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Summary of the TEEBAgriFood Global Symposium 2019: 25-27 February 2019

The Economics of Ecosystems and Biodiversity (TEEB) for Agriculture and Food (AgriFood) convened from 25-27 February 2019 at the UN Environment Programme (UNEP) Headquarters in Nairobi, Kenya. The event was convened by UNEP, with support from the European Union, the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMU) and the Global Alliance for the Future of Food.

The meeting provided an opportunity for project partners, experts and other stakeholders to discuss characteristics of diverse "eco-agri-food systems" and explore insights for policy interventions at various levels. Participants convened in plenary and breakout sessions and engaged in hands-on workshops to test different components of the TEEBAgriFood Evaluation Framework.

Specially tailored training sessions also took place for project partners involved in three pilot projects. The training explored how to apply the Framework to country contexts and how to effectively package and communicate assessment findings for policy makers and other audiences.

During the closing plenary, Alexander Müller, TEEBAgriFood Study Leader, emphasized that the end of this Symposium "is not the end of the work, but the beginning," and noted that the positive reactions he has already received from UNEP Permanent Representatives bodes well for follow up efforts to adapt and use the TEEBAgriFood approach at the country level.

A Brief History of TEEBAgriFood

The Economics of Ecosystems and Biodiversity (TEEB) is a global initiative focused on drawing attention to the economic benefits of biodiversity, including the growing cost of biodiversity loss and ecosystem degradation. TEEB aims to "make nature's values visible" by following 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, suggest how to capture those values in decision-making.

An offshoot of the broader TEEB Initiative, TEEB for Agriculture and Food (TEEBAgriFood) seeks to contribute to comprehensive economic valuations of the eco-agri-food systems complex and demonstrate that the economic environment in which farmers operate is impacted by significant externalities, both negative and positive, and a lack of awareness of interlinkages among different forms of capital.

Key Turning Points

Stern Review on the Economics of Climate Change (2006): The influential Stern Review set the tone for future economic assessments of biodiversity and climate change through its recognition that: biodiversity is the living fabric of our planet including all its ecosystems, species and genes; 'carbon sequestration and storage' is an ecosystem service; and humanity has an intrinsic connection with nature.

Phase I - Launch of the TEEB Initiative and Interim Report: The genesis of TEEB was a March 2007 meeting of environment ministers from the G8+5 countries meeting in Potsdam, Germany, which proposed to initiate the process of analyzing the global economic benefit of biological diversity, the costs of the loss of biodiversity and the failure to take protective measures versus the costs of effective conservation. In response to this proposal, the German Federal Ministry for the Environment and the European Commission provided support for a consultative process that produced an 'Interim Report' that set out the scope of future work and outlined the elements of a biodiversity and ecosystem valuation framework.

Phase II - TEEB Study Reports and Synthesis Publication: The launch of the TEEB Interim Report at a High-Level Segment of the Ninth Conference of the Parties to the Convention on Biological Diversity (CBD COP-9) in Bonn, Germany, in May 2008 stimulated further interest that resulted in the production of a series of reports targeted at specific stakeholders. These

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four reports were presented at CBD COP 10 in Nagoya, Japan, in October 2010, and comprised: 'TEEB Ecological and Economic Foundations,' which addressed fundamental concepts and methodologies for economic valuation of biodiversity and ecosystem services; and two reports containing analysis and guidance on how to value and internalize biodiversity and ecosystem values in policy decisions at the international, national, regional, and local levels. The fourth report, 'TEEB in Business and Enterprise,' focused on how private sector actors can identify and manage their biodiversity and ecosystem risks and opportunities.

A final output of this phase was a synthesis report to communicate key messages from the four reports and highlight useful policy recommendations. Titled, 'Mainstreaming the Economics of Nature: A Synthesis of the Approach, Conclusions and Recommendations of TEEB,' the Synthesis Report summarized two years of work carried out by over 500 researchers and called for wider recognition of nature's contribution to human livelihoods, health, security, and culture. The Report further documented the multi-trillion dollar annual contribution of the natural world to the global economy and formulated recommendations for policies and mechanisms that can help better account for, and protect, this contribution.

Phase III- Calls for Action & Implementation: Capitalizing on the momentum created from the TEEB reports and growing network of partners, the Initiative has moved into an ongoing phase of implementation, where study findings and the 'TEEB approach' are sought to be applied at different levels of policymaking. In its support role, TEEB seeks to enhance broad recognition of the myriad values provided by biodiversity and ecosystems, either at the biome level such as oceans or wetlands, or more globally to better assess their value to specific economic sectors, such as agriculture, and wider impacts on ecosystem and human wellbeing.

Launch of the TEEBAgriFood Study: Building on the earlier TEEB studies, agriculture was selected as the first economic sector to undergo an in-depth study. Initiated in 2013, the TEEBAgriFood study analyzed economic interdependencies among human (economic and social) systems, agriculture and food systems, and biodiversity and ecosystems. In doing so, it sought to address the economic invisibility of many of these links while exploring how biodiversity and key ecosystem services deliver benefits to the agriculture sector and beyond, being a key contributor to human health, livelihoods and wellbeing.

Publication of the TEEBAgriFood Scientific and Economic Foundations Report: The first major output of TEEBAgriFood is the 'Scientific and Economic Foundations Report' (The Foundations Report), published in June 2018. As part of this research, the co-authors developed an Evaluation Framework that provides broad categories of all interactions that may exist within a given eco-agri-food system.

Applications of the TEEBAgriFood Evaluation Framework: The overall purpose of the Framework is to provide a clear and common starting point for future assessments that seek to carry out holistic evaluations in line with the systems view advocated by TEEBAgriFood. Starting in 2018, three 'Framework-testing projects' have been initiated, with funding from the European Union Partnership Instrument (EU-PI), Germany's International Climate Initiative (IKI) and the European Commission Directorate-General for International Cooperation and Development (DEVCO). Implemented in 13 countries in Africa, Asia and Latin America, the projects entail a number of pilot studies to explore the three key features of the Evaluation Framework, namely: to be broad and systemic in nature; to reflect the contributions of all four capitals (natural, produced, human and social); and to examine connections along the full value chain, including production, processing and manufacturing, distribution, marketing and retail, and consumption.

