively for recommending policy interventions.

**Dr Michael Bucki**, **Counsellor & Head of Department, European External Action Service, EU Delegation to India**, in his address made mention of various programmes to promote sustainable value chains at a global scale, its importance to climate resilience and how it can be implemented in the Indian setting. He highlighted the role of the TEEB AgriFood Initiative, the application of the framework in Europe and the practicalities of applying the framework in countries like China, Brazil, India and other countries in Asia-Pacific. Dr Bucki stressed the need to implement dedicated strategies on climate change and biodiversity across different countries of the world to tackle issues of biodiversity loss and climate change. Further he pointed that the State-level stakeholder workshop is important to see how the TEEB study can provide an evidence-base for policymaking in India from a technical and scientific aspect. He suggested that countries should be flexible in adopting alternate methods to the existing business as usual scenarios to prevent the collapse of capital stocks. Dr. Bucki also emphasized the importance of rebuilding and rehabilitation of the massive forest cover in India that has potential in reversing the effects of climate change from the past and has benefits beyond Indian administrative boundaries. He looked forward to results from the India TEEB study being effective in building climate friendly and more resilient agri-food value chains through right policy interventions.

**Mr Yugal Kishore Pant**, **District Magistrate, Udham Singh Nagar**, Uttarakhand began his remarks by stating that the TEEBAgriFood study is much needed for the district of Udham Singh Nagar given both the changes in environment and the high consumption of chemical inputs for agriculture in the district. With respect to the cropping patterns adopted in the district, he highlighted that the consumption of chemical fertilizers, insecticides and pesticides had

increased drastically (up to two fold of the amount used in Punjab state) and is disturbing many elements of the agricultural system including declining crop and soil health. He emphasised the need to shift to sustainable agriculture practices such as natural farming, which is being promoted through government schemes, with focus on agriculture produce being, safe, nutritional, sustainably produced and can provide adequate income to the farmer. He also highlighted that there is a need to integrate livestock into farming practices, leading to reduction in requirements of external farm inputs.

**Dr Manmohan Singh Chauhan**, **Vice-Chancellor, G.B. Pant University of Agriculture & Technology**, Pantnagar, welcomed and extended his greetings to all the dignitaries present physically and virtually in the meeting. Dr. M.S. Chauhan pointed out that it is important to distinguish the hill and plain areas in the TEEBAgriFood study and the importance of areas in the plains and the lowland Tarai areas to promote organic farming and agroforestry to benefit poverty ridden farmers in Uttarakhand. He highlighted that integration of crop farming and livestock would be important in agricultural planning for the state. Further, Dr. Chauhan mentioned that promotion of indigenous species of cattle such as the 'Badri cow' for producing organic milk can be beneficial for the human health and can reap monetary benefits for the farming community.

**Dr Dhura Ram**, **Additional Commissioner, Natural Resource Management, MoAFW** explained the need for transformation of current practices in the Indian agriculture system and the importance of scaling sustainable agriculture practices such as natural and organic farming to conserve the country's natural resources and reduce biodiversity loss for future needs. He highlighted the flagship schemes of the Ministry of Agriculture and Farmers' Welfare under the National Mission for Sustainable Agriculture (NMSA) which includes interventions to scale practices on organic farming, natural farming, natural resource management, use of biofertilizers, efficient irrigation methods etc. He appreciated the implementation of the TEEBAgriFood study in Uttarakhand and looked forward to receiving concrete policy recommendations from the project.

**Dr Naveen Kumar Patle**, Deputy Commissioner, Central Institute of Horticulture emphasized the role of agroforestry in the discourse on organic farming. He highlighted that agroforestry has traditionally been practiced in India and the plains of Uttarakhand needs to be one of the important areas for its promotion. Further, it was pointed out that agroforestry can play an important role in the production of biofertilizers and providing plant nutrition, recommending that nitrogen fixing tree species in agroforestry can importantly contribute to reducing the use of chemical nitrogen on farms. Further, Dr Patle pointed out the importance of taking into consideration the carbon cycle and carbon sequestration while making policy interventions. Dr Patle identified a need to implement model agroforestry systems suited for different agro-climatic zones and suggested that in the case of horticulture block plantations, it is recommended that inclusion of crop species suited for adverse climate is incorporated with the plantation of tree species. He further indicated that micronutrient requirement of the soil and suitability of pH levels play a critical role at the time of germination, growth phase and at the harvest time. He also recommended the inclusion of green manuring crops in agroforestry for improvement of soil health and soil architecture and the use of perennial species for generating bio waste on farm.

