

***The economic impact of shifting to climate-smart agricultural and conservation practices in the Bwindi Ecosystem: A Targeted Scenario Analysis.***

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## Acronyms:

BIFNP	Bwindi Impenetrable Forest National Park
BAU	Business As Usual
CSO	Civil Society Organizations
HWC	Human-Wildlife Conflict
IGCP	International Gorilla Conservation Programme
LDC	Less developed country
NAAS	National Agricultural Advisory Service
NDP	National Development Plan
PES	Payment for ecosystem services
PIP	Public Investment plan
TRSP	Revenue-sharing scheme
SEM	Sustainable Ecosystem Management
TSA	Targeted Scenario Analysis
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USD	United States Dollars
USH	Uganda Shillings
UWA	Uganda Wildlife Authority
VT	Vanishing Treasures

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# The economic impact of shifting to climate-smart agricultural and conservation practices in the Bwindi Ecosystem: A Targeted Scenario Analysis.

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## Executive summary:

### Abstract:

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, leading to issues like wetland and soil degradation, deforestation, overgrazing, water pollution, and poor sanitation. These problems contribute to low productivity, income, and living standards. Climate change exacerbates these challenges, increasing dependency on national parks and environmental resources.

To address these issues, nature-based tourism and climate-smart agriculture (CSA) aim to diversify livelihoods and reduce food insecurity, thereby decreasing the environmental impact. Through sustainable farming techniques, CSA practices enhance productivity, resilience, and emission reduction. Sustainable Ecosystem Management (SEM) alternatives, including CSA, significantly improve productivity and potential revenues compared to Business-As-Usual (BAU) strategies under a changed 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, asset 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.

Effective policy implementation requires improved agricultural extension services, better management of revenue-sharing schemes, and enhanced inter-sector coordination. Public investment in agricultural extension, climate finance mechanisms, and participatory policy approaches are essential. Strengthening policy also includes improving tourism-related revenue-sharing transparency and accountability, which can accelerate sustainable development and conservation efforts in the region.

## A. Policy challenge:

Since the 1950s, southwestern Uganda, particularly the Kabale, Kisoro, and Rukungiri districts, has experienced significant population growth. Over 75% of Kisoro's population relies on natural resources, posing environmental challenges like wetland and soil degradation, deforestation, over-grazing, water pollution, and poor sanitation. These issues lead to low productivity, income, and living standards. Climate change predictions suggest that with even the slightest increase in temperature in the area, people will increase their dependency on resources from within the national parks. Nature-based tourism and climate-smart agriculture aim to increase livelihood diversity, reduce food insecurity, and reduce the impact on mountain ecosystems by reducing local communities' dependency on activities that deplete natural resources. Achieving sustainable land and natural resources management is essential for poverty eradication and improving livelihoods in the region, essential precursors to conserving biodiversity within and around Bwindi Impenetrable Forest National Park. However, both CSA and nature-based tourism are ecosystem dependent. Hence, most important is a balanced relationship between human-led CSA and nature-based income-generating activities, such as ecotourism etc.

Efforts to protect mountain gorillas and their habitats must adapt to changing environmental conditions. Policy makers need to integrate ecosystem management, climate adaptation, and mitigation issues into sector development policy and plans. Conservation of biodiversity and forests can play a critical supporting role in poverty alleviation and economic security in the face of climate change. That role will be realized if policies and practices reconcile environmental function with social and economic performance. The policy must be informed by climate, social, financial, and economic research evidence. Climate-Smart Agriculture (CSA) practices in rain-fed systems can increase crop yields and enhance food security, providing sustainable soil, water, and nutrient management strategies. Further scientific field studies are needed to assess CSA's long-term effects on different agroecological zones and carbon conservation, cost-effectiveness, and benefits to local people. Climate finance, including carbon markets, can support CSA by providing funds for agricultural extension and marketing services to counter declines in household revenues.

**Stakeholders:** This study focuses on the key changes in rural agricultural development and conservation policies and practices that could resolve key sources of conflict between biodiversity and development and address critical adaptation needs to develop a resilient, sustainable local economy. The beneficiaries are the approximately 343,554 (2022 estimate) ordinary people of Kisoro District. Over 75% of Kisoro's population lives in rural areas where unsustainable agriculture practices are common and contributing to the depletion of the natural resources. This situation significantly affects poverty eradication efforts. 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. These issues, compounded by global climate change, degrade the environment, leading to low productivity and income, thus perpetuating poverty.

For example, Nkuringo, a village bordering Bwindi Impenetrable Forest National Park (BIFNP), is primarily agricultural, with over 90% of its population engaged in subsistence farming. The main crops include climbing beans, maize, sweet potatoes, cabbages, Irish potatoes, eggplants, and bananas, sold in local markets. Higher-income households sell surplus produce, while low-income households often sell part of their food, exacerbating food insecurity. Other economic activities include tourism, mining, forestry, and off-farm jobs like petty trade and brickmaking. Many residents sell labor for income, with few gainfully employed.

**Business as Usual (BAU):** 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. The expansion of banana crops and changes in agronomic management have social implications, especially regarding gender relations and labor division. Limited use of fertilizer and manure leads to soil fertility depletion. Farmers focus on profitable banana crops near homesteads, neglecting hillside fields, which results in long-term soil fertility loss and destabilizes the farming system, increasing vulnerability to climatic and market shocks.

Weak organizational and institutional support, coupled with low investment, hinders sustainable farming. Smallholder farmers lack the educational skills to understand the dynamics of financially sustainable practices and face poor access to markets due to inadequate transport and communication infrastructure. The National Agricultural Advisory Service (NAAS) program, the main agricultural extension support, struggles with weak administration and limited inputs, failing to address the needs of poor farmers effectively.

In Kisoro District, public funding to scale investment in resolving framework challenges is limited, with minimal investment in essential communications infrastructure such as feeder roads to catalyze transformational economic change. Long-term financial planning and strategic lobbying for public sector finances are necessary. Local governments face challenges in utilizing devolved powers effectively, and financial needs assessments for rural development and conservation are lacking. Centralized control over key infrastructure funding, despite devolution, undermines local capacity. Addressing these issues can enhance job opportunities, income, and welfare, supporting a sustainable agricultural business model and resilience against climatic and market shocks.

**Sustainable Ecosystem Management (SEM):** Climate-smart agriculture (CSA) integrates sustainable farming practices to address climate challenges, focusing on productivity, resilience, and emission reduction. CSA's three core pillars are improving farmer productivity and livelihoods, enhancing farm resilience to climate impacts, and reducing greenhouse gas emissions. CSA practices include soil management, organic fertilizers, integrated pest management, seed banks, shade trees, water conservation, and household farming finance education. Gender-sensitive approaches are crucial, as men and women perceive risks and adaptation strategies differently.

The experience of the farmers supported by the Vanishing Treasures Programme (VT) has been very positive in achieving basic food security and surpluses for sale in local markets. The VT

project is a promising example of what could be achieved if activities are capitalized and adequately and technically supported at scale. VT supported the implementation of basic technological shifts from broadcast to row cropping, novel high-value horticultural crops, and the use of green, farmyard, and household manure to boost soil fertility, promoting increased production from land holdings. VT supported the development of critical institutions to access markets for inputs and the sale of surpluses, improving both productivity and income generation. To address critical labor scarcity issues, VT also promoted techniques to reduce labor inputs into non-farm activities such as water collection so that households could invest more time in farm enterprises, improving the efficiency of the household production system.

Uganda's Nationally Determined Contribution (NDC) and Climate Smart Agriculture Program (2015-2025) promote CSA, but barriers like limited knowledge, access to assets, and insecure land rights hinder adoption. Effective CSA requires an enabling environment with functional institutions, regulations, and coordination. Uganda's National Agricultural Advisory Service (NAAS) and research networks currently lack CSA prioritization, leading to fragmented implementation. Public investment in agricultural extension and technical capacity is essential, alongside greater coherence and integration among food security, poverty reduction, economic development, and climate change strategies. Mainstreaming CSA into broader policy and planning, especially in marginal areas like Kisoro District, is vital for success.

**Indicators:** The criteria, indicators, and sub-indicators (where appropriate) selected for this study are shown in the following table:

<b>Criteria</b>	<b>Indicators</b>	<b>Sub indicators</b>
<b>Financial</b>	Changes in net income (gross margin)	UWA Revenue-sharing flows to local communities (Section 4.1)
		Changes in agricultural enterprise productivity including diversification (selected crops) and climate change effects. (Section 5.2)
		Household net benefits, considering positive and negative externalities (Section 5.3)
<b>Economic</b>	Changes in net benefits (Kisoro District)	UWA Revenue-sharing flows to local governments (District-level) (section 4.1)
		Net benefits adopting CSA to Kisoro District (Section 5.4)
		Cost of natural resources degradation (Section 5.5)
		Cost of shifting from BAU to SEM (Section 5.6)

## B. Results:

Regional climate yield modeling predicts an average 30% reduction in total factor productivity due to future climate conditions (Ortiz-Bobea et al., 2021). This study examines the impact of these scenarios by comparing present and future production with performance differences expressed in USH based on gross margin estimates. Despite experiencing larger absolute losses due to starting from a higher baseline, sustainable ecosystem management (SEM) strategies show greater yield gains under future climates compared to Business-As-Usual (BAU) strategies. The analysis includes cropping enterprises such as climbing beans, maize, matooke bananas, sweet potatoes, Irish potatoes, and eggplant. Data are presented through tables and graphs, comparing farm enterprise revenues with and without SEM intervention strategies under both current and future climate trajectories. Enterprise production estimates are calculated as average production figures across the sample survey of communities in the project impact area using prevailing market prices (present value). Values aggregated at district level use household census demographic data from district sources to make projections.

### **Changes in productivity and climate change effects**

At the level of farm enterprise production activities, the adoption of SEM alternatives, including CSA techniques, significantly improves productivity and potential revenues across all activities studied, both in current and future climate contexts. Estimates were made using key informant interviews and participatory discussions of VT project participants, to recall unit area yields, costs and revenues, with and without CSA techniques. The average revenue increase under SEM is 117% per hectare.

Adopting the SEM strategies for each agri-enterprise presented has higher marginal net benefits. Climbing beans show the highest average improvement at 195% (from USD17 to USD51 per annum), while Irish potatoes have the lowest at 29% (USD535 to USD639). In the case of climbing beans, for example, the financial benefit to the household level in the targeted period (between 2024 and 2040). The smaller improvement in Irish potatoes is due to their already intensive production as a key cash crop. The SEM approach developed by the Vanishing Treasures project offers substantial productivity and revenue gains, particularly for climbing beans, while Matooke bananas' significant value underscores their importance. The relatively modest gains for Irish potatoes reflect their current high-input production. These results clearly indicate the impact of the Vanishing Treasure pilot CSA activities; important evidence of the economic and resiliency benefits to be gained from scaling these practices.