TEEBAgriFood Global Symposium 2019 Report

Opening of the Symposium

Welcome Statements: In her opening statement on Tuesday morning, Joyce Msuya, Acting Executive Director, UNEP, outlined relevant messages from UNEP's latest Global Environmental Outlook (GEO-6), and the inaugural FAO report on the State of the World's Biodiversity for Food and Agriculture. Stating that the two reports "offer worrying glimpses into the future of food production," she highlighted GEO-6's call for enhanced effort to feed 10 billion people in 2050 while reducing the environmental impact of food production needs by two thirds. Msuya welcomed TEEB's contribution to raising awareness among policy makers that natural resources are not free and inexhaustible.

Pavan Sukhdev, President, WWF International, linked the TEEBAgriFood Framework to growing recognition that there is need for the "New Deal for Nature and People," as called for in the Post-2020 Global Biodiversity Framework of the Convention for Biological Diversity (CBD). Noting that food production is not only relevant to achieving SDG 2 (zero hunger) but also other SDG targets, including those on climate, health, land, and oceans, he said TEEBAgriFood provides an approach for addressing the complexity of these interlinkages, but cautioned that it is not sufficient to have a "smart toolkit." He encouraged participants to

Joyce Msuya, Acting Executive Director, UNEP

Alexander Müller, TEEB AgriFood Study Leader

explore how to apply and improve the Framework and share their experiences with others.

In the ensuing discussion, participants highlighted, *inter alia*, the need to ensure that theories of change underpinning their recommendations are multi-dimensional and responsive to different contexts; and the importance of giving a greater voice to local communities in the TEEB discourse.

Introduction to the TEEBAgriFood Study and Evaluation Framework: Alexander Müller, TEEBAgriFood Study Leader, provided an overview of the Symposium objectives and programme of work. He called for: building an inclusive community of practice; considering "what, why and how" to assess impacts; sharing experiences; and using TEEB's eco-agri-food assessment checklists to calculate externalities of different production systems.

Salman Hussain, TEEB Coordinator, UNEP, outlined the history of TEEB, from the first 'Interim Report' of 2008 through four 2010 reports targeting different groups of stakeholders, to its present implementation phase since 2013. He noted TEEB's strong links to the CBD's Aichi Targets, the SDGs, and the UN's System of Environmental and Economic Accounting (SEEA). He pointed to the 2006 Stern Review on the costs of climate change, saying TEEB builds upon this to include biodiversity and assessment of benefits and offers tools to facilitate analysis of

Salman Hussain, TEEB Coordinator, UNEP

trade-offs. Hussain further stressed that TEEB does not "price" nature but incorporates many dimensions of valuation.

Hussain stated that TEEBAgriFood demonstrates agriculture's links with twelve global sectors with largest impact on biodiversity and 12 of the 17 SDGs, while the Scientific and Economic Foundations Report theoretically underpins the actions needed for on-the-ground change and aids in measuring otherwise "invisible" externalities. He encouraged participants to share, learn, and develop communities of practice and theories of change to improve livelihoods and biodiversity outcomes.

Barbara Gemmill-Herren, World Agroforestry Centre (ICRAF), discussed the third chapter of the Foundations Report. Posing the question, "Where are our food systems heading?" she highlighted global trends such as increased specialization and monoculture, low-cost food distribution models, volatile food prices, and growing obesity and other food-related health challenges. Noting the Report's conclusion that mixed, smallholder farm operations "are feeding the world," she highlighted opportunities to reform the current agro-food model through, among other actions: working with nature by promoting agroecological farming practices and natural solutions for controlling pests and diseases; localizing food processing for local benefits; and "making invisible flows visible."

Kavita Sharma, ETH-Zürich, provided an overview of the Foundation Report's sixth chapter, which presents the TEEBAgriFood Evaluation Framework. She noted that key objective of the Framework is to overcome some of the challenges of traditional research, which predominantly takes place in research silos, by, *inter alia*, opening up perspectives, bringing transparency to assessments, and establishing a common language. She said that the Framework helps to provide greater clarity for assessments by providing an overview of broad categories of all interactions that may exist within a given eco-agri-food system, ranging from stocks and flows to outcomes and impacts across entire value chains.

In the ensuing discussion, one participant pointed out that agricultural outputs should be included in the Framework as they can also contribute to ecosystem services, while another speaker highlighted trade, and political economy dynamics, as missing links. In response, Sharma explained that the Framework allows for different entry points and suggested that politics and institutional linkages can be seen as a component of social capital.

Applying the TEEBAgriFood Framework - Case Study Findings: On Tuesday afternoon, three presenters discussed the first set of pilot Framework applications.

Mauricio Bellon, Mexican Commission for the Knowledge and Use of Biodiversity (CONABIO), discussed a comparative study of maize production systems in Mexico, Ecuador and the US, noting that it focused on three types of production: itinerant, intensive and organic. He described one of the most significant findings from the Mexican study, that smallholders (campesinos) produce more maize and feed more people than if production were purely profit driven. He observed that smallholder farms supplied the maize needs of almost 50% of the national

Haripriya Gundimeda, Indian Institute of Technology

population in 2010, which goes against the conventional wisdom that they are primarily subsistence producers. He explained that by growing maize in diverse environments and varieties, smallholders make an important contribution to genetic diversity compared to commercial farmers and are thus "producing an evolutionary service of global relevance."