**Mr. P.K Singh**, **Agriculture & Soil Conservation Officer, Rudrapur, U S Nagar** expressed his concerns on disease & pest infestation in the plain area of Udham Singh Nagar and other districts of Uttarakhand. He highlighted that the consumption of insecticides and pesticide is

high due to the prevalence of pests and diseases and the lack of techniques to prevent pest infestation and losses to crops. He looked forward to policy interventions on biologically managed pest management in the plain areas, which could cater not only to the state but also other parts of the country. He highlighted that the Department of Agriculture is trying to implement organic and natural farming practices but there are key hurdles that needs to be overcome such as developing marketing channels for organic produce. He looked forward to the recommendations that would arise from the TEEBAgriFood study and stated that the study can benefit the district-based application of the programmatic interventions on organic and natural farming.

**TEEB Agrifood Initiative and TEEB Evaluation Framework**

**Mr. William Speller, Program Management Officer, The Economics of Nature Unit, UNEP** presented the process through which the TEEBAgriFood Initiative project was initated in India. In setting the context for the workshop he highlighted the global objective for conducting TEEBAgriFood assessments globally quoting Inger Anderson, Executive Director, UNEP "*with science as our guiding light, UNEP seeks to ensure the link between science, policy and decision-making remains stronger than ever, sustained by strong environmental governance and supported by economic policies that can be the foundation of a catalytic response to the challenges of climate change, biodiversity loss and pollution.*" He further quoted Hon'ble UN Secretary-General indicating that "*transforming food systems is crucial for delivering all the sustainable development goals*."

Mr. Speller explained the TEEBAgriFood framework and steps involved in the study process and comprehensively explained the linkages between agricultural systems, the human and social system and natural systems, the capital stocks and visible and invisible interlinkages that exists between them. He also presented the results from the TEEBAgriFood study in Thailand, evaluating the net benefits of the expansion of the sustainable rice practices in various dimensions, and explained that key areas were identified for making an economic case for policy makers, as the shift to organic did not significantly bring about benefits towards natural, human and social capital without any material loss of farmers. He highlighted the similarities to the scenario setting and valuation of capital stocks with upscaling of organic farming and agroforestry in Uttarakhand. Further, Mr Speller spoke about the relevance of the study in informing programmatic interventions of the Government of India on organic farming and agroforestry and how the agriculture and food sector can contribute towards the attainment of targets under the UN Sustainable Development Goals, the Post-2020 Global Biodiversity Framework (GBF), and the UN Convention to Combat Desertification (UNCCD) among others.

**TEEBAgriFood Initiative in India: Objectives and expected outcomes**

**Mr. Reuben Gergan**, Project Officer, TEEBAgriFood India provided a background on the implementation of the TEEBAgriFood project in India including the stakeholders involved in the in defining the project priorities through Project Steering Committee meetings and the scoping of the study carried out through implementing partners in Uttarakhand and Uttar Pradesh. To provide a context for the discussions, he mentioned that the study would be conducted in two districts in Uttarakhand and were based on recommendation of the Project Steering Committee and expert bodies; he also explained that similar to the studies in Uttarakhand, the TEEBAgriFood framework is being applied in five districts of Uttar Pradesh. He further that the project is evaluating the costs and benefits of promoting organic farming

and agroforestry implemented through flagship programmes of the Government of India such as Paramparagat Krishi Vikas Yojana (PKVY), Namami Gange, National Agroforestry Policy (NAP), Trees on Every Bund (*Har med par Ped*) etc. in Uttarakhand. He explained that the Kosi and Kailash watersheds have been identified for scenario setting and analysis of natural, produced, human, and social capitals. Further, he added that the study is supported by demonstration plots on organic farming in Udham Singh Nagar and the Nainital districts. The project team at GBPUAT in consultation with UNEP-TEEB officials has developed the scoping report for the study and encouraged stakeholders present at the consultation to provide their valuable inputs in consolidating the scenarios, elements of capital stocks that need to be prioritized for the state of Uttarakhand and recommendations of methodologies and data or the evaluation.