At the household level, this TSA study demonstrates the impact of climate adjustments on total household income, showing that SEM outperforms BAU financially (USD245 vs. USD172). By 2040, production under SEM is projected to be higher (USD1,183) than BAU (USD1,011), 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 US\$ 652,311 (USD177) per month or USD2,124 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 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 16), the analysis shows a decline in production between today and 2040. Not pursuing SEM over BAU results in an estimated cumulative loss of over USD310 million over the 16-year performance period (2024-2040) despite declining productivity under both practices due to climate change.

### **Cost of natural resources degradation**

The TSA focuses on soil conservation, a critical ecosystem service impacting poverty and economic growth. The economic effects of forest loss on agriculture due to soil erosion and fertility loss are difficult to quantify due to variable environmental and demographic factors. These include soil type, topography, rainfall, crop types, farming practices, and population density. The impact of declining soil fertility, though real, is complex and distributed over time. Households heavily depend on forests for fuel wood. Overexploitation leads to scarcity, forcing households to use crop residues or grass for fuel, further degrading soil fertility. The annual cost of soil degradation, (estimated as the replacement cost of nutrients in farmyard manure (FYM) with chemical fertilizer) per household is approximately USD531. For the district (projected 75,600 households in 2024), the total economic cost of soil degradation is approximately USD40.1 million per year. This cost represents a loss to productivity; mitigating it would correspondingly increase gross benefits.

### **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 USD309 million in benefits, close to the estimated USD310 million cumulative losses. An initial USD5 million investment in agricultural extension and marketing services, plus USD3 million annually for 17 years, could achieve this at a 17% annual return based on CSA improvement returns. The total investment would be USD56 million, about USD740 per household over 17 years (USD43 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.

## **C. Recommendations and Conclusion**

Climate and biodiversity finance presents opportunities for funding the CSA agenda. Policy coherence is vital in developing action plans and investment strategies. The National

Development Plan outlines the vision and strategies for agricultural livelihoods but lacks sufficient capital. An estimated USD56 million investment over 17 years could support food production and income-generating activities, aligning with the plan's agro-industrialization goals. Climate finance focuses on carbon storage, with funds provided through concessional finance or carbon market mechanisms. The former involves buyers supporting host countries in reaching their NDC targets by purchasing future carbon credits, reducing investment risks, and attracting additional funding. Alternatively, countries can trade carbon credits internationally at market-based prices. Effective climate finance requires verifiable targets, scientific measurement, and monitoring. Legal and regulatory gaps hinder conservation efforts, with issues in enforcement and evidence collection against poachers.

Key recommendations from the study are highlighted below and include improving revenue-sharing schemes, addressing organizational and institutional challenges, and ensuring equitable stakeholder involvement. Tourism revenue sharing remains challenging, with centralized bureaucracy, insufficient institutional coordination and limited monitoring and accountability, and affecting local attitudes and participation.

### **Development Management**

**Agricultural Extension and Management:** Improving agricultural productivity and resiliency to a changing climate requires effective extension services. 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. Critically institutional and organizational financial structures to maintain the services in the long term need to be addressed and near-term project financing to catalyze change should be sought e.g. GEF or GCF.

**Uganda Wildlife Authority, Revenue-Sharing Scheme (TRSP):** Revenue sharing should complement, not replace, local development finance. Objectives include increasing local capacity, improving livelihoods, and enhancing essential services. UWA and partners should invest in assessing how to address much-needed improvements in the management efficiency, cost-effectiveness, and equity of the impacts of the RS scheme. It is critical to review, for example, how the revenue sharing scheme is structured, the role of gorilla tour operators, the percentage shares linked to the UWA entry fee system, the transfer mechanisms, governance, use of the transfers, and financial impact monitoring and accountability. An active communication campaign is also needed to raise the awareness of the beneficiaries about the TRSP. The TRSP could significantly benefit from using multi-year financial planning and result-based budgeting. Equally important, a communication strategy with the participation of high-end tourism operators, promoters, and communicators, national and international, who can lobby at the highest possible level (presidential level), can also help with vertical policy coordination and prioritization of development support to Kisoro District.

**Ecosystem services:** Future climate change will profoundly impact poverty levels in the target populations over time, creating further strain on community and park relations. Reconciling development needs with biodiversity conservation is possible if well-targeted investment in sustainable rural development is scaled. 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. Likewise, conservation policy, such as UWA's revenue-sharing mechanism, needs to incorporate support to CSA, as indicated above, and quality spending for monitoring.

### **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 can support CSA initiatives. Novel market-based approaches to improve payment for ecosystem services (PES) can incentivize conservation by compensating those who protect ecosystem service. By establishing a PES applicable to tourism activities, operators could market at a premium certified "Climate-Smart Tracking Gorilla Tours". In addition, revenues could be applied to developing new or provide enhancements to existing local trust funds e.g. Bwindi and Mgahinga Conservation Trust to distribute the revenues efficiently. To this end, District officials need training to translate climate issues into local practices and communicate results, such as the results of this TSA. (District officials should?) 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 to access national adaptation and international mitigation finance to support climate-smart agriculture:** Novel market-based approaches, like payment for ecosystem services (PES), are also critical tools to raise funding to preserve these services, e.g., carbon and biodiversity. District- and sub-county officials lack the knowledge to translate ecosystem services and climate change issues into locally appropriate and adaptive practices and actions. This constrains efforts to mainstream climate change issues in planning and budgeting right from the local levels. Careful integration of sustainable development goals into a carbon credit project's design can ensure their successful delivery. There is an opportunity to develop nature-based climate solutions to produce higher-valued carbon credits with multiple co-benefits (social and environmental) or bundled with local sustainable development goals to keep on creating higher or premium values. Models developed by ECOTRUST can provide national examples to be emulated.

**Improve inter-sector coordination and collaboration at national and district levels:** Some of the policies and plans from the various governmental sectors are not well aligned or coordinated at the national level and this translates to challenges for operational implementation at the district level. The district needs support to invest in vertical and horizontal communication and policy development through multi-stakeholder climate action platforms. Critically at district level, the local organizational capacity to champion such initiatives needs to be developed through the technical

planning committee. Nationally, there is no widespread operational mechanism to address the impacts of climate change on agriculture, so Kisoro district will have to spearhead initiatives themselves, through active coordination between local government technical agencies and national level ministries e.g. Ministry of Lands, Water and Environment, as well as Ministry of Agriculture, Animal Industry, and Fisheries. To aid in this endeavor the district authorities should appeal to the Member of Parliament for political representation nationally.

**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. This is particularly important when considering accessing climate finance, when considering market-based mechanisms; payments are conditional on social and environmental performance (systematic environmental, social and economic monitoring). Critically, research data needs to clearly meet policy needs and be made available in time to influence the planning and budgeting cycles. Whilst initial development of systems and procedures could be project financed in the short term, on-going monitoring efforts should be funded through regular budget and durable funding mechanisms.

Environmental externalities, like forest and biodiversity loss, are closely linked to climate change and landscape resiliency. Understanding the potential economic impacts helps plan mitigation strategies. Effective landscape management to support economic growth and poverty alleviation requires multi-agency partnerships and investment. Integrating adaptation project experiences into mainstream practices is crucial. Long-term financial mechanisms and local stakeholder involvement are key to sustainable conservation and development. Integrating project experiences into mainstream practice can ensure scalability and impact of selected strategies. District and local policy planners can use economic evidence to support decision-making and prioritize actions.

# Main Report

# The economic impact of shifting to climate smart agricultural and conservation practices in the Bwindi Ecosystem: A Targeted Scenario Analysis.

## 1.0 Introduction

### 1.1 Background

In Uganda, Rwanda, and the Democratic Republic of Congo, mountain communities in the Greater Virunga Landscape heavily depend on farming, supplemented by natural resource use (harvesting timber and non-timber forest products), 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. Increases in local temperature and changes in total rainfall, its intensity, and temporal distribution could damage productivity by 25% to 35% (Ortiz-Bobea et al. 2021). Threats to livelihoods in communities adjacent to national parks lead to increasing pressure on resources sourced from them, even if illegal (IPCC 6, Chapter 8). Thus, nature-based tourism and climate-smart agriculture aim to increase livelihood diversity, reduce food insecurity, and reduce the impact on mountain ecosystems by reducing local communities' dependency on natural resources. Additionally, cultivating novel cash crops such as tea offers a previously unavailable income source resistant to wildlife damage (crop raiding, being less palatable for most wildlife species).

Currently, small-scale (less than 1ha per family) subsistence farming is the mainstay of rural livelihoods. Prolonged dry seasons due to climate change put increased pressure on water resources, which negatively affects small-scale farmers. Thereby, long-term livelihood income decreases, and the hunting of wildlife increases (either as a source of food, as an additional source of income, or as a method to prevent crop raiding). Developing nature-based tourism and promoting climate-smart agriculture reduces dependency on natural resources, including national parks. Rainwater harvesting tanks help mitigate the impacts of water scarcity and have a positive effect on small-scale farmers. Effective buffer zone management reduces human-wildlife conflict (HWC) by adding tea farming as an alternative income source, which helps preserve wildlife species. Improving local livelihoods, income, and food security can have a beneficial impact, reducing anthropogenic threats to conservation (GVTC, 2017; Annex 1). Successfully managing these complex interactions needs to account for complex interactions between management at the local level and policy at district and national levels. Competing for national and local financing sources requires evidence to support the prioritization of resources and the development of novel and appropriate financial mechanisms.

UNDP's Targeted Scenario Analysis (TSA) approach responds to the growing demand from decision-makers and stakeholders for effective policy-relevant economic analysis tools to

advance productive sectors' policy reform and, therefore, the national Sustainable Development Goals. TSA offers a practical approach to connecting policy objectives with fit-for-purpose economic analysis and enables the conversion of economic data into sustainable sector development policy.

TSA compares different ecosystem management approaches at the sector level to assess potential economic losses or gains in terms of sectoral output. The TSA approach is client and sector-focused (the targeted decision-maker of a selected sector with the capacity to lead decisions of policy reform and investment). The product of a TSA is a balanced time-bound presentation of economic and financial evidence for the decision maker that weighs up the pros and cons of continuing with business as usual (BAU) or following a sustainable development path in which ecosystems are more effectively managed. This alternate path is termed sustainable ecosystem management (SEM). This increases the likelihood that this data will be used to make policy and management decisions that result in effective and sustainable management of ecosystems and ecosystem services.

The TSA for the Nkuringo case study was implemented through co-design, consultation, and participatory analysis with various local stakeholders, including district and community authorities in Kisoro and other Vanishing Treasures program stakeholders. The process provided the opportunity to reflect on local needs and focus on the decision-makers' objectives in the TSA to ensure that it responds to their specific policy concerns.