Peter May, Federal Rural University of Rio de Janeiro, discussed a study of production systems for livestock and soybeans in the Brazilian Amazon. He said that the study explored a broad range of externalities arising from operations at different scales and enterprise mixes. He outlined current debates around "land sharing or land sparing" and noted the growing movement towards integration of forest and pasture following the soybean cycle, which has helped restore some 11.5 million hectares of degraded land over the past decade. He further discussed efforts towards intensification of beef production and noted opportunities to improve livelihoods for smallholders through targeted policies such as labeling of sustainably produced beef.

Haripriya Gundimeda, Indian Institute of Technology, reported on rice and wheat farming in northern India. She said the Green Revolution raised output but ignored negative impacts, including from: the rise of wheat monoculture that is linked a steady decline in the cultivation of rice and sugarcane crops since the 1960s; increased use of pesticides, fertilizers and electricity; and over-extraction of water for irrigation. She reported that a case study on organic vs. conventional rice and wheat farming showed that rice residue burning carries much higher negative externalities than the use of "Happy Seeder" machinery, which can plant wheat seed without getting jammed by rice harvest residues, thus minimizing the need for burning.

During ensuing discussion, Gemmill-Herren agreed on "landscape" and "territory" approaches and valuing forests for food provision as is the case with traditional agriculture, rather than just for timber. She called for confidence that food production systems can be changed to feed people while also reducing environmental damage. She suggested using knowledge-intensive, rather than input-intensive, agricultural methods.

A participant cited studies that demonstrate how natural farming techniques generate higher yields while simultaneously lowering water use and empowering women farmers, including through increased income and passing on of knowledge and skills. Another participant noted that traditional and mixed agricultural systems are more efficient than industrial agriculture but said supermarkets' interests are more aligned with the latter. He called for the further development of economic analysis to allow for comparisons of externalities across the three systems.

Responding to the issues raised, panelists: stressed the value of increasing the supply of meaningful jobs, as per "contributive justice"; called for capture of discounting in market prices, which is recognized but not done, and for reform of land tenure because tenant farmers discount the future; and noted that TEEBAgriFood does not prescribe specific decisions but provides tools to evaluate different decisions' potential outcomes.

Participants and panelists also highlighted challenges in using the Evaluation Framework, raising, among other issues: how to find a balance between detailed analysis and the limited resources and time available; how to derive meaningful results to enable targeted interventions for different actors, systems and scales; how to quantify invisible stocks and flows in agroecological systems – such as savings in use of inorganic fertilizers and pesticides.

Responding to a question about which study findings resonated most with decision makers, May noted that policy makers in Brazil recognize that there are differences at impact level between smallholder and commercial production, but are concerned about the budget implications. He suggested more work to highlight approaches that contribute to both income as well as ecosystem services.

Bellon noted the importance of recognizing that the high productivity of smallholders in Mexico is intrinsically linked to cultural values and not driven by profit alone. He said this highlights the need to understand deeper values that play a role in biodiversity conservation, which may not be reflected in market prices.

Discussing strategies to address some of the negative externalities of agricultural production, May noted that with one of the highest per capita rates of beef consumption in the world, changing unsustainable production systems in Brazil will require engaging consumers. He further noted the need for more work

Peter May, Federal Rural University of Rio de Janeiro, Brazil

Jacqueline McGlade, Maasai Mara University, Kenya, with participants from a breakout group

on little-addressed externalities, such as the impact on pollinators as well as the rise of respiratory diseases linked to the "burning season," when large tracts of the Amazon are cleared for soy and cattle production. May also suggested undertaking new research exploring the potential impact of substituting beef with chicken and fish.

Practical Exercises: On Tuesday, participants met in two breakout sessions aimed at using the Framework to work through different real-life scenarios for specific agricultural commodity production chains. The groups were guided through the process of: applying systems thinking to different eco-agri-food scales and locations; incorporating multiple capitals and value chain stages in the analysis; and understanding key concepts used to describe system interactions, such as stocks, in/outflows, outcomes and impacts. The first stage focused on developing a comprehensive description of the relevant agri-food system while the final session considered ways in which the Framework can be used to support conversations with different stakeholders and contribute to informed decision making at household, community and policy levels.

Reports by Breakout Groups: During a wrap up session in plenary, the different groups reported on the outcome of their discussion.

Tomato: Four groups reported on their analysis of tomato production systems in Brazil, Mexico, Tanzania, Kenya and Ghana, and Thailand.

For Brazil, it was noted that: most tomatoes are grown in greenhouses and need many pesticides and insecticides, affecting health of workers and downstream residents; people's attitudes are influenced by commercial actors convincing consumers to consider tomatoes' appearance rather than origins and impacts; tomato production entails residual plastic, water contamination, energy use, roads through habitat, and CO2 emissions and particulate pollution from truck transport; and great income disparities exist between farmers who can invest in greenhouses and those who cannot compete.

For Mexico, it was noted that: tomatoes are a massive export industry; the trend is from open-field to greenhouse tomatoes, with organic production emerging; plastics entail disposal problems, while pesticide residues are often channeled into nearby oceans; production uses migrant labor, associated with health issues from pesticides as well as inequality issues due to the "human subsidy" that low paid migrant workers contribute to make Mexican tomato exports very price-competitive in the US; and other costs may be incurred for refrigeration and other transport infrastructure, waste of non-commercialized low-quality tomatoes, and loss of pollinator species due to deforestation. Challenges in using the Framework included the fact that negative environmental and social inequalities have not been studied, but benefits in using the Framework include its systematic structuring and its good taxonomy and description of the production system.

On the tomato value chain in Tanzania, Kenya and Ghana, the group reported that production methods were linked to possible consequences for land tenure, use of machinery, water viability, transport and human capital. Potential positive impacts were reported to include value added, higher incomes and increased skill sets, but possible negatives included health risks due to pesticides, loss of ecosystems, and the effects of pollution. The Framework was seen as applying all along the value chain and useful for aiding investment decisions.