**Expert comments on the current scenario of organic farming & agroforestry in Uttarakhand**

**Dr Alka Bhargava, Former PCCF and Head of Forest Force, Assam and former Additional Secretary, Ministry of Agriculture and Farmer's Welfare, Govt. of India** explained that the TEEB Agrifood project is a holistic study of natural, human, social resources and the outcomes of the study will help in evaluating options for the payment of ecosystem services towards transitioning towards organic farming and agroforestry practices. She highlighted that the *Artha-Ganga* vertical under the *Namami Gange* programme being implemented in states adjoining the river Ganga is making efforts to scale sustainable agriculture practices and the TEEBAgriFood study can further inform the utilization of resources. Dr Bhargava added that impact evaluation is key to informing policy directions in future.

Dr Bhargava also shed light on the fragile nature of the environment in the State of Uttarakhand and the increasing occurrences of the natural disasters as a result of climate change. She highlighted that the TEEB assessment could help provide an overarching perspective through the assessment of capital stocks and ecosystem services in relation to climate change impacts in the food and agriculture sector in Uttarakhand. She explained that given that Uttarakhand is an important state with respect to the provision of ecosystem services, the TEEB study can reveal the true cost of agricultural practices, often ignored during assessments that are undertaken and provide evidence for right policy interventions in the State. She also explained the trends of decreasing landholdings of marginal farmers in the country and the need to demonstrate and implement research-based models on organic farming and agroforestry introduced by institutes like the Indian Institute of Farming Systems Research (IIFSR-ICAR) and the Central Agroforestry Research Institute (CAFRI-ICAR). Dr Bhargava advocated for the field demonstration of land optimization using agroforestry as a method for adequate income for marginal farmers. Dr Bhargava also highlighted how enhancing cross-sectoral platforms for processing and marketing in the country and abroad can bring about a significant change in the food value chain. She elaborated that it is popular notion that shifting from conventional agriculture to organic agriculture will cause a drop in income, however TEEBAgriFood assessments show results contrary to this notion as seen in the TEEBAgriFood study in Thailand. She also explained the importance of conserving forest cover and preserving the endemic species germplasm to safeguard against natural calamities.

**Discussion: Scenario setting and prioritized elements of capitals for TEEB AgriFood Evaluation in Uttarakhand**

This session discussed the scenarios developed for TEEBAgriFood assessments in Uttarakhand, along with the elements of natural, produced, human, social capitals identified for assessment. Inputs were received from participants including government officials, agriculture scientists and researchers, representatives of NGOs working in Uttarakhand to refine the scope of the study and include elements that should be considered during the study. The following is the summary of scenarios and elements of capitals identified under the study

**Scenarios for modelling and valuation studies:**

Six scenarios were created, considering different policy interventions (BAU, optimistic, and pessimistic) and climate change projections (RCP4.5 and RCP8.5). These scenarios have been created by combining the three policy scenarios (BAU, optimistic, and pessimistic) with two climate change scenarios (medium and high greenhouse gas emission scenarios RCP4.51 and RCP8.52). Decadal assessments from base year 2020 to 2050 will be presented for clarity.

The BAU scenarios represent the existing policies at the national and state level and their expected outcomes on organic farming and agroforestry, while the optimistic/pessimistic scenarios consider positive/negative changes in policy. Additionally, the scenarios for Study Area 1 (Udham Singh Nagar) and Study Area 2 (Nainital) are distinct because they are located in different regions of Uttarakhand with different prospects for the expansion of organic farming and agroforestry. Tabl provide the specifics of the six scenarios for both study sites.

**Table 1: Summary of Scenarios**

| **Udham Singh Nagar District** | | |
|---|---|---|
| **Scenario 1 (BAU Policy Intervention + RCP 4.5 Climate Scenario)** | **Scenario 2 (Optimistic Policy Intervention + RCP4.5 Climate Scenario)** | **Scenario 3 (Pessimistic Policy Intervention + RCP4.5 Climate Scenario)** |
| - Increase in organic farming area to 38% of the net cultivated area[3]<br>- Agroforestry continues to cover 12% of the cropped area | - 75% (103,273 ha out of 137,743 ha) of the net cultivated area brought under organic farming[4]<br>- Area under agroforestry increases at a growth rate of 3.5% per year[5] | - Organic farming continues to cover 4% *(3.98% PKVY organic farming area/net sown area of the district)* of the net cultivated area<br>- Agroforestry: Area under agroforestry reduces to 6% of the net cultivated area |

[1] Representative Concentration Pathway 4.5 is a greenhouse gas concentration scenario that is used in climate modelling to project future impacts of climate change. RCP 4.5 represents a medium emissions scenario, assumes that the GHG emissions will peak around the year 2040 and then decline, leading to a stabilizing concentration level of around 4.5 watts per square meter by the end of the century

[2] Representative Concentration Pathway 8.5 is a greenhouse gas concentration scenario that is used in climate modelling to project future impacts of climate change. RCP 8.5 assumes that GHG emissions will continue to increase throughout the country, leading to a concentration level of around 8.5 watts per square meter by the end of the century. This represents a future with high greenhouse gas emissions and is considered a worst case scenario for climate change.