The Government of the Grand Duchy of Luxembourg funded the UNEP programme titled "Vanishing Treasures; Climate resilient mountain ecosystems for resilient livelihoods and mountain flagship species". The programme works in three regions; Hindu-Kush Himalayas (Bhutan), Central Asia (Kyrgyzstan and Tajikistan), and the Virunga Mountains (Rwanda and Uganda) with the primary goal of generating maximum synergy between climate change adaptation and biodiversity conservation with a particular focus on mountain flagship species. Vanishing Treasures combines both priorities by contributing to the i) improved adaptive capacity of mountain ecosystems and maintenance of related ecosystem services under climate change, ii) contribution of key mountain flagship species to ecosystem functioning, and iii) promotion of alternative livelihoods.

The Virunga component of VT focuses on mountain communities in Uganda and Rwanda to increase climate resilience and promote climate-smart actions for mountain gorilla conservation. The International Gorilla Conservation Programme (IGCP), a partner of VT, has completed pilot site demonstrations showcasing community-based ecosystem-based adaptation (EbA) and green infrastructure solutions in the Nkuringo Buffer Zone in the southern sector of BIFNP(Annex 3). This report aims to assess the economic impacts of the project interventions on the beneficiary communities in order to inform future policy and up-s activities for other communities living in mountain areas of Uganda and Rwanda.

Achieving the VT Programme objectives includes addressing critical policy-related challenges. Therefore, it is indispensable for local leaders and decision-makers to understand the economics supporting policy reform to shift from unsustainable agricultural and livestock management practices to more sustainable ecosystems and biodiversity-friendly livelihoods such as climate-smart agriculture, zero-grazing systems, nature-based tourism, and other non-timber extracting activities. We highlight livestock management issues here, as increasing livestock ownership (milk cows, sheep and goats) is a key ambition for many households. Although current livestock ownership is low, the practices are not well-managed and overgrazing poses significant erosion control issues in many localized areas. Livestock systems need to be based on sustainable zero grazing strategies.

### 1.3 Local context

Bwindi Impenetrable National Park (Bwindi) is located in southwestern Uganda between latitude 0°53 to 1°8'S and longitude 29°35 to 29°50'E. It is situated on the edge of the Western (Albertine) Rift Valley, occupying the highest blocks of the Kigezi Highlands. The park lies along the border of the Democratic Republic of Congo, at about 29km by road to the northwest of Kabale town and 30km north of Kisoro town. Bwindi is located in Rubanda County of Kabale District, Kinkizi County of the new Kanungu District, and Mutanda County of Kisoro District. Bwindi is separated from Mgahinga by a stretch of intensively cultivated land. Adjacent to the park are 21 parishes. The Park has a total area of 330.8km<sup>2</sup> and hosts over 450 (Hickey et al, 2019) of the world's population of mountain gorillas (*Gorilla beringei beringei*). The protected area's high conservation value was the main reason the forest was upgraded to National Park status in 1991, strengthening the protection of this species and its habitat. Other reasons included the need to conserve ecological resources of high biodiversity value in the forested area and protect the forest as an important economic resource (Bwindi & Mgahinga General Management Plan, 2014-2023).

Human population increase in southwestern Uganda has significantly transformed the landscape since the early 1950s. The population of Kabale (then including the present Kisoro and Rukungiri districts) increased by 90% between 1948 and 1980, and by the 1980s, the region was cited as one of the most crowded rural areas in Africa (Ntozi, 1982; Butynski, 1984). However, the current trend in the annual population growth rate of 3.3% per annum indicates that the population is now around 343,554 people (2022), with no discernable immigration. Over 75% of the population in the Kisoro district live in rural areas and depend entirely on natural resources for their livelihood. This means that the state of the environment has a huge implication for poverty eradication. As a result, the district is faced with several natural resource challenges/issues, including:

- Wetland degradation caused by the lack of adequate land, unsustainable farming methods, and the over-harvesting of resources
- Soil degradation (fertility loss, erosion) due to poor farming methods e.g., no crop rotation, increasing numbers of livestock, and land fragmentation
- Deforestation, because of domestic fuelwood demand, unsustainable timber harvesting, charcoal making, and creation of farmlands
- Land degradation due to over-grazing because of overstocking
- Water pollution /lack of clean water because of non-protection of water sources and points, non-compliant developers

- Poor sanitation/poor refuse disposal due to inadequate refuse/waste bankers and lack of waste management culture.

The effects of global climate change compound the above-mentioned challenges and will contribute to the increasing degradation of the environment and natural resources. This leads to low productivity and, consequently, low income, which contributes to the district inhabitants' increasing poverty and low living standards.

Nkuringo Sector is, one of the community management areas designated by the UWA, of bordering Bwindi National Park, it takes its name from Nkuringo village one of the elger LC1 in the area. In terms of its formal political administration The Nkuringo Sector is located in the Nyabwishenya and Kirundo sub-counties of Bufumbira County, Kisoro District, in south-western Uganda: It is a rural landscape dominated by farmlands and villages of small settlements disbursed throughout the terrain. Agriculture is the population's main occupation, with 90% of households deriving their livelihood from subsistence farming (District Development Plan III, 2021 – 25). The Nkuringo population earns income mainly from the sale of staples such as Matooke bananas, Irish potatoes, maize, and beans, and horticultural crops such as cabbages and eggplants, with surplus sold to local markets. Only higher-income households have enough surpluses to regularly engage in market activities, whereas low-income households are often obliged to sell their own food stocks when in need of cash for essential items, e.g., medicine and school fees, which contributes to food insecurity in the Nkuringo area. Other economic activities that complement agriculture include tourism, mining, forestry, and off-farm activities such as petty trade, brick making, carpentry, and charcoal burning. However, a relatively large section of the population sells labor for income, and only a small proportion is employed gainfully.

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 and mud erosion, landslides, floods, and pests and disease accumulation). Furthermore, agricultural activities are at the subsistence level, with an average farm size of 5.08 acres per household. More than 40% of the households have less than 3 acres. Land holdings are highly fragmented, with an average household having 6-7 plots of land scattered on different hills, with each plot measuring between 0.1 to 0.7 acres (Production Department Household Farmer Profiling, 2019)<sup>1</sup>.

Regarding food security, many Kisoro households experience the classical “hungry gap” defined by Ellis (1993), where stocks of their own produce fail to meet consumption needs before the next harvest. In times of prolonged dry periods, the district experiences food shortages. Poverty limits people's access to nutritious food. Many subsistence farmers sell food crops to meet short-term expenses. Other factors that are a food security threat include inadequate nutritional awareness, cultural food preferences, and poor conditions of road and transport infrastructure (Natamba et al 2024).

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<sup>1</sup> The most recently available public data at the time of writing.

In the upland region of Southwest Uganda, annual crops are grown on steeply sloping (20–30%) hillsides in a zone of high rainfall intensity. Where the major forms of soil and water conservation (SWC) are achieved with traditional systems, which are insufficient to meet the local demand for basic food. As with food security, agricultural productivity is further constrained by poor communications, limiting the transfer of technical knowledge, information, and access to market access. The predominantly smallholder farmers in the Nkuringo area use traditional farming technologies with low levels of modern inputs like agrochemicals and fertilizer due to knowledge and financial and market constraints. Few households have any form of soil erosion control to manage rainfall runoff from steeply sloping agricultural plots. The nature of the terrain and small field size constraints mechanization as a technical solution to productivity

As the district's endowment of fertile soil and natural resources degrade, Kisoro is becoming dependent on produce from other parts of Uganda and neighboring countries to complement domestic production. Despite these constraints, there exist different commodity and service market opportunities following the increasing demand for food items and for the burgeoning tourism industry (hotels and lodges around Bwindi and Mgahinga) and the food market in the neighboring countries of DRC and Rwanda. Improvement of rural livelihoods is most likely to come from investment in basic agricultural and crop marketing "best practices" based on appropriate technologies. In addition, novel climate and biodiversity finance opportunities are also emerging as feasible pathways to secure large-scale investment finance to support adaptation and mitigation of greenhouse gas emissions from the agriculture, forestry, and other land use sectors.

The prevailing conditions in the Nkuringo Sector result in multiple conflict incidences between the park authorities and the neighboring communities, whereby communities are involved in illegal activities damaging the park's resources, and the park's wildlife damaging the communities' fields and crops adjacent to the park. Different conflict mitigation measures have been implemented to ease the situation through community conservation approaches, which include the zoning and development of community multiple-use zones (where restricted access to defined community user groups is regulated under a community use agreement) and buffer zones (transition zones between community and park). In the buffer zones, trails of locally novel, alternative income-generating/cash crops are unpalatable to the key crop-raiding animals, e.g., tea. In addition, there is a tourism revenue-sharing program aimed at providing direct benefits to local communities in the form of local development projects funded by tourism revenues. Human gorilla conflict resolution teams (HUGOs) were set up to reduce human-wildlife conflict. HUGO provides an important secondary benefit in terms of income generation, as team members are drawn from local communities and receive financial compensation for their services. These are important successes in managing the challenges of development and conservation. However, considering the current and future impacts of climate change on conservation and livelihoods, it becomes imperative to accelerate the necessary management and investment policy shifts aiming at securing the Park's survival and sustainable livelihoods in the region.

## 2.0 Objectives and Scope of the TSA

Identification of alternative feasible pathways to adapt to changing future climate factors is essential to build resilience in the livelihood strategies of park-adjacent households. Therefore, this TSA was developed as a case study from the Nkuringo Village (LCI) community (Nyabwishenya Sub-County – LCVIII; Kisoro District -LCV) adjacent to the BIFNP in southwest Uganda. The VT Programme is responding to the growing demand from decision-makers and stakeholders for effective policy-relevant economic analysis tools to advance productive sectors' policy reform and contribute to achieving the national Sustainable Development Goals.

The TSA inception workshop held in Nkuringo on 12- 13 July 2023 was a key step in introducing the TSA process by bringing key decision-making and VT stakeholders to understand how TSA works and the process to conduct it in the Virunga landscape. The TSA inception workshop was a critical step of the TSA methodology because it provided the opportunity to capture the decision-makers' objectives in the TSA and ensure that it responded to their specific policy needs and the needs of VT stakeholders.

The Inception workshop objectives included:

- Define and engage the decision makers (clients of the study).
- Identify the policy targets and questions to be addressed by the TSA.
- Describe the Business as Usual (BAU) scenario and the Sustainable Ecosystems Management (SEM) intervention.
- Advance with selecting criteria and indicators to construct the BAU and SEM scenarios and apply qualitative and, where possible, quantitative economic analyses.

