TEEB Implementation

The Economics of Ecosystems and Biodiversity

Supporting biodiversity and climate friendly land management in agricultural landscapes

Inception meeting and scoping workshop

7th and 8th May, 2018

St. Gaspar Conference Centre

Dodoma, Tanzania

Background and objectives

1. UN Environment (UNEP), with the support of the International Climate Initiative[1] (IKI) have launched a three-year project for supporting biodiversity and climate friendly land management in agricultural landscapes in four countries. These include Colombia, Kenya, Tanzania, and Thailand
2. Building on the momentum of the international TEEB initiative[2], TEEB country studies[3], the new study on TEEB for Agriculture and Food[4] and on national interest, the project can provide evidence-based information to inform cross-sectoral policies for natural resources management, especially as they relate to agriculture.
3. The project's main objective in the partner countries is to mainstream the values of nature in decision-making, through highlighting the several trade-offs made in land-use decisions, which are usually not captured through conventional assessments such as Strategic Impact Assessments. TEEB Agri-Food endeavors to reveal hidden and often invisible contributions of nature to agricultural production, both positive and negative impacts of agriculture on biodiversity, human health, and other links of agricultural systems with human health, culture, and other ecosystems at the landscape level. This project will design and conduct a study that identifies and quantifies those hidden and invisible linkages between agriculture and nature and connects that information to policies and policy makers in Tanzania.
4. The workshop was designed to:
    a. To officially launch the project in Tanzania;
    b. To identify thematic and/or spatial priorities that may offer useful starting points for the project. This may include, for example, integrated water resource management in priority watersheds or the impacts of changes in agricultural activities;
    c. To identify, in consultation with national and local authorities and other relevant stakeholders, how this project would contribute to policy making, building on existing initiatives and programmes currently taking place in Tanzania;
    d. To discuss and agree on the project management arrangements and the work programme for the project, including steering committee, project management, and technical partners to be involved during the project implementation.

[1] https://www.international-climate-initiative.com/en/
[2] http://www.teebweb.org/
[3] http://www.teebweb.org/areas-of-work/country-studies-home/
[4] http://www.teebweb.org/agriculture-and-food/

Participants

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19.	Dr. Salman Hussain	UNEP TEEB Team	Geneva
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Introduction

Opening remarks: Magdalena Ngotolainyo (Acting director of Environment Department) and Clara Makenya (United Nations Tanzania representative)

Conservation of biodiversity requires addressing underlying causes of environmental degradation, at the national and international level, using scientific information. Many Tanzanians, including many poor, are involved in agriculture as their primary activity. But agriculture can harm the environment and natural ecosystems that agriculture depends on, such as bee pollination and water provision.

The process of economic development is resource intensive. TEEB country studies are very relevant in steering the processes of agriculture development and sustainable management of natural resources. TEEB studies are evidence-based dialogues for sustainable economic development and conservation of natural capital. They are an opportunity to use science for actions to fine tune policies and initiatives, and translate biophysical and economic information for adoption in policy.

This is a technical session and not a political event, to facilitate implementation of TEEB in Tanzania, where we will identify thematic and/or geographic areas for study of the economics of ecosystems and biodiversity in Tanzanian agricultural systems.

Goals of TEEB:

TEEB is about connecting the benefits of natural ecosystems and biodiversity to livelihoods and human wellbeing. TEEB seeks to change the conversation around conservation and natural resource management by acknowledging the contribution of the natural world to every economic activity and everyday life. Agriculture is the main source of livelihood for 475 million people, but crops and livestock use and/or pollute water and contribute substantial greenhouse gas emissions from deforestation, soil degradation, and distribution of food. Globally, 80% of new agricultural development has replaced tropical forests.

TEEB for Agriculture and Food started in Tanzania by looking at the Ngitili Agro-forestry system, livestock rangeland on the Masaai Steppe and impacts of transition from pastoralism to irrigated intensive agriculture (Baltussen et al., 2017), and scenarios under the SAGCOT (Southern Agricultural Growth Corridor of Tanzania) (Mwalyosi et. al., IRA, 2017), acknowledging that agricultural development and expansion of irrigation are a main priority of the President of Tanzania and the Big Results Now initiative. More recently the President's support for the hydroelectric dam at Stiegler's Gorge will likely modify plans for SAGCOT and agri-food systems in general.