[3] As per the Uttarakhand Vision 2030 document (https://cppgg.uk.gov.in/wpcontent/uploads/2020/09/Uttarakhand_Vision_2030-Compress.pdf)

[4] As per*: Organic Farming Packages for Major Cropping Systems – ICAR-IIFSR*

[5] Based on an assessment of Trees outside Forests (India State of Forest biennial assessments)

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|---|---|---|
| | | due to increasing urbanization and change from agricultural land to non-agricultural practices |
| **Scenario 4 (BAU Policy Intervention + RCP8.5 Climate Scenario)** | **Scenario 5 (Optimistic Policy Intervention + RCP8.5 Climate Scenario)** | **Scenario 6 (Pessimistic Policy Intervention + RCP8.5 Climate Scenario)** |
| - Increase in organic farming area to 38% of the net cultivated area[6]<br>- Agroforestry continues to cover 12% of the cropped area | - 75% (103273 ha out of 137743 ha) of the total net cultivated area is brought under organic farming<br>- Area under agroforestry increases at a growth rate of 3.5% per year[7] | - Organic farming continues to cover 4% (3.98% PKVY organic farming area/net sown area of the district) of the net cultivated area due to disincentives to shift to organic farming<br>- Area under agroforestry reduces to 6% of the net cultivated area due to increasing urbanization and transition to non-agricultural practices |
| **Nainital District** | | |
| **Scenario 1 (BAU Policy Intervention + RCP 4.5 Climate Scenario)** | **Scenario 2 (Optimistic Policy Intervention + RCP4.5 Climate Scenario)** | **Scenario 3 (Pessimistic Policy Intervention + RCP4.5 Climate Scenario)** |
| Organic farming increases from the current 36% of the net cultivated area under existing schemes to 65% of the net sown area[8]<br>Area under agroforestry continues to cover 12% of the cropped area in Nainital as per current assessments because trees are rarely felled | - 95% of the net cultivated area is brought under organic farming considering targets set by the Government of Uttarakhand to accelerate the shift to organic farming in the hills and establish Uttarakhand as an organic state *(reference: UK Vision Document 2030)*<br>- Area under agroforestry increases at a growth rate of 3.5% per year based on the assessment of Trees outside Forests (India State | - Organic farming: Organic farming continues to cover 36% of the net cultivated area (*the current area under organic farming in the study area*) due to disincentives to shift to organic farming<br>- Agroforestry: Area under agroforestry reduces to 6% of the net cultivated area due to increasing urbanization and change from agricultural land to non-agricultural practices |

[6] As per the Uttarakhand Vision 2030 document (https://cppgg.uk.gov.in/wp-content/uploads/2020/09/Uttarakhand_Vision_2030-Compress.pdf)

[7] Based on an assessment of Trees outside Forests (India State of Forest biennial assessments)

[8] Given the scaling potential of organic farming in the district. *Reference – ICAR-IIFSR document*

| | | |
|---|---|---|
| | of Forest biennial assessments) | |
| **Scenario 4 (BAU Policy Intervention + RCP8.5 Climate Scenario)** | **Scenario 5 (Optimistic Policy Intervention + RCP8.5 Climate Scenario)** | **Scenario 6 (Pessimistic Policy Intervention + RCP8.5 Climate Scenario)** |
| - Organic farming increases from the current 36% of the net cultivated area under existing schemes to 65% of the net sown area given the scaling potential of organic farming in the district<br>- Area under agroforestry continues to cover 12% of the cropped area in Nainital considering rate felling of trees | - 95% of the net cultivated area is brought under organic farming [9]<br>- Area under agroforestry increases at a growth rate of 3.5% per year [10] | - Organic farming continues to cover 36% of the net cultivated area due to missing incentives to shift to organic farming<br>- Agroforestry: Area under agroforestry reduces to 6% of the net cultivated area due to increasing urbanization and transition to non-agricultural practices |