Decision makers in the case study were defined/identified according to organizational influence over socio-political jurisdictions and influence over sectoral activities in the target site. Uganda operates a highly politically and financially decentralized local government structure. The key local levels of government responsible for executive action and framework policy were identified as the district (LCIII) and parish-level authority (LCII). Under the supervision of the Ministry of Tourism, Wildlife and Antiquities, the Uganda Wildlife Authority (UWA) is the government agency responsible for managing and protecting wildlife in and outside protected areas. The park authority is responsible for managing local community relations and executing the tourism revenue-sharing plan through the office of the chief park warden and the community conservation warden. Civil society organizations (CSOs) play an important role in the design and execution of public policy activities. Representatives of CSOs within the target area that are active in sectors related to economic development and conservation issues were also invited to participate. The main issues of the policy questions that the TSA is meant to analyze are hinged on the interlinkages between conservation, livelihood, and economic opportunities.

The following policy questions will be addressed by this TSA:

1. What is the economic justification for increasing investment in climate-smart and ES-friendly agricultural and livestock policy in the Kisoro District?

2. Does the potential increase in farmer net revenue and economic net benefits at the district level, resulting from sustainable agricultural practices, justify increasing the investment to improve the management policy of the BIFNP and its buffer zone?
3. Do the medium—and long-term costs and benefits of shifting from unsustainable agricultural practices to sustainable practices justify the investment in establishing a public financial incentive to support the shift?
4. What are the financial and economic justifications for reviewing and updating the HWC-related compensation mechanisms and the UWA's revenue-sharing scheme?

The analyses and responses to the above questions are summarized in Sections 5 and 6.

Despite the numerous policy challenges, the Vanishing Treasures project has identified priority pathways, including a shift to nature-based tourism/climate-smart agriculture to reduce dependency on natural resources. Water tanks reduce the impacts of a lack of water resources and positively affect small-scale farmers. Improvements in buffer zone management reduce HWC with the addition of tea farming as an alternative source of income. Therefore, it preserves species populations and, as a result, increases tourism in the region. The project is also leading to local livelihoods increase and food insecurity decreases, positively affecting revenue for communities and general well-being. The VT Programme aims to enhance the resilience to climate change of vulnerable Virunga mountain species, such as the iconic mountain gorilla, while supporting local mountain communities who live alongside them. The TSA will provide feasible policy responses to further develop the investment framework and financial mechanisms to accelerate positive change.

### 3.0 Defining Business As Usual (BAU)

Many of the characteristics of the current situation resulting from unsustainable agricultural practices (BAU) have already been described in section 1.3 (Local context). Further, the findings of the TSA scoping (inception) workshop outline the need for urgent coordination of conservation efforts with emerging climate adaptation and mitigation frameworks, underscoring the vital role of forests in poverty alleviation and economic security as well as the role of climate, social, and economic research in the development and delivery of evidence-based policy. The tabulated outputs from the BAU and SEM identified are detailed later in the report. A brief summary of issues drawn from the discussion in each of the groups participating in the above-indicated workshop is included in this section to provide context for the BAU situation, supplemented by references to research and technical reports. The BAU narrative is followed by a discussion of the alternative scenario based on sustainable ecosystem management (SEM) principles.

Climate change presents a mounting threat to the viability of land-based livelihoods in the region. Enhancing agricultural productivity is vital to lifting global living standards and advancing sustainable food production in the face of escalating challenges to agriculture and the environment. Investments in agricultural research have boosted agricultural productivity, but this growth in productivity has been distributed unequally across the world, and there are signs that it is slowing. Over the last five years, Uganda's population has grown from 39.58 million to 47.73

million (an increase of 3.3% per annum), while output in agriculture has grown at only 2% per annum. In comparison, other East African countries have had up to 5% annual output growth in agriculture (Government of Uganda 2022). At the same time, human activities during the last century and a half have caused global temperatures to rise by more than 1°C above their pre-industrial values. This increase affects the global weather patterns that are essential to agriculture, further constraining productivity.

Uganda is among the world's most vulnerable and simultaneously least adapted countries to climate change (Government of Uganda 2022). Increasingly frequent climatic shocks heavily affect rural livelihoods and the economy. The mining of soil nutrients and biomass, coupled with rapid population growth in rural areas and low adaptive capacity to climate variability, are key impediments to the transformation of the rural economy. Unsustainable land use also lowers the resilience to climatic shocks and exacerbates carbon emissions.

### 3.1 Farming system and livelihoods under BAU

Most rural households in Uganda derive much of their livelihood from agriculture. They face challenges related to declining soil fertility and stagnating crop yields, declining farm size as a result of population growth, poor market access, insecure land rights, and climate change (Jayne et al. 2006; Kristjanson et al. 2012; Rufino et al. 2013). Ugandan farmers depend largely on subsistence agriculture but are keen to move into more intensive market-oriented farming if the opportunity arises. Despite the inherent productivity of their land, most are suffering a combination of production-related problems that policy will need to address if agriculture is to be the foundation for economic growth. Farmers most frequently report problems of declining yield and offer the following explanations, most of which were also identified in the focus groups discussions:

- Increased incidence of pests and diseases affecting both crops and livestock.
- More intensive farming, land fragmentation, and reduced fallow causing a decline in soil fertility and productivity of the land.
- Lack of access to and/or high cost of agricultural inputs (notably improved seed and planting material, fertilizers and pesticides) and mechanization.
- No or very little help from or contact with the Agricultural Extension Service. This service seems largely to have ceased functioning in recent years.
- Unreliable weather, mostly periods of drought in the growing season but also very destructive intense rainfall events in some areas.
- Loss of marketing co-operatives and poor access to markets.
- Land fragmentation.
- Soil erosion, particularly in the hillside communities.

Other research in the region further identifies key constraints that initiatives such as those in the VT program can help to resolve. For example, the expansion of the banana crops and changes in its agronomic management have resulted in social implications with respect to gender relations and labor division (Rietveld et al., 2021; Rietveld and van der Burg, 2021). In general, the use of fertilizer and manure remains highly limited, resulting in soil fertility depletion (Wairegi and van

Asten, 2010; Den Braber et al., 2021; Rietveld et al., 2021). Briggs and Twomlow (2002) quantified nutrient depletion in the upland soils, as farmers place little value on improving the nutrient status of hillside fields distant from homesteads. Households, as is the case with most African subsistence farmers, would rather concentrate their limited labor and organic residue resources on maintaining the productivity of the more profitable parts of the farming system, in this instance, banana crops and annual fields close to homesteads. Thus, in the short term, the perennial banana system maintains a balanced flux of organic resources at the expense of hillside soil fertility.

Over the longer term, the current system will lead to a severe reduction in mulch availability, resulting in declines in perennial crop yields, further destabilizing the farming system. This will compound the risks of vulnerability to climatic and market shocks because of the increased dominance of bananas, soil fertility loss, deforestation, and changing social relations are important sustainability concerns. Combined with the trends of increases in population and land-use intensity and decreases in farm size these represent major challenges for many farmers, particularly the poor and vulnerable, most of whom are suffering multiple production constraints. Many of these concerns, in fact all but co-operatives and market access, relate directly or indirectly to poor coverage of agricultural services.

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. The experience of the VT beneficiary subsistence farmers was very positive in terms of developing basic food security and surpluses for sale on local markets. The project is a promising example of what could be achieved if activities are capitalized and adequately and technically supported at scale. VT supported the implementation of basic technological shifts from broadcast to row cropping, novel high-value horticultural crops, and the use of green, farmyard, and household manure to boost soil fertility, promoting increased production from land holdings. VT supported the development of key mechanisms to access markets for inputs and the sale of surpluses, improving both productivity and income generation. To address acute labor scarcity issues, VT also promoted techniques to reduce labor inputs into non-farm activities such as water collection so that households could invest more time in farm enterprises, improving the efficiency of the household production system

## 3.2 Impact on Ecosystem Services

The extensive and unsustainable agricultural practices, under conditions of high population growth, drive the loss of ecosystem services, i.e., forest, biodiversity, pollination, fresh water, and soil fertility. The ecological health of BIFNP remains threatened by invasive species spreading through natural processes from agricultural fields and continued incursions by park-adjacent people for illegal hunting and gathering. In the Kisoro District, the options for expansion of

agriculture into uncultivated areas are limited and often undesirable in already densely populated areas and challenging topography (steep hills).

Campbell & Luckert (2002) emphasize the crucial role of valuing non-market goods and services derived from natural resources, particularly for Less Developed Countries (LDCs). Rural livelihoods in LDCs heavily rely on natural resources, especially trees and forests. However, many of these goods and services are not priced, leading to inadequate information for policymakers to make economic decisions regarding resource allocation. This lack of pricing information hinders the setting of development priorities within an economic framework. Conservation areas, significant natural resources in LDC economies, require informed decisions for their conservation and management to ensure their long-term preservation. Typically a natural landscape generate a variety of ecosystem services the direct and indirect benefits that ecosystems provide humans. The Millennium Ecosystem Assessment (MEA), a major UN-sponsored effort to analyze the impact of human actions on ecosystems and human well-being, identified four major socio-ecological categories of ecosystem services: provisioning, regulating, cultural, and supporting services.

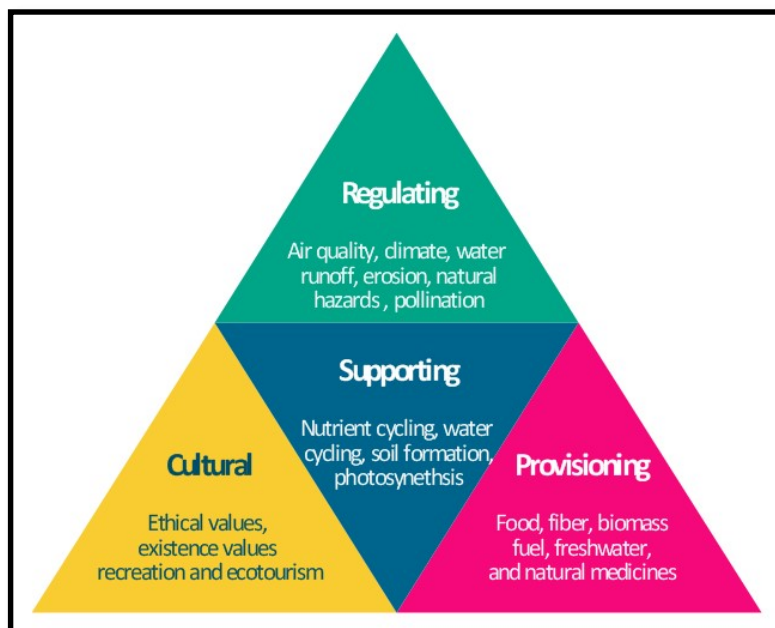


Diagram 1 A typology of ecosystem services by socio-ecological function (TEEB, 2024) <sup>2</sup>

These can be further categorized according to two broad functional economic categories use (direct and indirect and non-use, in a total economic value framework. These are the final values that can be determined (priced) using a variety of techniques before other spatial and temporal scaling can be made upon which to assess the welfare impacts of ecosystem changes as a result of policy (Hanley and Barbier, 2009).

