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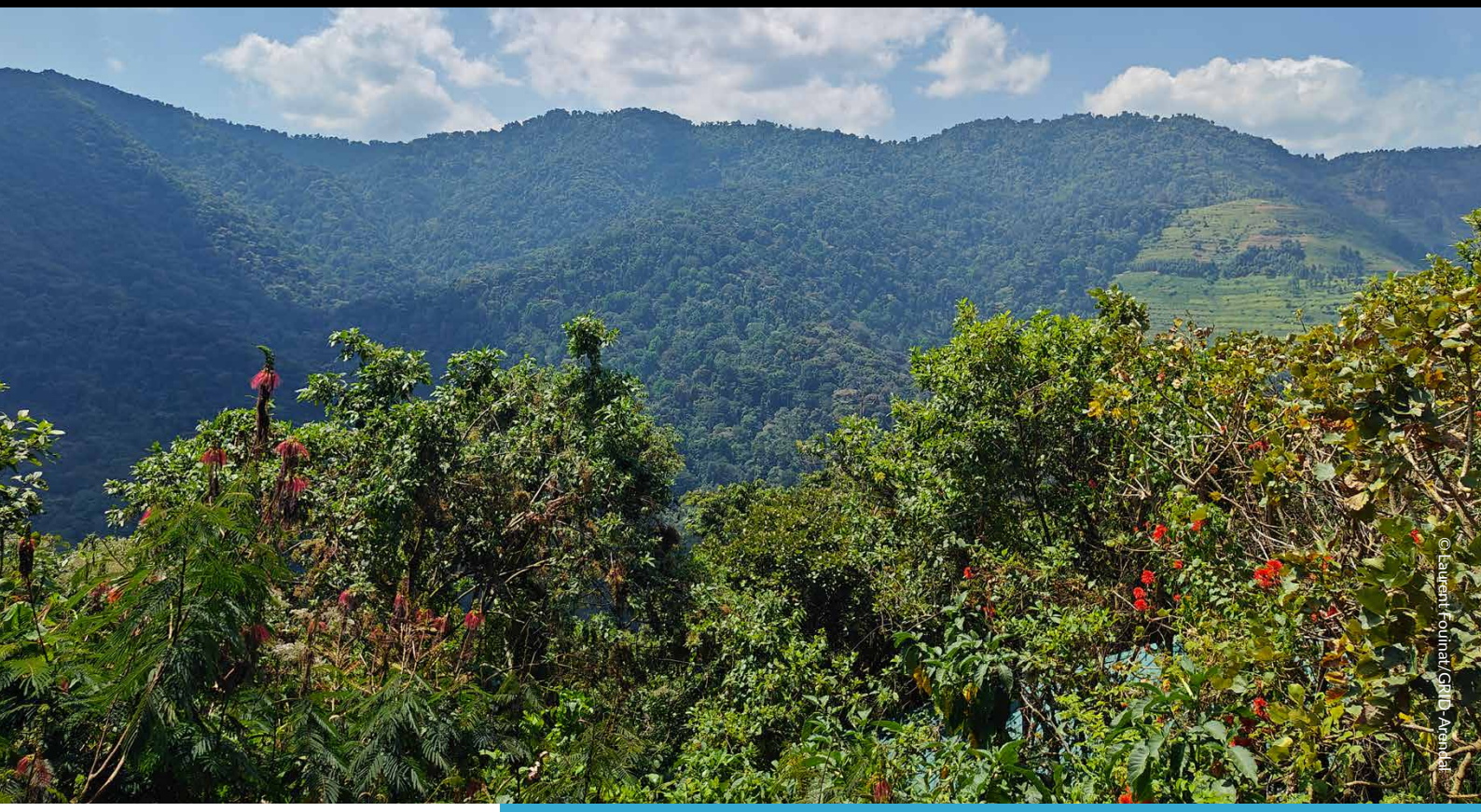