**Table 2: Ecosystem services identified for evaluation**

| **Capital** | **Ecosystem services identified for evaluation/modelling** | **Linkages with Organic farming and agroforestry** |
|---|---|---|
| **Natural Capital** | Water Quantity | - Perennial crops/tress have higher water retention capacity<br>- Building up of crop/tree canopy reduces evapotranspiration<br>- Improvements in soil water holding capacity due to build-up of organic matter |
| | Water Quality | - Reducing the porosity and binding properties of organic matter will enhance the filtering capacity of soil<br>- Absorption of toxic metals by trees |
| | Soil Erosion | - Reduction in soil erosion due to binding properties of organic matter |

[9] Considering targets set by the Government of Uttarakhand to accelerate the shift to organic farming in the hills and establish Uttarakhand as an organic state (reference: UK Vision Document 2030)
[10] based on the assessment of Trees outside Forests (India State of Forest biennial assessments)

| | | |
|---|---|---|
| | Soil Health | - Enrich the nutrient holding capacity of the soil<br>- Increase in soil biodiversity and organic carbon content |
| | Carbon Sequestration | - Enhancement of carbon sequestration potential |
| Produced Capital | - Rice and wheat yield<br>- Vegetable Yield<br>- Millet yield | Initially, the yield might be compromised but eventually it will be sustained. Additional quality might be SOP for the intervention |
| | - Timber provisioning services | An increase in the number of trees, especially in the plain region of the state will enhance water quality, and timber availability and intervention with horticultural plants will support by providing fruits and income |
| Social | - Women Empowerment | Women in hilly areas have significant contribution to agricultural activities, as discussed above. Organic farming and agroforestry will add to the quality of life not only in terms of health but also economy by getting the better price of their produce (Jhariya and Bargali,2015) |
| | - Increased employment opportunities | Organic farming and agroforestry will increase employment opportunities for both on farm and off farm activities |
| Human | - Education & Skill development | Knowledge dissemination through cultivation practices will enrich the present status of practices (Adnan et al. 2018) |
| | - Improved Livelihoods | Organic farming and agroforestry will ensure a high income which should be seen not only in terms of paper currency, but should also be seen from the health gain and expenditure made on health care issues (Rosati et al. 2021) |

| | | |
|---|---|---|
| | - Human Health | Quality food for family consumption and marketing of surplus will add value to society. Rural and tribal families, not aware of the quality of food and its relationship with health will be benefitted (Meemken and Quaim, 2018) |

**Discussion on scenarios identified and prioritized elements of natural, produced, social and human capital in Uttarakhand on organic farming and agroforestry and its policy implications**

**Dr. Preeti Mamgain, Principal Scientist Zone-1, ICAR ATARI, Ludhiana**: provided insights on the ongoing project of natural farming through *Krishi Vigyan Kendras* (KVKs) of Uttarakhand. She added that the TEEBAgrifood study should look to link up with KVKs in Uttarakhand to demonstrate how agroforestry and organic farming models can be effective for enhancing incomes in Uttarakhand, particularly in reducing outmigration trends in the State.

**Mr Rajpal Singh, Kisan Aayog Adhyaksh (Chairman – Farmer's Commission/Group), U.S Nagar, Uttarakhand** emphasized the problem of wild animals in Uttarakhand hills and migration of youth from villages as barriers to scaling organic farming and agroforestry practices in the State. Speaking of farmer's viewpoints on organic farming in the state, he added that adoption of organic farming is often impeded because of the lack of marketing channels and a price premium. He added that the TEEBAgriFood assessment should also look to capture health issues due to over use of chemical fertilizers and pesticides as has been experienced in other areas of the country such as Punjab.

**Dr Lakshmi Kant, Director, VPKAS, Almora** discussed the Agri-Horti-Silviculture system practiced in the hills and the need to promote such traditional systems in improving fodder availability with co-benefits of carbon sequestration. Dr Kant further explained the rainfed agriculture system in the hills and raised the issues related to timely availability of inputs to farmers in the hills.

**Ms Bhawana Joshi, Chief Horticulture Officer, Udham Singh Nagar, Uttarakhand** discussed the issues in availability of organic seeds and production of organic seed as a constraint to scaling organic farming. In addition, Ms. Joshi highlighted that there is need to strengthen infrastructure and support to farmers for the production of quality organic seeds which will help overcome the barrier of availability of inputs and accelerate growth of area under organic farming.