<sup>2</sup> [TEEB training package for national implementers and practitioners](#)

As indicated earlier in the text, a vicious circle exists linking population growth, agricultural practices, environmental degradation (and reduction in ecosystem services), agricultural productivity, and poverty levels. The compounding effects of global climate change exacerbate the situation. The implication is that intensification of agriculture is needed on land currently under production. Any intensification must occur sustainably to minimize further negative environmental impact and ensure social and human well-being. In southwest Uganda, banana cultivation has expanded over the past decades (Ochola et al., 2022), resulting in marked increases in production volumes and incomes (Gold et al., 1999; Rietveld et al., 2021). However, while the increases have generally improved the economic performance of the farming system, this has largely been at the expense of other dimensions of sustainability. The banana area increase has been at the expense of other (food) crops, livestock, and forest areas (Rietveld et al., 2021; Ochola et al., 2022), with implications for food and nutrition security and environmental services (Wairegi and van Asten, 2010; Den Braber et al., 2021; Rietveld et al., 2021).

### 3.2.1 Soil fertility

Land degradation in Africa has been vastly detrimental to agricultural ecosystems and crop production, thus impeding the achievement of food security and improving livelihoods (Kiruri and Mazarbaev, 2015). It also has substantial environmental, social, and economic costs. Land degradation reduces the productive capacity of agricultural land, rangelands, and forest resources and significantly impacts landscape biodiversity (Davidson & Strout, 2004). This is evident in the Kisoro District.

The costs and consequences of land degradation can be direct or indirect. Direct costs may include costs of nutrients lost by soil erosion, lost production due to nutrient and soil loss, and loss of livestock carrying capacity. On the other hand, indirect costs may include costs such as loss of environmental services, silting of dams and riverbeds, reduced groundwater capacity, and social and community losses due to malnutrition and poverty. From the viewpoint of land degradation as a state and a process, the cost of action against land degradation includes investments to restore degraded land and reduce degrading land's degradation rate. This can be achieved by adopting biological, and to a limited degree, mechanical measures and by improving land productivity, e.g., CSA activities. The returns to such investments are considered as benefits of action through the prevention of crop damage and the derived loss in productivity, an issue that is examined and costed later in this report. This critical ecosystem service is further examined in section 5.5 through a benefit transfer model to estimate the damage costs avoided in moving from BAU to SEM.

### 3.2.2 Biodiversity and nature-based tourism

CARE Uganda (Blomley, 2001) reported that the Bwindi Impenetrable Forest National Park (BINP), established in 1991, is a biodiverse natural forest area with high low-to-high-altitude forest types. It provides numerous ES to local agriculture, mainly small farmers. BIFNP also supports local climate regulation and is a water catchment area. The BIFNP contains Afromontane forest

vegetation and offers a rich habitat for biodiversity, including montane, bamboo, alpine fauna, and extensive marshes between the nearby volcanoes. Before 1991, BIFNP was a forest reserve, and local people had unregulated access to forest resources, such as fuelwood, timber, medicinal plants, fibers, and game meat. The national park's creation ended legal resource use, increased prices for timber and forest products, declined incomes for forest-dependent households, and reduced food security (Wild and Mutebi, 1996). The lack of access to the forest for adjacent communities resulted in conflict and resentment. As a result, the 1990's saw the emergence of conservation strategies to be more inclusive of community social and economic needs, and the development of sustainable financial mechanisms to fund them e.g. the UWA tourism revenue sharing program and the Bwindi & Mgahinga Conservation Trust<sup>3</sup>.

The emblematic mountain gorillas are only found in a restricted range in southwest Uganda, northeastern Rwanda, and the east of the Democratic Republic of Congo (DRC), between elevations of 1,100-4,500m (Advani, 2014). There are approximately 1,063<sup>4</sup> individuals remaining in the wild. Due to this small population and highly restricted geographic distribution, mountain gorillas are particularly vulnerable to changes in climate, with a high risk of exposure and limited adaptive capacity. Climate change also increases pressure on water resources, negatively affecting local populations, particularly small-scale farmers. This has increased the demand for land and natural resources for agricultural production and has significantly exacerbated conflict over land use in and around African National Parks (Seimon et al., 2014). Because of increased water stress, agricultural productivity across the African continent is expected to decrease by 17–28% by the 2080s (GVTC, 2014). This will become acute, particularly in mountainous regions and higher elevations, where changes in climate may be more dramatic. Local communities and farmers are already encroaching on forests outside the national park boundaries, converting and fragmenting mountain forests. In southwestern Uganda, human population density is very high, leaving few options for reforestation efforts. Without management intervention, it is likely that climate change will continue to aggravate this existing pressure on gorilla habitat.

The gorilla habitat and the gorillas are the most important ES that supports nature-based tourism and conserves the entire Uganda National Park System. Gorilla trekking in Bwindi is a major tourist attraction, producing substantial revenue for the Uganda Wildlife Authority (UWA), for example, over USD20 million from Gorilla Tourism alone in 2023 (around 60% of all UWA revenue). All park tourism revenue is pooled and reallocated to support management costs for the entire Uganda National Park network. Twenty percent of all park entry fees are restricted towards the revenue sharing scheme (TRSP); funds are shared with local governments around national parks to support local community projects. In the year 2023, for example, Kisoro District received around USD134,130 from the TRSP. However, the impact of the revenue-sharing scheme on local communities' livelihoods has been reported as minimal. The study team reviewed the TRSP regulatory framework and previous TRSP review reports provided by the UWA. There are a number of issues related to the management of the revenue-sharing mechanism; these are included in Section 5.

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<sup>3</sup> [BMCT website](#)

<sup>4</sup> Gorilla Doctors (2019). [Mountain Gorilla Numbers on the Rise](#). Press Release.

### 3.3 The alternative path forward (SEM): Climate Smart Agriculture.

Uganda faces ongoing population pressure, land scarcity, and encroachment of nature reserves (Adonia and Kakurungu, 2014; Mwesigye et al., 2017). Almost 80% of the population are smallholder farmers (UBOS, 2020). One of the most widely grown staple crops in Uganda is the East African Highland banana (*Musa* spp., further referred to as banana), grown by >75% of all farmers in the country (Promusa, 2020). Major growing areas are concentrated in the south and southwest of the country (UBOS, 2020; Ochola et al., 2022), including the communities around the BIFNP.

Climate-smart agriculture (CSA) practices – from the farm to the landscape or watershed level – are critical to enhancing productivity while limiting land or livestock management emissions and enhancing climate resilience. As noted by the Rain Forest Alliance, climate-smart agriculture is not distinct from sustainable agriculture; rather, it combines various sustainable methods to tackle the *specific* climate challenges of a *specific* farming community. Nevertheless, a critical element for its sustainability is its financial profitability. Thus, the vision for CSA includes three core pillars:

- Improve farmers' productivity and, as a result, livelihoods (higher margin of profitability);
- Make farms more resilient to climate impacts they're facing now and to those likely to hit in the future;
- In addition, curb greenhouse gas emissions associated with growing food where feasible.

A nascent national framework needs to be capitalized and scaled up to help deliver on the wide-ranging national needs for adaptation and mitigation in the agricultural sector (CIAT 2017). Promising examples of farm enterprise-level measures have been developed under the Vanishing Treasures project, the impacts of which are illustrated in a later section. CSA is critical to generating nature-positive agricultural practices and the household economy. CSA's measures can entail:

- Introducing crop and soil management plans
- Application of organic fertilizers
- Integrated pest and disease management
- Establishing seed banks
- Introduction of shade trees
- Water conservation practices
- Introducing education and practice on household farming finance.

The introduction of CSA practices should account for differences in terms of risk perception, adaptation capacity, and information levels between men and women. Since perceptions of risks and adaptation strategies differ across genders, approaches to CSA and information transfer are required, that are gender sensitive and tailored to the needs and knowledge levels of smallholders (van Campenhout 2017). While the NAP does specifically mention the expansion of CSA as the main area for action in its Nationally Determined Contribution (NDC), several barriers to adoption need to be overcome. Alongside its NDC, Uganda developed climate change mainstreaming guidelines and a 10-year Climate Smart Agriculture Program (2015-2025), which have the

potential to foster the adoption of CSA on a community or even landscape level. However, there is limited knowledge of key CSA practices among farmers, particularly women, as well as a lack of access to assets. Many CSA practices require special equipment or benefits only materialize economically only after a few years of practice. Insecure land rights often inhibit long-term investments in sustainable agriculture. During the TSA field visits, farmers noted that the participation of women in the VT's CSA agricultural support strategy has led to a decrease in household violence since they (women) have gained more access to household financial resources and planning.

Successful practice of CSA requires an enabling environment characterized by functional institutions, regulations, and coordination, as well as governance structures favoring the generation, dissemination, and use of CSA. Uganda's National Agricultural Advisory Service (NAAS) and research network (NARO/NARS) currently do not prioritize CSA promotion, and many CSA-related projects and policies in Uganda are implemented in a fragmented manner with limited coordination, hampering the awareness and success of CSA more broadly. Under SEM, the GoU could provide public investment to improve the agricultural extension system and ensure its staff have adequate technical capacity and knowledge to disseminate tailored, gender-sensitive, and climate-smart technologies. Moreover, the GoU could promote greater coherence, coordination, and integration among food security, poverty reduction, economic development, social security, and climate change adaptation/mitigation efforts as well as related strategies, and mainstream climate-smart agriculture into broader public policy, expenditures, and planning processes (Harvey et al. 2014), particularly in marginal rural regions such as Kisoro District.

## 4.0 Policy Framework

The TSA study addressed critical loopholes in agricultural policy and the UWA's TRSP and explored issues around border policy that developed the framework for investing in resolving critical sustainable development challenges identified in the inception workshop and key informant interviews. This section covers tourism revenue sharing and agricultural and climate policy. The narrative provides context on the interrelationship between national, district, and local level challenges as they relate to addressing adaptation and conservation threats and bottlenecks to coordination. The opportunities to promote action and scale support at the local level are presented in the conclusion and recommendation section.

### 4.1 Tourism revenue sharing

Regarding the UWA's TRSP policy and monetary flows, the following policies were reviewed during the TSA study:

- UWA Guidelines for revenue Sharing between Wildlife Protected areas and adjacent Local Governments and Communities (2013)
- UWA Statutory Instruments (2022) – Uganda Wildlife (Compensation Scheme Regulations)

- Guidelines for Revenue Sharing Between PAs and Local Governments and Communities (no date)
- Rwanda's Gorilla Tourism Policies

The current objectives of the TRSP include: a) Establish good relations between PA and local communities (LC), b) Demonstrate the economic value of PA and conservation to the communities neighboring PAs, and c) Strengthen the support and acceptance of PAs and conservation activities by communities living in the adjacent PAs.