Regarding Thailand, tomatoes were reported to be grown primarily by small scale farmers for use in manufacturing ketchup. Potential problems identified included: over-use of pesticides and insecticides, water pollution and over-use; the need for many inputs including electricity and chemical fertilizers; and the need for massive infrastructure involving big machinery, marketing and distribution. Benefits from current production methods were identified as including: farmer capacity building; development of farmers' cooperatives that negotiate good prices with tomato processors; and other economic benefits to both farmers and processors. It was noted that Thai farmers are


Participants playing the "Trade-off" game

unaware of negative externalities. The Framework was predicted to be useful in contributing to planned agricultural projects.

Wheat: Two groups analyzed wheat production in Kenya and Ethiopia, respectively. Taking a historical approach, the Kenya group reported that: production has declined since 1990; large-scale commercial farmers produce the bulk of wheat; and there is a large presence of international actors in the value chain. Issues in the value chain were highlighted, including food safety in the production process, high energy demand, land tenure and access in wheat-growing areas located in pastoralist zones, and health and environmental impacts from depletion and contamination of water sources.

The Ethiopia group reported they had focused on a transformative scenario, based on the overall vision that "agriculture has to work" to enhance food security in a country that is currently the largest recipient of targeted food aid in the world. Referring to key players in such a transformation, the group highlighted the need to move from the current scenario of a few large-scale producers and importers towards numerous local seed banks producing drought-resistant and diverse genetic varieties that build on local knowledge and sustainable agricultural methods. They also highlighted opportunities to add value to locally produced food for both the domestic and export market through better branding to stress the positive health, livelihood and local-empowerment impacts of diversified wheat production. The group also noted the need to tackle current financial flows and subsidies to convince large-scale producers to reduce harmful impacts.

Chicken: The group characterized key players in the chicken value chain, ranging from households and local restaurants to veterinary services and actors in the domestic and international markets. The group highlighted some negative externalities such as greenhouse gas emissions from packaging and chicken waste, high energy consumption, and human health impacts due to the spread of bacteria and viruses and resistance to antibiotics. They stressed the role of consumers in demanding higher environmental standards and promoting genetic diversity in the sector.

Introduction to the TEEBAgriFood Workstreams and Theory of Change: Salman Hussain opened discussions on the final day of the Symposium by introducing the three TEEBAgriFood workstreams. He highlighted an existing series of Norway-funded "feeder studies" in Africa that had analyzed the food and beverage sector using Natural Capital Accounting (NCA). He said a DEVCO-funded project is currently re-examining a subset of those case studies in Africa in line with the Framework, to consider how to apply the needed changes identified through the NCA project. He noted that despite funding limitations and work remaining to be done, the exercise had enabled learning, particularly on why certain elements of the Framework were difficult to fill in.

Peter May presented the theory of change described in the ninth chapter of the Foundation Report. He defined its aim as being to understand obstacles to shifting from business as usual (BAU) approaches such as path dependency and denialism, and how to overcome these. He said information alone is insufficient since pro-change actors with countervailing power within society are needed for pushing back against resistance from powerful actors such as multinational companies who want to maintain their dominance and keep control over their profits. He suggested beginning with the question of the future costs of BAU policy, as in the Stern Report, and then showing value to be gained from change. He noted the importance of communication styles for the different groups one wants to influence.

Country Case Studies

European Commission-Funded Pilot Studies - Key Research Findings from Africa: On Wednesday morning, Barbara Gemmill-Herren, ICRAF, reported on the DEVCO-funded pilot study of rice value chain pathways in Senegal. She said questions of policy interventions were structured around Food and Agriculture Organization of the UN's (FAO) ten elements of agroecology and an existing framework based on the four capitals and their stocks and flows, including non-monetary values. She identified issues in the areas of mechanization, credit, subsidies, ownership of processing facilities, and transport.

A study participant noted that issues initially identified were associated with profitability and economics, but the Framework enabled recognition of many others, such as farmer attitudes regarding pesticides, fertilizers, and water use.


Barbara Gemill-Herren, ICRAF

Gemmill-Herren described the methodology used for the study, based on identifying problems and then policy interventions for their solution, then finding mechanisms to link the two, testing them through modeling scenarios and comparing the long-term outcomes of proposed solutions with those from BAU. She said the process is more important than results because it facilitates learning.


Priscilla Wainaina, ICRAF

Priscilla Wainaina, ICRAF, reported on two agroforestry projects in Ethiopia and Ghana focusing, respectively, on the coffee and cocoa value chains. She said that 95% of Ethiopian coffee is cultivated by smallholders, the bulk of which is processed in the country, in contrast to cocoa production in Ghana, where the bulk of the harvest is exported as raw beans with low returns for farmers.

Among positive impacts, she highlighted the "certification premium" arising from agroforestry coffee, as well as invisible benefits such as biological pest and disease control and improved carbon stocks above and below ground. Describing some negative impacts, she highlighted health and environmental problems associated with a growing preference for wet coffee processing, which leads to high water withdrawals as well as contamination of rivers. She cited studies pointing to water contamination in Ethiopian rivers of up to 30 times the recommended World Health Organization (WHO) levels, which is linked to loss of aquatic species, health effects and other negative impacts.

On policy options, Wainaina discussed opportunities to explore the generation of bioethanol from coffee waste as an alternative energy source and called for more detailed analysis of the health costs of water pollution for farm households.

With regard to the cocoa value chain in Ghana, Wainaina highlighted negative impacts linked to high pesticide use as well as social costs linked to child labor, noting an estimated 41% of children are involved in cocoa production, with some working under harsh conditions. During the ensuing discussion, however, several participants cautioned against labeling "light work" by children on smallholder farms as "child labor" noting it is a common practice in Africa and should be distinguished from the involvement of children in commercial plantations.