**Dr Seema Kwatra, Professor, Dept. of Family Resource Management, College of Home Science, G.B. Pant University of Agriculture and Technology** explained the processes undertaken for participatory training programme and education imparted on ergonomic principles for health and safety. She also discussed the adoption of an action checklist for good agricultural practices and merits of organic farming that could be useful under the TEEBAgriFood project in Uttarakhand.

**Parunata Ghosh, G.B. Pant National Institute of Himalayan Environment** pointed out that valuation of ecosystem services in the agriculture and food sector plays an important role for

improvements in the agriculture value chain. She highlighted that the TEEBAgriFood project should take into account the activities in the state on certification of organic production.

**Dr Ajeet Singh Nain, Director Experiment Station, G.B. Pant University of Agriculture and Technology, Pantnagar** illustrated the role of forest ecosystems in contributing toward biomass production that can contribute to scaling organic farming practices within the state. He also pointed out the need to further efforts to generate and disseminate knowledge on organic farming and natural farming research to farmers. Further, Dr Nain the research on organic inputs in the university to control pest and disease control in organic and natural farming about unavailability of testing of quality inputs of organic products is not available in the state.

**Dr Pankaj Singh, G.B. Pant University of Agriculture and Technology, Pantnagar**, in consideration of the scenarios and elements of capitals outlined in the scoping report, highlighted that water quantity, water quality, soil erosion, soil health, carbon sequestration and timber provisioning would be important elements of natural capital to be captured within the study area.

**Dr Deepak Tripathi, Medical Officer, G.B. Pant University of Agriculture and Technology, Pantnagar** highlighted the need to study linkages between organic farming and reduction of health hazards (particularly in the application of pesticides and weedicides). He also discussed the need to assess human health improvement through the consumption of organic produce in order to create demand for organic production within the study area.

**Dr. Pankaj Tewari, AAROHI (NGO)** shed light on efforts to create model villages on organic farming in the State of Uttarakhand and studies that are contributing in highlighting the socioeconomic benefits of organic farming. He placed on record the need to translate research in institutions to farmer's fields through the implementation of models on organic farming and agroforestry. He advocated for the dissemination of research including under the TEEBAgriFood project through existing cooperatives, SHGs, FPOs besides KVKs in the state.

**Dr. Ajay Kumar Verma, Chief Agricultural Officer, U.S. Nagar, Uttarakhand** discussed the implementation of organic farming, natural farming under government schemes such as Paramparagat Krishi Vikas Yojna in district Udham Singh Nagar and extended support on the assessments under the TEEBAgriFood Project in Uttarakhand. He also highlighted concerns relating to the high application rate of pesticides and weedicides in the district Udham Singh Nagar.

# Stakeholder Workshop on TEEB Agrifood Initiative in Uttarakhand, India

## Rapporteur's Report

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|---|---|---|---|
| **Event Title** | Stakeholder Workshop on TEEB Agrifood Initiative in Uttarakhand, India | **Date:** | 27.09.2022 |
| **Event organizer** | Directorate of Extension Education, G.B. Pant University of Agriculture and Technology, Pantnagar Distt. U.S. Nagar, India | | |
| **Event Target Groups** | • Scientists from SAU and ICAR, government bodies, representatives of the agri-food sector, NGOs, public authorities, and farmers | | |
| **Moderator** | • Dr. Suvigya Sharma, Post-Doctoral Fellow, TEEB Agrifood Initiative in Uttarakhand | | |
| **Rapporteur** | • Dr. Nirmala Bhatt, Associate Director, Directorate of Extension Education, G. B. Pant University of Agriculture and Technology, Pantnagar | | |
| **Opening Remarks** | • Dr. Salman Hussain, Coordinator, TEEB<br>• Mr Atul Chaturvedi, Secretary, Department of Animal Husbandry & Dairying (Retd.)<br>• Dr. Michael Bucki, Counsellor & Head of Department, European External Action Service<br>• Dr. Manmohan Singh Chauhan, Vice-Chancellor, G.B. Pant University of Agriculture and Technology, Pantnagar<br>• Dr. Dhura Ram (Representative Sr Ashish Srivastava, Jt. Secy RKVY, PC & NRM) | | |
| **Special Remarks** | • Shri Yugal Kishore Pant, District Magistrate, Udham Singh Nagar, Uttarakhand<br>• Dr. P.K. Singh | | |
| **Workshop Speakers** | • Mr. William Speller, Programme Coordinator, TEEB<br>• Mr. Reuben Gergan, Project Officer, TEEB AgriFood, India<br>• Dr. Anil Kumar Sharma, Director and PI, Directorate of Extension Education & SAMETI, G.B. Pant University of Agriculture & Technology, Pantnagar (Uttarakhand) | | |