The next phase of TEEB needs to link the study of geographical and ecological impacts of agriculture to the agri-food supply chain and government policies. This next phase can build upon the rigorous academic studies mentioned above as well as extensive modeling of the impacts of land use change scenarios conducted by the World Conservation Monitoring Center (WCMC) at Cambridge University, mentioned below.

Associated projects and research

Presentations were made by institutions that have conducted research recently on agri-food systems in Tanzania in order to inform how this next phase of TEEB Agri-Food can contribute to agricultural development policies and decisions.

The **Institute of Resource Assessment** at the University of Dar es Salaam has studied the impacts of agricultural development (as per the SAGCOT initiative) in the Rufiji basin. The Rufiji is critical for development, particularly in relation to water and land use. The goal of SAGCOT is to deliver rapid agricultural growth and expansion in this region; this study evaluated carbon balance and agricultural output within the Kilombero sub-catchment associated with five different scenarios: Business As Usual (BAU), Maximum (unconstrained) Development, Water Constrained SAGCOT, Ag intensification (less land used), and water efficiency (30% improvements). The study used a CROPWAT model to estimate the irrigation requirements for ag ambitions, and SWAT to estimate water yield and run-off from areas of ag expansion. Systems Dynamics modeling (Natural Capital Project's InVest Scenario Generator) was used to generate future land cover maps under the five scenarios. This study resulted in a policy brief that recommended key crops or sectors due to a combination of water, soil, and ag product demand, to support the transitions towards commercialization of the ag sector in this region.

The researchers conclude that agricultural production should be made intensive, not extensive and water efficiency improved, by way of a combination of scenarios 4 and 5. The presentation of this study opened up a good discussion about the differences between modeling crops and the private sector taking up certain crops in certain areas. SAGCOT is currently using a commercial investment guidance tool, from IRA, to endogenize sustainability into agricultural development planning.

Sokoine University presented an overview of many studies conducted in the past 10 years, on biodiversity, climate change mitigation and adaptation, vulnerability, REDD, ag innovations to decrease biodiversity impacts and others. An economic analysis of water use of lower Kihansi Hydropower plant was highlighted. The study evaluated how much power would be generated under different water by-pass scenarios and concluded that more water could be bypassed to the benefit of biodiversity while maintaining profitable hydropower production.

Sokoine representatives commented that there has not been much integration between agriculture and biodiversity and that more studies are need, particularly on the value of ecosystems services and forests to the national economy.

The **World Conservation Monitoring Centre** presentation and report (see annex for a summary) provides details of current and previous biophysical modelling and valuation initiatives that provide a platform for the current TEEB project. In particular, TEEB IKI will focus on land use and land cover change and the implications thereof for ecosystem services' provisioning, and there have been previous attempts to model such changes (future scenarios).

WWF gave an overview of the state of the environment, in particular the steady decline in biodiversity and extinction of species globally. This was presented in the context of the Global Footprint assessment, and the case was made that Tanzania should also be aware of (and responsive to) ecological thresholds.

IRA has been commissioned to do an Environmental Impact Assessment of the proposed Stiegliz Gorge dam project. Some "trial" modeling has been conducted, but not a comprehensive full-system, upstream-downstream ecosystem services modeling. Example brought up included Mbarali Plain, a rice producing zone.

TEEB Study Options Development

UN Environment/TEEB can offer support to study agriculture and environment issues in Tanzania, focusing on issues where there are different potential approaches to choose or policies to adopt that could influence agriculture and environment outcomes. Within this current IKI project, the aim is to use spatial modeling as evidence base at the science-policy interface, and as such to go from academic modeling to political processes and commercial investment. But first we have to pick an area or policy or issue, where a policy or decision could change an agriculture and environmental outcome, and make an implementation plan.

Steps towards implementation of this project:

1. Identify priority agricultural issues and potential study options
2. Describe the scope of each "option", lay out the pros and cons
3. Build a steering committee who will choose the option and steer the study

First, participants were asked to brainstorm study options per the following criteria:

1. How does the issue or "option" relate to ecosystem functions and ecosystem services?
2. What is the geographic scope?
3. What is Business-As-Usual scenario, and what could be changed through different policies or decisions?