Generating direct economic benefits to the local communities bordering the PA and in the buffer zones is not part of the overall objectives. Besides, there are a significant number of issues that need immediate attention, for example:

1. Local communities need more education and capacity to participate in the complex TRSP administrative process.
2. Local communities are not the primary beneficiaries of the TRSP scheme
3. Given the lack of capacity/education of LC, members of local communities need to be made aware of how the RS scheme works and the limited benefits delivered at the community level.
4. The cumbersome and outdated design of the RS administration and benefits distribution approach results in higher benefits for the administrators (local governments) and little benefit to the communities.
5. There is little or no evidence of the RS mechanism's impact on LC's well-being and income.
6. Lack of transparency and accountability on how visitors' entry permits and fees are managed.
7. Access to the HWC compensation is highly complex for communities with little or no education. Overdue compensation payments are increasing; compensations are processed the year following the incident (in the next fiscal year budget if funding is available), and how compensations are financed is still unclear. In addition, the compensation payment levels for different situations are outdated.
8. There is little or no evidence of how compensation payments affect LC's well-being and mitigate income loss from HWC.
9. Information on the costs of managing the RS scheme and the compensation mechanism is not available.
10. The costs of community-based conservation and forest protection are unknown.
11. Statistical information about monetary flows resulting from the RS scheme and the compensation mechanisms are unavailable for review and auditing.

Tumusiine and Vedeld (2012) noted that since 1994, tourism revenue-sharing has been piloted at Bwindi. Initially, the Uganda National Parks (UNP) was required to give 12% of their total gorilla revenue to local communities. RS became part of the Uganda Wildlife Statute in 1996. However, to increase local revenue shares, UNP changed the 12% of total park revenues to 20% of the

park's entry fees. Unfortunately, this change led to an income decline for communities around Bwindi, where the number of gorilla visitors is controlled using IUCN guidelines. "For example, if a foreign tourist bought a gorilla-tracking permit in 2010 for USD 500, gate fees accounted for only USD 30. Under the former agreement, USD 60 (12 percent of USD 500) would have been put into the revenue-sharing scheme, but after the 1996 legislation, only USD 6 (20 percent of USD 30) was put into the scheme. This amounts to only 1.2% of the initial USD 500, against the 12% that would have been shared with the locals before the 1996 legislation. It was only in 2006 that a USD 10 gorilla levy fund was established in Bwindi, with CARE support. Under this new arrangement, USD 5 out of the USD 10 goes to the UWA in Kampala to support local communities living near other parks, and USD 5 is intended to support communities adjacent to Bwindi, in addition to the 20% of park entry fees" (Tumusiine and Vedeld, 2012.)

Because of the historical and contextual similarities, the TSA team conducted a rapid review of the Rwandan Tourism Revenue Sharing Programme Review led by the Rwanda Development Board (RDB) and the International Gorilla Conservation Programme (IGCP) in 2021. The challenges in the Tourism Revenue Sharing Programme (TRSP) are similar to the current challenges of the UWA TRSP. The TSA team's review focused on how these RS schemes increase local household incomes and improve the local economy. In addition to these valuable insights, the review offers a comparative analysis of the TRSP, further enriching our understanding of these initiatives.

Fourteen issues were identified in the RDB's Review from 2021. It assessed how things evolved from 2007 to 2021. The review noted that several of these challenges showed improvement in 2021. These improved areas are labeled as 'improved' in the table below. On the other hand, for the UWA TRSP, there is no updated report, and therefore, the TSA team assumed that all aspects remain problematic. UWA's TRSP faces more complex situations in the fourteen listed issues. This is likely the consequence of the complexity and inefficiency of the current UWA's TRSPTRSP structure.

<b>Challenges*</b>	<b>Rwanda 2007-2021</b>	<b>Uganda 2023</b>
1. Limited understanding of the TRSP by sector and district managers	Improved	Prevailing
2. Limited pool of projects from which to select	Prevailing	Prevailing
3. Delays with funding and project implementation	Prevailing	Prevailing
4. Community disappointment in fund/project allocation	Prevailing	Prevailing
5. Lack of direct impact measurement of project impact on conservation	Prevailing	Prevailing
6. Limited land access and resource use by the communities around PAs and lack of Buffer zones	Improved	Prevailing

7. Lack of engagement / ownership of District level officials in project selection, implementation, and monitoring	Prevailing	Prevailing
8. Limited impact on socio-economic development	Prevailing	Prevailing
9. Poor budgeting and project design	Prevailing	Prevailing
10. Inequitable distribution of TRSP benefits, that is limited to the economically advantaged residents	Prevailing	Prevailing
11. Delay in the submission of accountability reports which as a paramount for the following funds reimbursement	Improved	Prevailing
12. Expired TRSP policy that did not reflect the current reality to appropriately guide all TRSP projects design	Improved	Prevailing
13. Lack of technical expertise required for project selection and implementation	Prevailing	Prevailing
14. Lack of well-defined indicators & tools to measure impact.	Prevailing	Prevailing

(Based on RDB/IGCP, 2021)

Critical elements for this TSA are the still prevailing shortfalls related to:

- Delays with funding and project implementation
- Community disappointment in fund/project allocation
- Lack of project impact on conservation
- Limited impact on socioeconomic development
- Poor budgeting and project design
- Inequitable distribution of RS benefits

According to data provided by UWA, 2024, financial flows at the district level have increased significantly, as shown in the next table. From USD 19,760 in 1996 to USD 808,131 in 2029-2021. However, detailed data on the level of investment in community projects was not available at the time of the TSA study. Therefore, estimating the cost and benefits of the community or individual projects supported by the TRSP scheme is not possible; the analysis of the impact of such projects is not the purpose of this TSA study. Based on the BAU and SEM projections estimates, the impact has been minimal.

***Tourism Revenue Sharing Program: Financial flows to districts 1996 to 2021***

Period	Districts			Totals Ush	Totals USD
	Kanungu.	Rubanda.	Kisoro.		
1996	44,000,000	20,000,000	12,000,000	76,000,000	19,760.00
2002-2003	57,223,000	21,032,000	10,500,000	88,755,000	23,076.30
2006-2007	69,895,500	29,603,200	14,720,000	114,218,700	29,696.86
2007-2008	80,000,000	18,000,000	9,000,000	107,000,000	27,820.00

2009-2010	60,872,000	26,088,000	13,044,000	100,004,000	26,001.04
2009 GL	171,870,375	73,312,150	43,797,475	288,980,000	75,134.80
2011-2012	350,740,649	148,899,332	162,134,828	661,774,809	172,061.45
2013-2014	266,860,832	121,661,574	111,718,606	500,241,012	130,062.66
2015-2017	509,367,724	221,625,232	163,905,044	894,898,000	232,673.48
2019-2021	1,796,083,120	802,415,611	509,697,773	3,108,196,504	808,131.09
				<b>5,940,068,025</b>	<b>1,544,417.69</b>

Source: UWA, 2024

The TRSPTRSP presents a significant opportunity for local investment to support the shift to sustainability of climate-smart and nature-positive agriculture practices in Bwindi.

## 4.2 Agriculture

In addition to the above-discussed UWA's TRSP scheme, agricultural policies are at the core of this report. The national policy highlights the potential of Agro-Industrialization (AGI) for Uganda to transition into a modern industrial economy, aligned with the National Development Plan (NDP). AGI offers inclusive growth opportunities, boosts trade balance in agro-industrial products, adds value to agricultural raw materials for export expansion, and addresses post-harvest losses while increasing household incomes. It underscores the importance of sustainable transformation of agro-value chains to support domestic industries and employment. The aspirations of global agendas like Agenda 2030, SDG 8, and Agenda 2063 align with Uganda's vision of modern agriculture and value addition. Despite the dependence on agriculture due to various challenges, including low productivity and poor infrastructure, Uganda aims to enhance commercialization and competitiveness through increased exports of processed agricultural commodities.

The goal of this programme, therefore, is to increase commercialization and competitiveness of agricultural production and agro-processing. The key results to be achieved over the next five years are:

- (i) Increase the total export value of processed agricultural commodities; coffee, tea, fish, dairy, meat, and maize (and its products) from USD 1 billion to USD 4 billion.
- (ii) Reduce the total value of imported cereals and cereal preparations, vegetable fats and oils, and sugar preparations from USD 931.1 million to USD 500 million.
- (iii) Increase the agricultural sector growth rate from 3.8 percent to 6.0 percent.
- (iv) Increase labor productivity in the agro-industrial value chain (value added, USD per worker) from USD 616 to USD 850.
- (v) Increase the number of jobs created in agro-industry along the value chain by 500,000.
- (vi) Reduction in the percentage of households dependent on subsistence agriculture as a main source of livelihood from 68.9 percent to 55 percent
- (vii) Increase the proportion of households that are food secure from 60 percent to 80 percent.

The plan cites many priority interventions that coordinate well with the needs on the ground, many of which are identified here, for example:

1. Strengthen agricultural research and technology development:
  - Invest in infrastructure for agricultural research.
  - Recruit and train agricultural research staff.
  - Establish technology demonstration centers and strengthen linkages between research institutions and agro-industry enterprises.
  - Upscale research on bio fortification and nutrient-dense food staples.
2. Strengthen the agricultural extension system:
  - Recruit and facilitate extension workers.
  - Develop an ICT-enabled extension supervision system.
  - Scale-up innovative extension models.
  - Incorporate vocational institutions into the extension system.
  - Enhance research-extension-farmer linkages to increase technology uptake.
3. Strengthen agricultural inputs markets and distribution systems:
  - Establish farm service centers for input procurement.
  - Strengthen inspection, certification, and regulation of inputs.
  - Scale up e-voucher models for input distribution.
  - Establish regional mechanization centers to promote agricultural mechanization.
  - Enforce pre-export verification for agricultural inputs.

However, these important legislative and policy frameworks have not been translated into action at the scale needed for transformational change at the district level in Kisoro. District data indicate that although aggregate gross revenues to the district have increased, the per-household value has decreased as the population has grown over time. This means that the increase is occurring due to adding more people at a lower living standard.

The identified loopholes in the agricultural policy that contribute to unsustainable agricultural practices in Kisoro District include:

- Lack of coordination between policymaking at the central government level and its implementation at the decentralized (district and other lower entities) levels.
- Insufficient resources allocated to the district's agriculture department level to implement the relevant programs, most critically, support subsistence farmers.
- Weak coordination framework of partners involved in agriculture development at national and district levels.
- Inadequate communication network: lack of investment in phone coverage and internet/connectivity to support farmers.
- Insufficient investment in climate-smart agricultural practices
- Inadequate/ineffective extension service.
- Lack of research geared toward access to technology-based solutions.