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|---|---|
| | • Dr. Alka Bhargava, Former PCCF and Head of Forest Force, Assam and Additional Secretary, Ministry of Agriculture and Farmer's welfare, Govt. of India |
| **Contributing stakeholders to discussions on scoping of the TEEBAgriFood work in Uttarakhand** | • Dr. Preeti Mamgain, Principal Scientist Zone-1, ICAR ATARI, Ludhiana<br>• Shri Rajpal Singh, Kisan Ayog Adhyaksh<br>• Dr. Lakshmi Kant, Director VPKAS, Almora<br>• Mrs. Bhawana Pant, Chief Horticulture Officer, Udham Singh Nagar, Uttarakhand<br>• Dr. Seema Kwatra, Professor, Deptt. of Family Resource Management, College of Home Science, G.B. Pant University of Agriculture and Technology, Pantnagar<br>• Mrs. Paromita Ghosh, GBP-NIHE<br>• Dr. Ajeet Singh Nain, Director Research, G.B. Pant University of Agriculture and Technology, Pantnagar<br>• Dr. Pankaj Singh, G.B. Pant University of Agriculture and Technology, Pantnagar<br>• Dr. Deepak Tripathi, Medical Officer, G.B. Pant University of Agriculture and Technology, Pantnagar<br>• Dr. Pankaj Tewari, AAROHI NGO<br>• Dr. Ajay Kumar Verma, Chief Agricultural Officer, U.S. Nagar, Uttarakhand |
| **Participating Farmer Representatives** | • Mrs. Bindu Srivastava, U.S. Nagar<br>• Sri Subhash Chaudhary, U.S. Nagar<br>• Sri Narendra Singh Mehra, Nainital<br>• Sri Anil Pandey, Nainital<br>• Sri Sukhdev Singh, Jaspur U.S. Nagar<br>• Sri Gurpreet Singh, U.S. Nagar<br>• Sri Balker Singh, Kashipur U.S. Nagar<br>• Sri Sanjay Nayal, Nainital<br>• Sri Arun Sharma, U.S. Nagar |

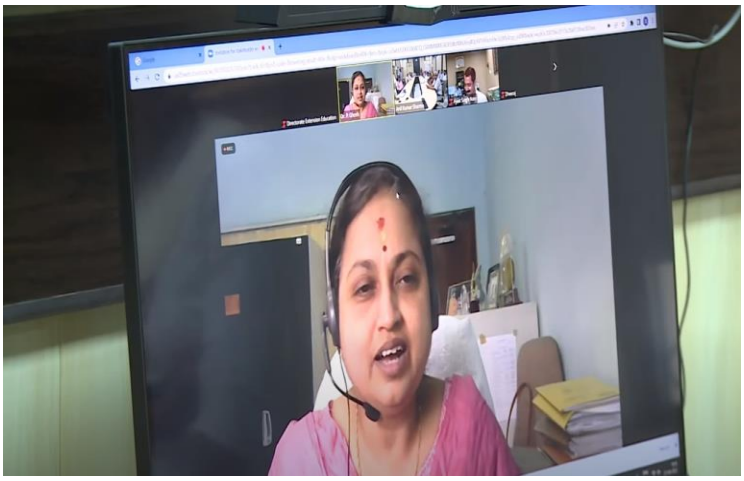
**TEEBAgriFood for Scoping and Scenario Setting Consultation for Uttarakhand**

**(27 September 2022)**



Directorate Extension ...
Directorate Extension Education
Anil Kumar Sharma
Atul Chaturvedi
Dr. D. Ram Additional Comm...
salman hussain


Ajeet Singh Nain




Natural Capital:


Stakeholder Workshop
TEEB Agri Food Initiative in Uttarakhhand, India
TEEB
UN environment programme
27 September, 2022 (Tuesday)
Organized by
G.B. Pant University of Agriculture & Technology, Pantnagar (Uttarakhand)
OUR EARTH OUR FUTURE


Technology Development
transferred to IIL, New Delhi
Tomato plants
in vitro AM inoculum
Stakeholder Workshop
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