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POLICY BRIEF

UNEP VANISHING TREASURES PROGRAMME

# Targeted Scenario Analysis of the Economic Impact of Shifting to Climate-Smart Agricultural and Conservation Practices in the Bwindi Ecosystem

## A case study in the villages of Nkuringo Town Council

**Despite advances in climate-smart agriculture, small-scale farmers face heavy income loss due to climate change, according to a new UNEP study. Since the 1950s, southwestern Uganda has faced significant environmental challenges due to population growth, particularly in Kabale, Kisoro, and Rukungiri districts. Over 75% of Kisoro's population relies on natural resources as the basis of their livelihoods. Current management practices are unsustainable, leading to issues like wetland and soil degradation, deforestation, overgrazing, water pollution, and poor sanitation. These problems contribute to low agricultural productivity, income, and living standards. Climate change exacerbates these challenges, increasing dependency on national parks resources and environmental resources.**

**To address these issues, climate-smart agriculture (CSA) aims to diversify livelihoods and reduce food insecurity, whilst decreasing environmental impact. Through sustainable farming techniques, CSA practices increase productivity, enhance resilience, and reduce emissions. Sustainable Ecosystem Management (SEM) alternatives, including CSA, significantly improve productivity and potential revenues compared to Business-As-Usual (BAU) strategies under alternate future climate scenario. SEM can lead to an average revenue increase of 117%, particularly benefiting key agricultural crops for food security and income generation. However, technical and institutional barriers like limited knowledge, market access, and insecure land rights hinder the design of effective policy and action, limit access to potential sources of capital, and weaken the potential of CSA to deliver resilient economic growth and poverty alleviation.**

Mountain communities in the Greater Virunga Landscape spanning the shared borders of Uganda, Rwanda, and the Democratic Republic of Congo, heavily depend on farming, supplemented by natural resource use, for income and as a source of food. Climate change predictions reveal that even under small marginal changes in average global temperatures, the effects on tropical regions will be very damaging.

In southwestern Uganda, over 75% of Kisoro District's population lives in rural areas where unsustainable agriculture practices are common and contributing to the depletion of the natural resources. The district faces severe environmental challenges, including wetland and soil degradation, deforestation, land degradation from overgrazing, water pollution, and poor sanitation due to inadequate waste management. Concerning the agricultural profile, Kisoro's District Authorities note that the district's agricultural productivity and yields are among the lowest. The diversity and volume of production for some important crops have reduced over the last three decades due to declining soil fertility and land degradation because of poor land management practices, exacerbated by climate change impacts (soil erosion, landslides, floods, and pests and disease accumulation). These issues, compounded by global climate change, degrade the environment, leading to low productivity and income, thus perpetuating poverty. The existing dominant farming methods are highly vulnerable to future climate change. Basic changes to production techniques/cultural practices (low/no-input technologies) can yield significant production benefits and reduce soil erosion and flooding risks under future climate change.

An economic analysis termed Targeted Scenario Analysis (TSA), commissioned by UNEP's Vanishing Treasures Programme, compared the economic impact of two agricultural scenarios: the ongoing 'Business-as-Usual' (BAU) dominant farming methods which are highly vulnerable to climate change, and already experiencing decreasing economic returns, with a Sustainable Ecosystem Management (SEM) scenario in which climate-smart agriculture (CSA) integrates sustainable farming practices to address climate challenges. In the BAU scenario, income is reduced, which results in park-edge communities to seek out resources from the neighbouring national parks, home to Endangered species such as the mountain gorilla, increasing human-wildlife conflict and risk of disease transmission. In comparison, the SEM scenario focuses on productivity, resilience, and emission reduction. The CSA practices include improved crop management techniques, soil management, organic fertilizers, integrated pest management, seed banks, shade trees, water conservation, and household farming finance education.

The agricultural sector-centred TSA captures the policy objectives of the sector's decision-makers. Thus, it addressed the need for policy reform, especially in aligning the agricultural sector's development goals and biodiversity protection efforts, such as protecting the mountain gorilla and its habitat. Key decision makers included the Kisoro District Government, Nkuringo Town Council, Ugandan Wildlife Authority, and local stakeholders including representatives of the eight villages who benefitted in CSA trainings through the Vanishing Treasures Programme.