Pietro Galgani, True Price/Impact Institute, presented the results of a joint study with Wageningen and Sokoine universities that explored the contribution of livestock and chicken production systems in three agroecological zones of Tanzania. He said that while largely small-scale with low productivity, these systems play an important role in household income and sustainable production due to the low use of chemical inputs, recycling of agricultural and food waste, and minimal transportation costs as most products are sold locally. He also highlighted the contribution of backyard chicken production in women's empowerment.

Galgani further reported that the study found pastoralism to have higher economic and ecosystem services benefits than other food production systems in the same locality. He attributed this to the adaptation of pastoralism to rangeland environments and coexistence with wildlife, hence it does not negatively impact on tourism revenues. He highlighted opportunities to enhance the economic value of livestock systems through increased processing and infrastructure investments, but noted that the pastoralist lifestyle is increasingly under threat due to expansion of sedentary farming and urban settlements and closing of wildlife migration corridors.

Reflecting on experiences in using the TEEBAgriFood Framework, he said it was useful in identifying institutional barriers as well as areas where trade-offs could be made in developing policies, but highlighted challenges with developing farm-level models due to a lack of data.

International Climate Initiative (IKI) Pilot Studies: Progress, Challenges and Lessons Learned:

Yoanna Kraus Elsin, Humboldt Institute, discussed the Colombia study. Noting that the project is still in its early stages, she said an institutional scoping workshop had opted to shift from an ecosystem to landscape approach and had selected to study the Putumayo escarpment using the TEEBAgriFood Framework. She said the project was currently developing dynamic systems models to assess stocks and flows throughout the value chain of a variety of agricultural sectors in the region. Elsin reported that the project aims to work in close collaboration with indigenous communities and political stakeholders and would seek to incorporate the results in Colombia's national assessment of biodiversity and ecosystem services. Among challenges faced, she highlighted difficulties with engaging agricultural decision makers, and the challenges of completing a study in a short time frame in this post-conflict setting.

Taita Terer, National Museums of Kenya, presented the Kenya case study. He noted that rain-fed agriculture accounts for 98% of agricultural activities and over 70% of rural livelihoods in the country, which makes the sector particularly vulnerable to climate change. Discussing relevant policy frameworks, Terer said


Yoanna Kraus Elsin, Humboldt Institute

Kenya's Vision 2030 underscores the need to increase agricultural productivity and value-added margins in order to improve food security and livelihoods, while the 2010 Constitution sets a target of restoring forest cover to 10% of Kenya's surface and conserving water catchment areas, and affirms every citizen's right to a clean and healthy environment. In light of these policy objectives Terer said the study steering committee, which was established during an inception workshop in February 2018, had chosen to focus on the Mau Escarpment, one of Kenya's foremost water towers, with significant cultural and ecosystems services value.

Joel Norbert, University of Dar es Salaam, reported on a pilot study proposal for Tanzania using the TEEBAgriFood Framework to focus on food security. He pointed to shifts in ecosystems in the 1980s in the lands to be studied, from grasslands to artificial pine forests, which has changed hydrological patterns and local food production. He noted the project's objective to mainstream values of nature in decision making by highlighting trade-offs through mapping and review of policies and management, data collection, gap assessment and evaluation of positive and negative impacts of predicted changes to stocks of the four capitals (natural, produced, human and social) under different future scenarios. He said consultations with key change agents will then generate uptake of policy recommendations.

For Thailand, Phumsith Mahasuweerachai, Khon Kaen University, described a TEEBAgriFood study currently being formulated to compare conventional and organic rice farming practices. He noted that a trade-off analysis of the four capitals will be done to determine which provide greater net benefits to society with a view to informing policy decisions.

During ensuing discussion, questions and comments focused on, among other issues:

- The difficulty of identifying inputs within very complex systems that can be changed in order to influence the direction the system is taken in;
- The difficulty of achieving buy-in across ministries at the national level;
- The need to focus on positives when beginning dialogues with policymakers in order to establish positive synergies;
- The advantages of engaging with technical people and agencies rather than just high-level decision-making authorities; and
- The fact that government officials are regularly transferred to new positions, which necessitates engagement with new government counterparts.

Hussain then closed the session.

Project Breakout Groups

TEEB Training on Scenario Development and Modeling: Facilitator Tomas Declercq, UNEP, opened this half-day session. Participants first took part in a group activity, The Natural Capital Project's Ecosytem-Service Trade-Off Game, that required them to decide which products to invest in, whether maize or livestock, and how to allocate them according different goals, starting with the maximization of revenue and then with the addition of maintenance of ecosystem values. The group then identified limitations of the game, noting that it cannot: reflect the whole complexity of the real world; answer the question of where information comes from and how it can be improved; or account for other strategic actors with differing interests who may also have influence over allocation decisions.

Tomas Declercq, TEEB

Declercq then explained how to develop hypothetical scenarios that would facilitate such analysis of trade-offs between policy decisions in order to aid decision making. He said an effective scenario is relevant, participatory, legitimate, scientifically credible, comprehensive and distinct from other scenarios. He also observed that the choice of scenario is highly contingent on the policy cycle phase it should feed into, be it agenda setting, policy design, implementation, or review, and noted that TEEB's typical focus is on intervention scenarios. He also highlighted the spatial and time dimensions of scenarios, cautioning that they often cannot represent the complexity and nuance needed for effective decision-making, and drew attention to TEEB's six-step approach for scenario development. Participants then split into groups again to practice developing a scenario storyline.

Jacob Salcone, UNEP, informed participants that models replace experiments where the latter cannot be done and that models are used to calculate metrics so that decision makers can


Participants formed groups to compete in the "Trade-off" game

Jacob Salcone, TEEB

evaluate, "How would things be different if Scenario A existed rather than Scenario B?" He said that the modeling process involves first identifying the drivers of changes to the capitals, then modeling their impacts in terms of ecosystem services or socio-economic impacts. Salcone explained that models may measure simple cause and effect (drivers and impacts), or include system dynamics showing feedbacks that influence whether impacts increase or decrease over time, and highlighted numerous models that can be used to measure elements of food systems as explained by the TEEBAgriFood Framework. He noted, however, that TEEBAgriFood study results should be aimed toward answering policy-makers' questions, which are often practical, and focused on incomes or livelihoods and the consequences for these of their potential policy decisions.