Four options are described below, are there is a notable overlap between them. In order to advise the Steering Committee we must evaluate further:

1. How does each option build on other projects/initiatives including valuation of ecosystem services?
2. Which actors would need to be involved for transformative change? (Link to policy)
3. Which research institutes have the technical competence to carry out the analysis (literature review and scenario analysis)?
4. Which individuals/institutions hold bio-physical and valuation data pertinent to the option

Option 1: Small-holder farming

Geographical Scope and Ecosystems	• Nationwide • Of particular concern are wetlands in MIOMBO ecosystems • Could focus upon SESAME VALUE CHAIN, Southeastern Tanzania (Mtwara, Lindi and Coastal Region)	
Environmental Issues	• Following drought, farmers are now moving towards Miombo wetland ecosystem (it allows settlement during wet season doing bee keeping, charcoal, logging for timber, tobacco farming, etc. and during dry season they can move downwards doing fishing • Almost 70% of the reserved is in Miombo wetland • Farmer-pastoralist conflicts are found in Miombo area • Intensive chemical use has an impact upon biodiversity • Charcoal burning impacts upon water • Deforestation • Investors also move to Miombo area	
Scenarios and related ecosystem services (What would be measured/studied?)	• Trade-offs between different crops and their value chains (e.g. Avocado, Sunflower, Sesame, Beekeeping, Chickens) • Farming best practices (vs. BAU) • Promote village forest reserves; General Land vs. Conservation Land designations	• Food security • Sustainable incomes • Water quality • Erosion • Soil-degradation • Other forest services?
What could be influenced?	• Forest tenure and forest ownership (back to village authorities?) • Promotion of farming best practices	
Data and Data Sources (stakeholders)	• Academia and Research institutions TPRI, SUA (Sokoine University of Agriculture), TAFORI, IRA • Private and Non state actors (The Aghakhan Foundation, TCRS, MVIWATA (Network of Smallholder Farmers Groups in Tanzania), PASS(Private Agriculture Sector Support), Medium Scale Farmer • Government (Ministry of Agriculture, TFS, Ministry of Water, Vice President's Office)	

Option 2: Full Rufiji basin

Geographical Scope and Ecosystems	• Rufiji Basin – particularly those areas affected downstream of the proposed Stiegler's dam • SAGCOT area • Part within Selous Game Reserve	
Environmental Issues	• Current production – main crops are rice, sugarcane, cassava and livestock • Expected to be a massive upswing in available water resources but land use planning is required to optimise the value-added of agricultural activities across the value chain – a crop/livestock optimization strategy • Need to develop these scenarios allowing, in each scenario, for at least the minimum flow rate that is required to maintain biodiversity, i.e. satisfying the water needs of biodiversity	
Scenarios and related ecosystem services (What would be measured/studied?)	• Water availability increases - potential for flooding • Crop optimization strategy / Priority crops • Need to measure changes in value chain (provisioning of outputs from on-farm and food processing), livelihood impacts, health impacts, changes in social and cultural capital as communities may be displaced from upstream production	• Combination of InVEST, systems dynamics modelling, CROPWAT and SWAT would be required • Needs to allow for dry season/rainy season variability
What could be influenced?	• The outcomes would feed directly into the SAGCOT strategy and on-the-ground application for agri-food management, which in turns talks to wider issues such as national food sovereignty, food security, improved nutritional outcomes/health impacts being reduced, whilst also meeting international and national commitments on biodiversity conservation	
Data and Data Sources (stakeholders)	• Not discussed	

Option 3: Iringa sub-basin

Geographical Scope and Ecosystems	• **Upper highland area of Rufiji** • Forests (small scale/woodlots, natural forests) • Small scale agriculture	
Environmental Issues	• Trade-off between land uses (biodiversity, access to various needs from forests (traditional medicine, woodfuel) • Water flows - agriculture and woodlots impacts • Food security and poverty • Monocultures and invasive/exotic species causing loss of biodiversity • Growing population, growing wood demand for building • Climate change influencing agriculture then forestry	
Scenarios and related ecosystem services (What would be measured/studied?)	• Long term investment (woodlots/plantations) versus short term (agriculture) • Upstream – Downstream ecosystem services	• Food security • Sustainable incomes • Biodiversity – exotic species and agriculture • Water quantity, timing, and quality • Hunting, NTFPs
What could be influenced?	• Strategies to implement land-use plans • Modify land-use plans or land-use regulation (as opposed to de-gazetting) • Promoting best farming practices • Alternative income strategies • Discordant policy (simultaneously promoting ag and forest conservation)	
Data and Data Sources (stakeholders)	• Not discussed	