The results of the study demonstrated that a shift to CSA will need a large amount of capital investment in institutions at local government and community level to manage agricultural education, training and economic transformation, but that in the long run this practice will experience greater yield gains and resiliency under future climates compared to the existing traditional farming techniques. Ultimately, the shift to CSA ensures sustainable livelihoods, increasing productivity and profit, whilst simultaneously reducing human-wildlife conflict and pressures on natural resources. The TSA also responds to a subset of policy questions through the following main conclusions:

- The potential higher profits (net revenue) for farmers resulting from the shift from BAU to SEM justifies an increase in funding to the National Agricultural Advisory Service (NAAS) to be able to promote CSA approaches and have the geographical reach needed to drive transformational change in the district.
- More support is needed for local government to develop their capacity for policy design and implementation, using participatory approaches to ensure effective policies. This includes developing frameworks for climate finance which can support CSA initiatives.
- The current revenue sharing scheme through the Uganda Wildlife Authority (UWA) should be reviewed to identify opportunities for funding CSA initiatives within park-edge communities.

To reach these conclusions, the TSA used a range of indicators listed in the table below:

| Criteria | Indicators | Sub indicators |
|---|---|---|
| Financial | Changes in net income (gross margin) | Changes in agricultural enterprise productivity including diversification (selected crops) and climate change effects. |
| | | Household net benefits, considering positive and negative externalities |
| Economic | Changes in net benefits (Kisoro District) | Net benefits adopting CSA to Kisoro District |
| | | Cost of natural resources degradation |
| | | Cost of shifting from BAU to SEM |

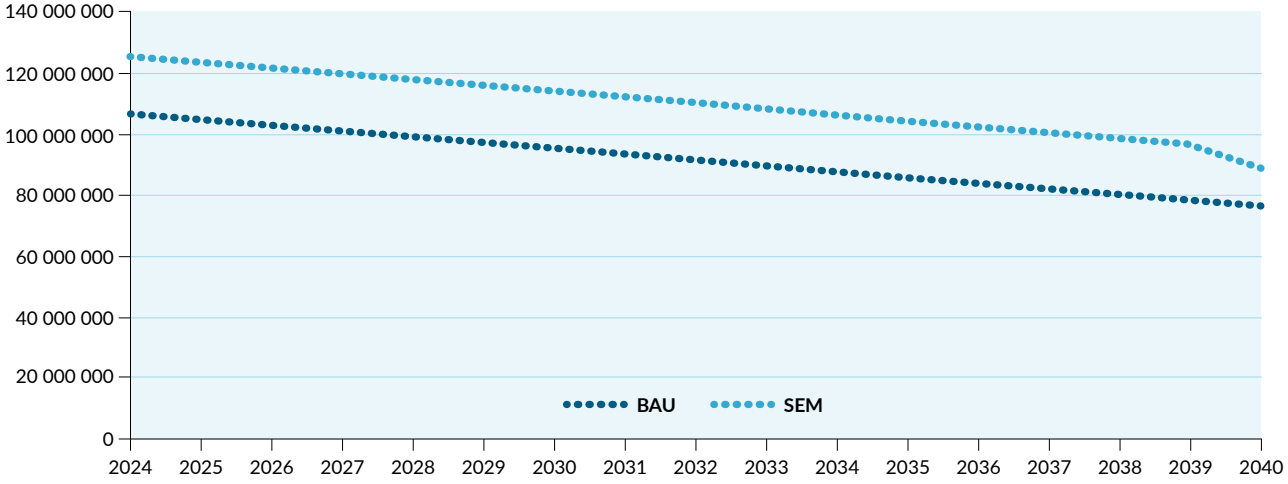
# Key Results

At the level of farm production enterprises, the adoption of SEM alternatives, including CSA techniques, significantly improves productivity and potential revenues across all enterprises studied, both in current and future climate contexts. The average revenue increase under SEM is 117%. Matooke banana revenues show a notably higher financial estimate, reflecting the significant cultural and economic importance of Matooke in Ugandan agri-food systems.