Salcone explained the various types of economic value: direct, indirect, option, and existence value. He then briefly outlined the variety of methods that must be combined to estimate the total economic value of an ecosystem.

William Speller, UNEP, spoke on human and social capital, which he described as the most difficult of the four capitals to measure and model, and which constitutes a missing link in eco-agri-food systems. He acknowledged that while the overall goal is to predict the human and social world, this is unreachable. He highlighted several methods for measuring human and social impacts at the project level, including surveys and proxy indicators. He also outlined several examples of how to conceptualize questions, such as measuring social impacts from changes in employment data.

Participants then broke into smaller groups to complete the last part of training exercise, on considering what needs to be measured in order to decide what actions to take.

At the conclusion of the exercise, Declercq summarized the key points as the need to: think about what to measure and how; determine what metrics will influence outcomes; and generate scenarios and utilize models to answer the questions that policy makers are likely to have.

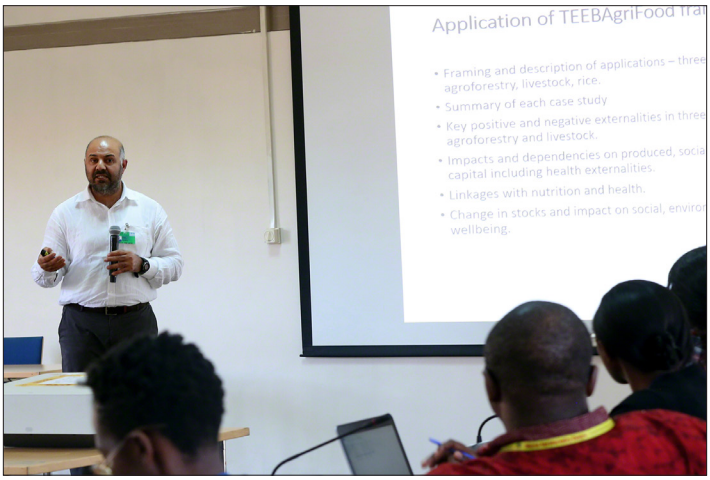
'TEEBAgriFood Africa' Stakeholder Workshop: On Wednesday afternoon, partners in the DEVCO-funded project, 'TEEBAgriFood in Africa: Assessing options to improve livelihoods,' shared experiences from the three pilot studies, as well as the overarching regional report. Introducing the session, Dustin Wenzel, TEEB/UNEP, said the session would provide a final opportunity to integrate feedback into the project reports that are due to be published in March 2019. He explained that the project builds upon a number of exploratory studies commissioned in 2014 for different commodities, but modifications were needed to align the analysis with the TEEBAgriFood Evaluation Framework, which was being developed in parallel. He added that the project offered an opportunity to provide a more policy-focused narrative for improving agriculture and food systems.

Harpinder Sandhu, Flinders University, provided an overview of the proposed publication, noting it would comprise one narrative report and three standalone pilot case studies. In the ensuing discussion, one participant wondered if the research questions addressed in the assessments were based on expressed needs of policy makers and if the language used was appropriate for the target stakeholders. Other speakers highlighted the need to: identify a specific timeframe against which to assess progress, such as the 2030 Agenda, or Africa's Agenda 2063; involve key institutions as agents of change; and ensure that policy discourse does not detract from efforts to develop sustainable models on the ground.

One participant noted the need to recognize that many externalities transcend the agricultural sector, which raises the question of whether it is more effective it is to develop "generic" policies. Another contributor suggested that the study might be most useful in guiding policymakers to understand how to apply data to calibrate policies, as well as what it takes to trigger policy change.

Commenting that "this initiative will not be sufficient to generate the anticipated change," another speaker called for going beyond published reports to engage more deeply with the key stakeholders.

In response, Harpinder noted that sufficient information has been gathered through the case studies to identify where the externalities are and concurred with calls to include strong



Harpinder Sandhu, Flinders University

messaging on the role of farmers as change agents and the need for more investments in institutions that work directly with communities.

In a final round of discussions, representatives of each study team highlighted specific proposals from the country cases.

Discussing the rice study in Senegal, Barbara Gemmill-Herren outlined 16 policy recommendations developed by the study that included proposals for: increasing resource-use efficiency, for instance through replacing, or removing subsidies for, inefficient irrigation equipment; tailoring subsidies to encourage the use of natural fertilizers; investing in climate-smart interventions; promoting small- and medium-sized processing facilities at the local level; and supporting initiatives that seek to revive local genetic stocks and better link food producers and consumers.

Gemmill-Herren explained the usefulness of budget analysis undertaken as part of the study, which revealed that Senegal spends a significant portion of its annual budget to repay loans that were used to fund large-scale irrigation projects and intensive agro-processing zones. She said such insights offer a starting point to encourage policy makers to explore alternative development pathways.

Highlighting insights from the cocoa and coffee agroforestry case studies, Priscilla Wainaina mentioned the need to promote certification of sustainably produced commodities to better reflect the invisible costs and benefits of different agricultural systems. One participant emphasized the importance of more research to bring out the residual effects of unsustainable production methods, while another speaker emphasized the need to focus on the health costs of pesticide use in the cocoa industry, which he described as "probably the biggest externality" in the value chain.

Reflecting on the Tanzania livestock study, Pietro Galgani said the TEEBAgriFood Framework helped identify potential pitfalls and trade-offs in choosing different pathways, including the risk of losing "local site benefits" such as improved livelihoods for the poor, empowerment of women, tourism and sustainable use of farm and livestock waste. He suggested exploring ways to link agricultural subsidies to payments for ecosystem services schemes and noted that while sustainable intensification practices are an important part of the solution, these do not currently form part of the policy discourse.