Option 4: Kilombero sub-basin

Geographical Scope and Ecosystems	• Wetland area below Iringa, immediately above Stiegler's Gorge • Large scale - Teak, Rice sugar cane • Small scale (mix agriculture and woodlots for Teak) • Wildlife • Fisheries • Pastoralism	
Environmental Issues	• Biodiversity - Endangered species (Puku) • Livestock influx • Long investment (woodlots/plantations) versus short term (agriculture) – land issues • Water flows and quality - agriculture • Farmers-pastoral conflicts • Exotic species and agriculture • Overfishing	
Scenarios and related ecosystem services (What would be measured/studied?)	• Water use efficiency technologies • Environmental friendly agricultural practices • Intensive exotic woodlots vs. natural forest • Largescale ag vs. small scale vs. pastorialsim	• Food security • Sustainable incomes • Water quality • Biofuels
What could be influenced?	• Harmonize national policies, national strategy for ag harmonized with environment •	
Data and Data Sources (stakeholders)	• Not discussed	

Proposed Project Governance Steering committee / consortium –technical committee

Ministries /Groups of Stakeholders form the TEEB Project Steering Committee

1. Director of Environment, Vice President's Office (Co-Chair) TBD
2. Ministry of Agriculture (Co-Chair) TBD
3. Ministry of Water and Irrigation TBD
4. Ministry of Natural Resources and Tourism TBD
5. National Environmental Management Council (NEMC), TBD
6. Southern Agricultural Growth Corridor (SAGCOT) (Mr. John Banga Nakei)
7. MVIWATA Small-holders Association (Ms. Theodora Pius)
8. Private Agricultural Sector Support (PASS) (Mr. Nicomed Bohay)
9. WWF Country Office (Mr. Severin Kalonga)

Ex Officio

1. UN-Environment
2. Vice President's Office, Secretariat of the Project

Annex: IKI Inception Workshop Background Report- summary notes

From WCMC Tanzania Scoping Report

National strategies related to Aichi targets:

- National Strategy for Growth and Reduction of Poverty (MKUKUTA), created under the Tanzania Poverty Environment Initiative (Reuter et al., 2016), and;
- National Biodiversity Strategy and Action Plan (NBSA) objective vii) "*Promote economic valuation for biodiversity and payments for ecosystem services*" (GoT, 2015)

Valuation efforts:

1. TEEB Rufiji Delta (see below)
2. TEEB AgriFood Valuation of livestock eco-agri-food systems: poultry, beef & dairy, using Maasai Steppe pastoralism as a case study
3. TEEB case study on value of forest restoration efforts from the 1986 Hifadhi Ardhi Shinyanga initiative
4. Valuing the Arc project in the Eastern Arc Mountains (Natural Capital Project InVest modeling of many ecosystem services)
5. The UNDP-UNEP Poverty and Environment Initiative economic valuation of Ihefu Wetland 2007 -2010 and a pilot study of the economic importance of ecosystems in the Livingstone Mountain Ranges
6. The University of Dar es Salam and Stockholm Environment Institute looked at the value of land resources in the Tabora Region for the Vice President's Office. The analysis highlighted the importance of water services, with water regulation services making up over 60% of the value of the 9 ecosystem services estimated (total USD$1.45 billion per year).
7. The Environment for Development – Tanzania (EfDT) initiative assessed the importance and value of pollination services to small-holder agriculture production in Tanzania. The study assessed the contributions of natural habitats to crop yields by integrating plot level data on agricultural production with spatially and temporally matching data on land cover in the context of small holder agriculture. The study evaluated changes in agricultural revenues associated with the actual land cover change between 2008 and 2013, finding that change in forest cover over this period has reduced household total farm revenue by 23% on average. [This seems very difficult to identify causality.]
8. Uluguru Equitable Payments for Watershed Services project was identified as a way of responding to the conversion of forest to farmland, which resulted in lost sediment retention services and increased water treatment costs downstream (Natural Capital Project, n.d.).
9. There are eight REDD+ projects identified in Tanzania, which provide payment for carbon sequestration / storage ecosystem services (REDD, n.d.-b)

Natural Capital Accounting efforts:

- Natural Resource Accounting Study (Forests): University of Dar es Salaam and the National Bureau of Statistics conducted Natural Resource Accounting study on the contribution on natural forests to income in the Urambo district in 2002. The study estimated the value of non-marketed forest resources, with the objective of informing modifications of the national accounts.