- No investment in research to monitor and evaluate policy impact (economic, social and environmental)

## 4.3 National Climate Policy Framework

The Government of Uganda (GoU) has recognized the risk climate change poses to its development prospects, reflected in the Uganda Vision 2040 and in its current NDP, and by initiating the development of an institutional structure within the national government to support climate change action. It has also released a supporting expenditure framework, in which the GoU indicated its intention to mainstream climate change into sectoral and cross-sectoral planning and decision-making. The National Climate Change Policy (NCCP<sup>5</sup>) was approved by Uganda's Cabinet in 2018, and a National Climate Change Act<sup>6</sup> was adopted in 2021 to provide the comprehensive legal framework for policy action on the Kyoto Protocol and the Paris Agreement. It outlines policy actions to build climate change resilience and climate-compatible development through climate change adaptation and mitigation while at the same time promoting economic and social development. The policy is not meant to replace sectoral policies but rather to provide a framework for the harmonization and coordination of the various sectoral efforts already underway and to be put forth in the future. At the core of the NCCP is the recognition that climate change is fundamentally a multi-sectoral issue and that all sectors and categories of stakeholders must, therefore, be actively involved during policy implementation. This especially calls for mainstreaming climate change concerns in the relevant sectoral, national, and local policies, plans, and budgets.

However, while climate change is referenced in various sectoral policies and plans, Action remains limited, and efforts must expand at the district level, a challenge that is being addressed to some extent through a few ongoing projects (Bakiika et al, 2020). Further capacity building and access to the knowledge and resources needed to shape mitigation and adaptation plans at the sectoral and local levels are needed. Projects geared toward increasing the capacity of government officials to address climate change are helping address some of these gaps and limitations but remain limited.

### 4.3.1 Nationally Determined Contributions (NDC):

Uganda has developed a vibrant and highly liberalized framework to harness the power of the emerging carbon markets to deliver on its low-emission development strategy and NDC to the United Nations Convention on Climate Change. Uganda updated its NDC in September 2022 based on its Vision 2040 and the Third National Development Plan (NDP III). The Uganda Climate Change Act (2021) highlights climate finance mechanisms as tools to deliver the NDC commitments and boost climate ambition. Uganda stated its plan to build on the existing Clean

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<sup>5</sup> <https://ccd.go.ug/wp-content/uploads/2018/09/NATIONAL-CLIMATE-CHANGE-POLICY-SUMMARY-VERSION-2018-2.pdf>

<sup>6</sup> <https://www.preventionweb.net/media/93572/download?startDownload=20240604>

Development Mechanism pipeline. Uganda's updated NDC (2022) recognizes agriculture and natural resource use issues among the top 4 of 13 strategic pillars:

- Promote climate-resilient and low-carbon agricultural development.
- Promote and apply land management practices that support sustainable and productive use.
- Promote climate-resilient water supply systems, increase water supply capacity and use efficiency.
- Promote sustainable management of ecosystems and nature-based solutions, including community engagement.

In addition, the NDC specifically targets the development of enhanced ecosystem resilience to protect and restore mountain ecosystems. Policies that should prioritize regions like Kisoro District for climate adaptation and mitigation finance.

#### 4.3.2 Reduction of emissions from deforestation and forest degradation (REDD+)

Uganda has developed the National REDD+ strategy and action plan, the National Forest Monitoring System, the National Forest Reference Emission Level, the Safeguards Information System, and a number of additional REDD+ frameworks and initiatives. The aim of the REDD+ strategic options is to turn current wood and biomass extraction into sustainable abatement activities (i.e., strategic option activities). Each strategic option will add to the mitigation capacity in its own manner, but the main idea is to gradually stop the use of wood coming from natural forests and replace it with wood coming from planted forests, improve the efficiency of wood use, and prevent wildfires. Many of the proposed strategic options have strong links to climate-smart agriculture, watershed management opportunities for gender-focused activities, and the involvement of forest-dependent and marginalized vulnerable people. Further, numbering the strategic options does not relate to prioritization of the options, which was considered unimportant due to various cross-linkages between the options for implementation.

#### 4.3.3 Voluntary carbon market (VCM)

The country also has 92 registered VCM activities that are contributing to most of the carbon credits issued. The VCM activities are dominated by energy efficiency activities supporting improved cookstoves as well as other project types like biogas projects, including forestry. Perhaps the most relevant to CSA is the project Trees for Global Benefits (TGB). Coordinated by ECOTRUST since 2003, TGB is a cooperative offsetting scheme that links Ugandan farmers (6000+) to the voluntary carbon market. TGB combines carbon sequestration with rural livelihood improvements through small-scale, farmer-led agroforestry projects and ecosystem services by linking rural farmers to the international ecosystem service markets. The TGB scheme operates as a programme of activities to enable scaling up through the design of new activities and the

recruitment of new farming communities. In addition to farmers' direct payments for planting trees and climate mitigation, the project contributes to income stability, food security, and fuel security at the community level.

#### 4.3.4 Adaptation planning and finance

Uganda has two approaches to its national adaptation planning (NAP) process. The first approach is where individual sectors prepare their own NAPs. The second approach is linear, where sectors prepare their NAPs and integrate them into one overarching 'National NAP.' The Ministry of Water and Environment is preparing the National NAP under the Climate Change Department, while the Ministry of Agriculture, Animal Industry and Fisheries has prepared a sector NAP. A NAP roadmap was prepared for the production of the National NAP, which accompanied other key documents like the NDC and the Uganda Green Growth Development Strategy. Kisoro District authorities, with VT support, can prioritize coordinating with the evolving NAP agenda as a potential source of investment to finance CSA development in the district.

At the district level in Kisoro, there is no structural approach to mainstream climate adaptation and mitigation measures to safeguard local economic development and resilience in its local development plans. Neither was there even anecdotal evidence of intentions to develop the local government institutions and capacity to coordinate with national policy or comprehension of the potential of emerging sources of climate finance to support their economic development plans such as REDD+, the voluntary carbon markets, or adaptation finance.

### 4.3 2 Weak organizations, institutions and low investment

Increasing sustainable food production is vital in food security, basic nutrition, and revenue-generating terms. However, subsistence farming is dominant in the region. Smallholder farmers' contribution is crucial but does not receive the necessary government support. Farmers' knowledge of financially sustainable agricultural practices, including costs and net revenue, is absent. Farmers are neither aware of the cost of the input use nor its link to productivity and its impact on their food security. Access to markets and communications (the feeder road network is poor and highly vulnerable to erosion and flooding) is not adequate to support a profitable and environmentally sustainable business model. The positive social benefits from an SEM strategy will be in terms of increased job opportunities, income, and welfare levels experienced equitably across socio-demographic groups.

**Institutional and human capacity:** Overall capacity is poor compared to the current needs. Whilst institutional mechanisms as the framework for resolving sustainability challenges are evident, they remain under-resourced, inefficient, and ineffective in promoting transformational change. For example, the main source of agricultural and rural development extension support is the NAAS program, which locally faces several challenges to its performance, such as poor administration, limited supply of quality inputs, and weak abilities to attend to the neediest in the community. In

addition, the business/operational strategy poorly focused on the needs of the majority of poor smallholder farmers has negatively affected the impact on the scale of the NAAS program.

Local government officials are concerned about insufficient budgets from the central government and limited options to generate district-level revenues. There is a low financing level for investment in rural food security and enterprise development. Most annual public funding (short-term incremental budgets) is allocated to recurrent costs, with minimal or no investment; therefore, assessing financial impact is impossible at this point. Long-term financial planning based on clear results will be highly beneficial. District authorities need improved means and methods of lobbying for public sector finances to support the provision of key infrastructure. Despite the deconcentrating of central government power, the capacity of the local government to think and act strategically around their devolved powers remains weak. This means that financing and the level of investment in the area are very low compared to needs and opportunities.

While climate change funds might be accessible from donors and development partners, articulating climate change issues in local development plans is critical. Insufficient knowledge of climate and environmental management issues and their direct linkages to development and poverty alleviation priorities is weak. Consequently, the issues are not presented in district development plans. Key informants reported rigid government Indicative Planning Figures (IPFs) that constrain district funding within centrally designated priorities, often misaligned with local needs. In addition, even if such funds are available, weak technical capacity to implement such novel development practices is a risk. If funds remain unused in a financial cycle, they will count against district government performance with potential penalties in future funding cycles, discouraging innovation in local government policy.

Political interference stems from ineffective decentralization, and for over a decade, the national government has recentralized many local government roles, such as appointing and remunerating top district leaders, abolishing local revenue sources (e.g., graduated tax<sup>7</sup>), and allocating small budgets to non-productive sectors. This leaves districts without decision-making power and unable to hold top leaders accountable. Financing of key public infrastructure to encourage investment is controlled by the central government, e.g., electrical power and feeder roads, even though the operational means for provision is devolved to district authorities, undermining their capacity. This devolved decision-making issue also affects the funding modality of the UWA's revenue-sharing scheme.

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<sup>7</sup> Graduated Tax: Successful decentralization relies heavily on the ability of subnational government to generate its own revenue. Until it was abolished in 2005, one of the main sources of own revenue for subnational government in Uganda was a poll tax known as graduated tax. The reasons for abolishing the tax included the fact that it relied on coercive enforcement, the costs of collection were quite high and it disproportionately affected the poor. However, there have recently been calls – within and outside government – for the reintroduction of the tax.

## 5.0 Scenario analysis and result

### 5.1 Selection of criteria and indicators

A selection of provisional criteria and indicators were discussed during the inception workshop and later refined according to data availability. The criteria, indicators, and sub-indicators (where appropriate) are shown in the following matrix. The associated data and discussion sections are indicated.

Criteria	Indicators	Sub indicators
<b>Financial</b>	Changes in net income (gross margin)	UWA Revenue-sharing flows to local communities (Section 4.1)
		Changes in agricultural enterprise productivity including diversification (selected crops) and climate change effects. (Section 5.2)
		Household net benefits, considering positive and negative externalities (Section 5.3)
<b>Economic</b>	Changes in net benefits (Kisoro District)	UWA Revenue-sharing flows to local governments (District-level) (section 4.1)
		Net benefits adopting CSA to Kisoro District (Section 5.4)
		Cost of natural resources degradation (Section 5.5)
		Cost of shifting from BAU to SEM (Section 5.6)

The following sections describe the results of the TSA scenario analysis using the indicators in the above table.

The study's results consider the impacts of continuing with BAU practices and the shift to SEM practices, including those of the Vanishing Treasure pilot CSA activities with farmers around BIFNP. In addition to the TSA objectives stated in Section 2.0, the TSA study supports the following VT objectives:

- 1) Understand the present benefits of climate-smart agricultural practices.
- 2) Assess the effects of future climate change on production:
- 3) Assess changes in the net benefits over time to illustrate the costs of future climate change and how investment in strategies to respond to climate change can deliver higher net benefits.