Pietro Galgani, True Price/Impact Institute

Closing Plenary

In final remarks, Salman Hussain noted that the workshop was organized to learn how to apply the TEEBAgriFood Framework, bring together practitioners to share lessons learned and compile information to create momentum for its use.

Alexander Müller then thanked participants for their hard work on a complex subject. He noted some take-away messages from the discussions, including that: the complexity of the modeling needed is impressive and daunting; if a systems approach to decision-making is not taken, but only a few elements considered, this can result in wrong answers; it is all about collaboration between different communities; it is time to stop talking and start doing it; and there is a desire to become part of the TEEB community to influence action and actively participate. He said the underlying message is that the end of this symposium is not the end of the work, but the beginning.

Müller reported having just received positive comments from UNEP Permanent Representatives about this work, observing that this bodes well for countries to adopt it and use it.

In closing, he thanked the interpreters, workshop organizers, and donors, noting his wish that donors continue to make contributions to keep this work stream going over the next year.

Project Partners Workshop

The workshop took place on Monday, 25 February 2019, ahead of the official opening of the Symposium, to gather the country partners who are implementing TEEBAgriFood via the IKI and EU-PI-funded projects. Salman Hussain introduced the TEEBAgriFood Evaluation Framework and said it is intended to improve assessment of costs and benefits of food and agriculture systems and to provide a theory of change in order to produce concrete results and achieve positive outcomes for farmers, consumers, and biodiversity and ecosystem services. He highlighted that the Framework is intended to enable humans to see nature's value and provide clear evidence that actions that benefit nature also benefit local and global communities, thus incentivizing changes in behavior. He further noted that this inaugural Symposium would show participants how to carry this concept forward as "the implementers of change on the ground."

Opening of the pre-Symposium workshop

Participants during the breakout group on the IKI Project

Breakout Group on the IKI Project: During this interactive session, which focused on progress, challenges and lessons learned, country teams from Colombia, Kenya, Tanzania and Thailand reflected on the process of developing their TEEBAgriFood pilot studies. The review covered, *inter alia*, experiences in establishing linkages with policy makers and other stakeholders, and using different evaluation methodologies.

In the ensuing discussion, participants highlighted challenges faced in defining the scope of their respective country studies, noting, in particular, the difficulty of achieving a balance between generating quick results and ensuring in-depth analysis of specific sectors and ecosystems. On strategies for stakeholder engagement, the role of steering committees was highlighted as being a useful approach for involving all stakeholders, but cautioned that it can also raise expectations among members that may not be easy to meet.

Breakout Group on the EU-PI Project: Salman Hussain opened discussions in this breakout group, which highlighted experiences in promoting a sustainable agriculture and food sector in Brazil, China, India, Indonesia, Malaysia, Mexico, and Thailand. He explained that the project aims to protect biodiversity, promote wellbeing and produce concrete changes. He noted its focus on biodiversity conservation and ecosystem service provision in agricultural landscapes to address: the funder's desire for broad impact; cumulative pressures affecting biodiversity and ecosystems in the host countries; and the local and global importance of the project. He listed ten types of interventions as potential solutions for consideration: broadening of existing agricultural extension, peer-to-peer learning, macro-accounting, sustainability standards and certification, payment for ecosystem services schemes, global compensation systems for provision of global ecosystem services, stimulating banking sector financing, tax and subsidy reforms, land tenure reforms, collaboration between line ministries, and direct engagement with all stakeholders and change agents.

Hussain then summarized the progress under the eight Work Packages, which cover: analysis of ongoing or potential interventions; policy mapping; development of pilot projects; engagement with the agri-business community; comparison of policy-changing and business-as-usual scenarios; development of roadmaps of concrete steps toward change; delivery of the change and project sustainability; and communications and mainstreaming.

Mark Gough, Natural Capital Coalition (NCC), presented details on: engaging the agri-business community (Work Package 4) to mainstream the inclusion of natural capital in decision-making; harmonizing approaches; and bringing business and other sectors together to develop a protocol of joint solutions. He highlighted the role of the NCC and other organizations in countries' implementation and noted the status of implementation in each host country.

Dolores Barrientos, UNEP, reported on a UNEP-GIZ high-level consultation and technical workshop held recently to begin a process to form a steering committee for TEEBAgriFood decision-making in Mexico.

Jasmin Hundorf, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), reported on the agency's cooperation in this activity, and said the workshop identified three foci for Mexico: the traditional MILPA integrated system for small-scale planting of maize, beans, and pumpkin; the social, environmental and health values being lost in intensive industrial agricultural production in northern Mexico; and water and soil. She said that five to six policy options for each would be identified and presented to the steering committee for a decision on two study areas for the TEEB.

Salman Hussain noted that Mexico represents the first "model" of implementing TEEBAgriFood and said the TEEB office stands ready to help countries put together policy processes like Mexico's. He congratulated Mexico on its successful launch.

In ensuing discussion, Linxiu Zhang, UNEP, expressed support for TEEBAgriFood, the stakeholders included in the coalitions, and the application of its principles in different countries and contexts, such as China. Marcio Selva, UNEP, noted that Brazil supported the system approach for evaluating the many elements of agriculture.

Hesti Lestari Tata, Indonesia, noted that environmental valuation for ecosystem services represents a bridge between conservation and human benefits. He mentioned a 2018 concept

Jasmin Hundorf, GIZ

View of the room during the communications training session

note on sago flour as a substitute for wheat flour for wetlands restoration. Jakrapun Suksawat, Thailand, cited incipient programmes on GHG emissions from rice and sugarcane and on policy for public and private sector collaboration for addressing issues in durian production.

Communications Training: On Monday afternoon, partners from the different pilot projects participated in a communications and media outreach training facilitated by Matthew TenBruggencate and Tasha Goldberg, International Institute for Sustainable Development (IISD). The objective was to enable project partners to effectively disseminate key messages from the TEEBAgriFood pilot studies targeted both at policy makers and the general public.