- Zanzibar Marine Accounts: The Universities of Columbia and Dar es Salaam developed marine ecosystem services accounts for 2007. The study estimated that marine ecosystem services contribute 30% of GDP.

- Also a few academic studies (U. Turku, U. Cambridge, U. Reading, USFS-WCS and MEA) on identifying, describing, and quantifying ecosystem services, without valuation.

Modeling Landuse Changes:

The most extensive changes in land use, under all scenarios modeled as part of the WCMC efforts, occur in areas of grassland and shrubland, which are expected to be converted to crop and pastureland in particular. This is due to the weight of the overarching drivers of projected increases in population and associated demand for food and fibre, increased wealth leading to increased demand for animal products and climate change.

The relationship between intensification of agriculture to meet yield potentials and the impacts on biodiversity and ecosystem function provision is the fundamental issue. Some areas of high yield gaps with relatively low risk (from weather variability) for investments in intensification also correspond to areas with high levels of ecosystem function, where food production, according to this study, is projected to increase at the expense of wild provision and regulating functions associated with forest habitats. In these areas, population densities (and therefore beneficiaries of these services) are relatively high and expected to remain so.

- In Tanzania especially, large areas with high biophysical potential to close yield gaps for rainfed cereals, but with high risk due to high variability in water availability, are likely to be targeted in plans and programmes aiming to develop the country's so-called "underutilised" lands. These areas are seen as areas with potential for large scale industrial agricultural development (see e.g. Tanzania National Agricultural Policy): irrigated, mechanised and high input farming. The conversion of such large areas into (more intensive) agriculture, can have a large impact on a country's (and global) biodiversity and ecosystem services. It is important to consider and balance the costs and benefits of development for all stakeholders in these areas.
- Results reinforce the need to increase yields, whilst putting in place appropriate incentives and regulation to avoid expansion of cropping or grazing into forest or grass/shrubland areas that hold important biodiversity and provide ecosystem services that support local livelihoods, and agriculture, and other contributions to the national economy.
- Finally, the relationship between agricultural intensity, technologies and practices that support intensification of agriculture and the impacts at a local level on biodiversity and ecosystem function provision need further investigation. Yield gap calculations and analyses of the potential to close them (and how), are needed for more climate zones and crops. Also, analyses of potential trade-offs with biodiversity and ecosystem functions would benefit from more refined indices.

Tanzania Rufiji Basin TEEB Study - summary notes

From: http://www.teebweb.org/areas-of-work/teeb-country-studies/tanzania/

Objective:

Examine major land use/cover and management of trade-offs in three ecological gradients: mountain highlands, midlands, and the delta of the Ruhudji-Kilombero-Rufiji River sub-catchment.

- The TEEB study carried out 5 policy scenario analyses (BAU, plus varying ag development scenarios) to inform decisions on land management and to "result in improved awareness of environmental, social, and economic impacts of land use on communities and ecosystems, and potentially inform land use policies in the region."

- Focused on Kilombero because there was insufficient data available for the full Rufiji catchment
- Basin has forest/grassland/ag land uses; dams and intensive ag compete for water.
- 300,000 ha identified for greater irrigation potential, currently low productivity, high poverty area (presumably subsistence farming).
- The Southern Agriculture Growth Corridor of Tanzania (SAGCOT) initiative targeted 51,800 hectares for additional agriculture production to generate annual gross revenues of 35 million USD after five years, yield around 4,500 direct employment opportunities, and provide benefits to almost 40,000 people in total.

- Study used CROPWAT and SWAT to analyze irrigation requirements and runoff, respectively. Then "systems dynamics" modeling used to predict changes in future land cover. InVest used to look at carbon stocks and potential changes.

- Results serve as a kind of cost-benefit analysis of the SAGCOT initiative.

Conclusions:

- Development of SAGCOT ag irrigation/expansion without improved water use efficiency could cause erosion and water overuse.
- Different scenarios have varying carbon impacts, leading to both greater and lesser sequestration rates than the status quo.
- Economic value results are sensitive to carbon outcomes, using social cost of carbon of $43/ton.
- Potential future crop mix needs to account for carbon and water impacts.