At the household level, this TSA study demonstrates the impact of climate adjustments on total monthly household income, showing that SEM outperforms BAU financially (USD 245 vs. USD 172). By 2040, production under SEM is projected to be higher (USD 1,183) than BAU (USD 1,011) annually, indicating future gains from adopting SEM. However, due to climate change, future gains from CSA practices will not fully offset total expected losses from the present under either scenario. To contextualize these values, they are compared to Uganda's national living wage estimates, calculated using the Anker methodology. This methodology considers costs for a nutritious diet, adequate housing, essential items (health care, education, clothing), and a buffer for contingencies. The living wage for rural workers near floriculture farms is estimated at USD 177 per month or USD 2,124 annually. Comparing SEM improvements between present (2024) and future (2040) climates, it is evident that local incomes currently fall short of the living wage and will face an even larger gap by 2040.

Aggregating household values to the district level reveals a consistent trend: adopting SEM significantly outperforms BAU in future climate scenarios. SEM adoption by all households can result in a 17% overall increase in financial value compared to BAU. This comparison, static between 2023 and 2040, highlights

**Kisoro District: Aggregate annual total household revenue 2024–2040 (USD)**



that benefits will aggregate over time. However, the model does not account for future demographic changes or potential market price fluctuations. Using straight-line depreciation for annual BAU and SEM estimates (Figure 1), the analysis shows a decline in production between today and 2040. Not pursuing SEM over BAU results in an estimated cumulative loss of over USD 310 million despite declining productivity under both practices due to climate change.

**Cost of shifting from BAU to SEM and net benefits**

To justify investment in necessary changes, a simple compound growth calculator was used to estimate generating up to USD 309 million in benefits, close to the estimated USD 310 million cumulative losses. An initial USD 5 million investment in agricultural extension and marketing services, plus USD 3 million annually for 17 years, could achieve this at a 17% annual return based on CSA improvement returns. The total investment would be USD 56 million, about USD 740 per household over 17 years (USD 43 per household per annum). This investment is feasible for a small to medium-sized development facility and warrants a detailed project development and investment appraisal. The potential public benefits include poverty reduction and economic growth in the context of climate change.

# Recommendations

**1. Arable agriculture and livestock management reforms:**

- National Agricultural Advisory Service (NAAS) needs enhanced funding and technical development to be able to promote CSA approaches and have the geographical reach needed to drive transformational change in the district.
  - Coordinating existing and planned projects, like the GEF High Impact Program, can technically address production constraints and support small producers, building capacity in district government agricultural management agencies.
- Ecosystem services and conservation need to be incorporated at the district planning level, which requires coordinated action between conservation agencies and local governments. Agricultural management and investment policy need to incorporate SEM practices such as CSA.

**2. Policy management and finance mechanisms:**

- Develop the climate and environmental policy design and implementation capacity within local government.
  - Support the local government to develop their capacity for policy design and implementation, using participatory approaches to ensure effective policies. Developing frameworks for climate finance to support CSA initiatives.
  - District officials need training to translate climate issues into local practices and communicate results.
  - Investigate potential partners and collaborate in the design and implementation of novel climate-related investing mechanisms.
- Develop the district framework climate investment and performance management plan in order to access national adaptation and international mitigation finance to support climate-smart agriculture.
- Improve inter-sector coordination and collaboration at national and district levels.
- Review of the tourism revenue sharing program (TRSP) managed by UWA to identify opportunities for channeling funding from the TRSP to CSA activities within park edge communities.
- Strengthen research-policy linkages and support district performance monitoring (environmental, social and economic).
  - National and international research institutions need to strengthen partnership with local government ministries to support evidence-based policy planning and decision-making.