The training built on the recognition that tremendous effort is needed to generate comprehensive policy recommendations that weave biodiversity and ecosystem services considerations into all aspects of human activity. In addition, policy recommendations must be effectively communicated to key stakeholders – from government decision makers to peers to business groups and beyond – and move them to act.

IISD facilitators **Matthew TenBruggencate** and **Tasha Goldberg**

Core elements of effective communications covered in the training included: how to reframe messages to resonate in peoples' hearts and minds, moving them to act; identifying the right audiences; crafting messages that appeal to self-interest ("What's in it for me?"); and using memorable stories.

The facilitators took attendees through the process of building a plan to share research findings using the least amount of resources (time, money) for the maximum results. The training also addressed how project partners can make the best use the tactics professional communicators deploy to achieve their goals.

Upcoming Meetings

UN Science-Policy-Business Forum on the Environment: The UN Science-Policy-Business Forum on the Environment will hold its sessions at the UN Headquarters in Nairobi in the lead up to the fourth session of the UN Environment Assembly (UNEA 4). **dates:** 8-10 March 2019 **location:** Nairobi, Kenya **contact:** Shereen.zorba@un.org / **Skype:** Shereen.zorba **phone:** +254 788 526000 **www:** http://web.unep.org/environmentassembly/science-policy-and-business-forum-0

UNEA-4: The theme of UNEA-4 is 'Innovative solutions for environmental challenges and sustainable consumption and production.' The meeting will be preceded by a meeting of the Open-Ended Committee of Permanent Representatives from 4-8 March 2019. **dates:** 11-15 March 2019 **location:** Nairobi, Kenya **contact:** UNEP **email:** beatpollution@unenvironment.org **www:** http://web.unep.org/environmentassembly/

Monitoring and Evaluating for Inclusive and Sustainable Food Systems: New evaluation approaches need to be developed to cope with the dynamic and complex nature of food systems, which feature multiple perspectives, multiple levels, multiple actors with multiple goals operating in multiple sectors. The main question of the conference is: "How should and can monitoring and evaluation support the transition towards inclusive and sustainable food systems?" **dates:** 3-4 April 2019 **location:** Wageningen, The Netherlands **email:** lotte.

vandenberg@wur.nl **www:** http://www.managingforimpact.org/event/conference-monitoring-and-evaluation-inclusive-and-sustainable-food-systems

IPBES 7: The seventh session of the plenary of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES-7) will consider, among other issues: the report of the Executive Secretary on the implementation of the first Work Programme for the period 2014-2018; the Global Assessment of Biodiversity and Ecosystem Services; and institutional arrangements. **dates:** 29 April - 4 May 2019 **location:** Paris, France **contact:** IPBES Secretariat **phone:** +49-228-815-0570 **email:** secretariat@ipbes.net **www:** https://www.ipbes.net/event/ipbes-7-plenary

EAT Stockholm Food Forum 2019: EAT food forums seek to drive progress and coordinate action across sectors and disciplines to tackle the intertwined challenges of the global food system. The 2019 Forum will build on the findings of the EAT-Lancet report on healthy diets from sustainable food systems, launched in January 2019. **dates:** 12-13 June 2019 **location:** Stockholm, Sweden **contact:** EAT Partner Team **email:** info@eatforum.org **www:** https://eatforum.org/events/

International Soil Congress 2019 – "Successful Transformation toward Land Degradation Neutrality (LDN): Future Perspective": Marking the 25th anniversary of the UN Convention to Combat Desertification (UNCCD), the Congress will bring together senior scientists, academicians, experts, policy makers and young researchers to analyze the current and future trends of soil and land resources. **dates:** 17-19 June 2019 **location:** Ankara, Turkey **contact:** Secretariat **email:** ldnsoil@gmail.com **www:** https://soil2019.gidatarim.edu.tr/en

50th Session of the IPCC: The Intergovernmental Panel on Climate Change (IPCC) is currently in its sixth assessment cycle, which includes the Special Report on Climate Change and Land, which is tentatively scheduled to be adopted in August 2019. **dates:** 13-17 August 2019 (TBD) **location:** TBD **contact:** IPCC Secretariat **phone:** +41-22-730-8208/54/84 **fax:** +41-22-730-8025/13 **email:** IPCC-Sec@wmo.int **www:** http://www.ipcc.ch/

SBSTTA 23: The twenty-third meeting of Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) will review possible elements for the post-2020 framework, including any implications arising from the IPBES global assessment, the draft of the fifth edition of the Global Biodiversity Outlook as well as other relevant information and sources of knowledge. **dates:** 14–18 October 2019 (tentative) location: to be confirmed **contact:** CBD Secretariat **phone:** +1-514-288-2220 **fax:** +1-514-288-6588 **email:** secretariat@cbd.int **www:** https://www.cbd.int/

CFS 46: The 46th session of the Committee on World Food Security (CFS) will convene from 14-18 October 2019 in Rome, Italy. **dates:** 14-18 October 2019 **location:** FAO Headquarters, Rome Italy **contact:** CFS Secretariat **email:** cfs@fao.org **www:** http://www.fao.org/cfs/cfs-home/en

Glossary

CBD	Convention on Biological Diversity
COP	Conference of the Parties
DEVCO	European Commission Directorate-General for International Cooperation and Development
EU-PI	European Union Partnership Instrument
FAO	Food and Agriculture Organization of the UN
GEF	Global Environment Facility
ICRAF	World Agroforestry Centre
IKI	International Climate Initiative
NCA	Natural Capital Accounting
SDGs	Sustainable Development Goals
TEEB	The Economics of Ecosystems and Biodiversity
TEEBAgriFood	The Economics of Ecosystems and Biodiversity for Agriculture and Food
UNEP	UN Environment Programme

TEEB Global Symposium 2019 participants