Section 5.1 outlines the method for comparing BAU vs. SEM in two different climate contexts (present vs. future), 5.2 focuses on the farm management level issues (net benefits or gross margin), and 5.3 develops a household economy assessment to understand the issues in terms of the effects on living standards. Section 5.4 focuses on district-level net benefits scenarios. The findings from the two levels of analysis are brought together in an investment appraisal to illustrate the potential financial costs of public investment to scale CSA at the district level and potential economic returns (aggregate net benefits to the district). Section 5.5 presents an assessment of the ecosystem service costs of not adopting CSA practices, and section 5.6 attends to issues around the operational effectiveness of the revenue-sharing mechanisms for biodiversity conservation.

## 5.1 BAU vs SEM farm activity assessment method

To investigate the promise and performance of CSA techniques at the farm activity (enterprise) level, we conducted a survey of a sample of farmers who have participated in the VT program activities. Key informants were identified from several local communities in the program and took part in focus group discussions. Focus groups of 5-8 project participants were interviewed in a group setting around key agricultural cropping enterprises, using a semi-structured interview format. The survey elicited, from respondent recall, basic farm management data input/output and market price information, as well as information on quantities sold for cash versus consumed in the home, to estimate crop gross margins per unit area of land.

A gross margin is simply the difference between the gross income earned by a farming activity e.g. maize, beans or banana cultivation, and the direct costs (or cost of inputs) required for production. Gross margin analysis is one of farm management's oldest and simplest analytical tools. It has been used widely in economic studies for analyzing the profitability of farm production practice (Upton, 1987; Choumbou et al 2015). The basis of gross margin analysis is that the farm unit is seen as a group of independent, productive activities, also termed enterprises (Johnson, 1990). The gross margin of the farm activity is the difference between the total income earned and the variable costs incurred. For a farm undertaking several different activities, the total gross margin is the sum of the gross margin on each activity (Abbot and Makehan, 1992). The total revenue represents the volume of the output from the farm (e.g., the physical quantity of the crop multiplied by the unit price), while the total cost is the total value of the entire farm input during a certain period of production.

Typically, the gross margin consists of two component parts: fixed cost and variable cost. Fixed costs are those costs incurred on fixed inputs that do not change as production changes. The fixed costs are just in the short run because, in the end, all costs become variable since conditions may warrant changing all the factors of production; on the other hand, variable costs are the short-term costs of resources that last for less than one year. Variable costs typically change as productivity increases; they fluctuate according to output and are incurred on variable inputs, which can be attributed to specific enterprises (Upton, 1987). Gross margin is the difference between the gross farm income (GFI) and Total Variable Cost (TVC). A gross margin is a type of

profit, but not in the strict accounting sense, as typically it will not consider capital costs such as depreciation of assets, e.g., farm buildings, equipment, and machinery. It is a useful planning tool in situations where fixed capital is a negligible portion of farming enterprises as in the case of small-scale subsistence agriculture.

In our sample, there were no recorded inputs other than labor and seed. However, the treatment of labor costs is tricky. In households with a high level of consumption, the labor price exceeded the harvest's monetary value for many respondents, which means we get examples of negative gross margins. That makes the calculation of a sample mean difficult to interpret. In subsistence farming systems, the opportunity cost of household labor is often zero as there is often no alternative activity in which to invest your time (Upton, 1987) and because food security and not profit is the primary motive. This is supported by the fact that the TSA sample households that had high levels of subsistence consumption (>80%) all showed negative gross margins related to the respective enterprise. Thus, the gross margin estimate does not include the cost of labor for the selected enterprises. To simplify meaning in this context, we refer to the gross margin in the illustrative case study as “annual revenues” per acre. That would not be the case where a crop is exclusively grown for commercial purposes, e.g., coffee or tea. The construction of the scenarios is done in three parts:

1. Identifying business as usual, the common technology today (BAU)
2. Constructing an alternative, the new technological approach (SEM)
3. Conditioning the BAU and SEM under a future climate context (2040)

BAU is the current farm enterprise data from the focus group discussions, essentially the traditional farming technique (without CSA), labelled in the scenario analysis as “Present 2024”. The alternative is the SEM (the improved/climate smart technique with CSA). Labelled in the scenario analysis as “Future Climate 2040”. With this data, it is possible to compare with/without (BAU/SEM) improvement at the same time. In order to illustrate the effects of future climate change, the TSA team examined the with/without estimates in two times (climate contexts): “Present 2024” and “Future climate 2040” (midcentury estimates illustrated in Bush et al. 2022).

## 5.2 BAU vs. SEM farm activity results

Regional climate yield modeling by Ortiz-Bobea et al. (2021) generally indicates a 30% reduction in total factor productivity. The future climate scenario is estimated by adjusting the present production downwards by 30%, and the difference in performance is expressed in USH based on subtracting the gross margin estimates. The difference in the present versus future scenarios ( $\Delta$  present vs future) is shown as a negative value, i.e., an overall loss in value. The magnitude of losses under a future climate scenario are higher for SEM than those of BAU, because the SEM losses represent 30% of a larger number. Importantly, the yield gains from adopting SEM even under a future climate are higher than those of BAU under a future climate scenario.

Selected activities in the analysis are:

- Climbing beans
- Maize
- Matooke bananas
- Sweet potatoes
- Irish potatoes
- Eggplant

Data are presented in tables and bar and line graphs. The table presents the BAU and SEM numerical estimates under the two climate scenarios. The associated bar graph displays two clusters of bars to provide a pictorial representation of the estimated changes. The first is a comparison of farm activity revenues (standardized per acre per year) under current (2024) climate conditions (BAU, SEM, and the  $\Delta$  - difference), with the second group showing a comparison of the same factors under a future climate scenario (2040). The line graphs illustrate the trajectory of financial performance over time between the scenarios and give an overall impression of the cumulative difference in the performance period.

### 5.2.1 Climbing Beans

In the Nkuringo area, bean production plays a significant role in local agriculture. Beans are cultivated during the two rainy seasons and harvested during the subsequent dry seasons. The beans are cultivated for household consumption and the surplus is sold to the local markets. While the high-income households sell the agricultural surplus, the low-income households have no surplus to sell but are forced to sell part of their own food, which contributes to food insecurity in the Nkuringo area. Climbing beans is a potential solution to increase the agricultural sector's productivity and sustainability. Elevation, population pressure, and drought shocks are important drivers of climbing bean adoption by households in the region. However, Kisoro's District Authorities note that the beans' productivity and yields are among the lowest. The volume of production has reduced over the last three decades due to declining soil fertility and land degradation as a result of poor land management practices exacerbated by climate change impacts (soil and mud erosion, landslides, floods, pests, and disease accumulation. In addition to smallholdings and inadequate use of modern technologies, there is widespread market failure due to poor physical infrastructure, such as roads and telecommunications, and the absence of markets for credit.

Climbing beans: Annual net revenue per acre (USH/acre)		
Scenario	Present 2024 in VT communities (USH)	Future climate 2040 in VT communities (USH)
BAU	63,983	44,788
SEM	188,466	131,926
Δ BAU vs SEM	124,483	87,138

Table 1 Climbing beans annual net revenue per acre

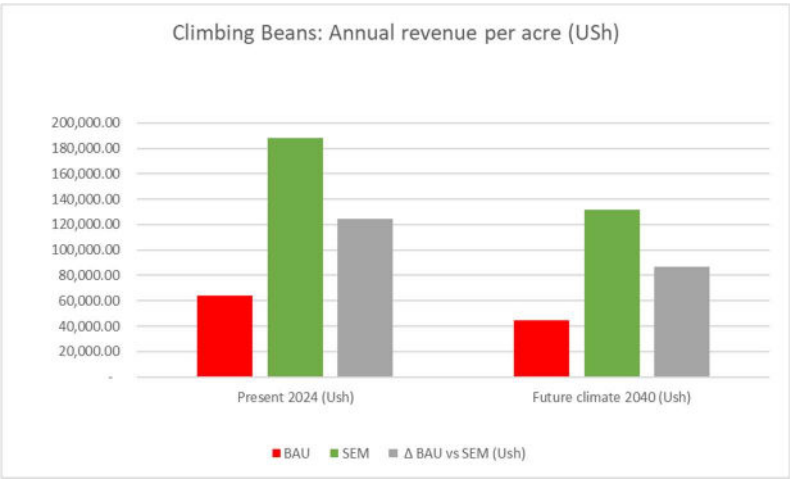


Figure 1 Climbing beans annual net revenue per acre

As the district’s endowment of fertile soil and natural resources is degraded, Kisoro is becoming dependent on produce from other parts of Uganda and neighboring countries to complement domestic production. The illustrations show that the SEM alternative can improve productivity with a tripling of potential net benefits in both the present and future climate scenarios. However, the future net benefits from SEM will decline from just over USH180,000 per annum to just over USH130,000 with expected future climate constraints (Table 1 and Figure 1).

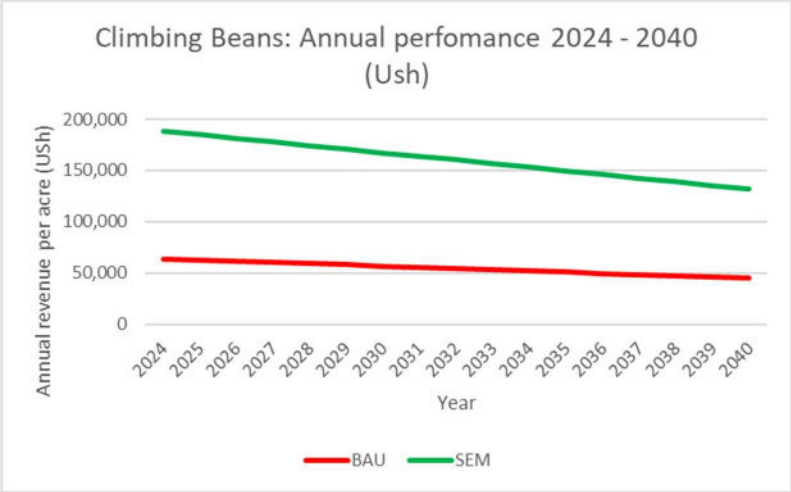


Figure 2 Climbing beans annual performance 2024-2040

Figure 2 depicts declining productivity and financial returns in climbing bean cultivation per acre over time for both BAU and SEM scenarios; the cumulative losses from not adopting SEM (sum of annual differences between BAU and SEM) is estimated as USH1,800,000 during the scenario period (2024-2040).

### 5.2.2 Maize

Maize production plays a crucial role in supporting the livelihoods of thousands of small-scale farmers in the Nkuringo area. Maize is an essential food and income security crop and is a staple for most farmers. Like beans, maize is produced for household consumption and local market. However, maize production is challenged by the lack of appropriate agricultural techniques, including weed management, soil fertility management, and pest and disease management, climate change factors. The illustrations in Table 2 and Figure 3 show that the SEM alternative has a marked improvement in productivity with a doubling of potential benefits in both the present and future climate scenarios. The future benefits from SEM will decline from just under USH370,000 per annum to just over USH270,000 with expected future climate constraints.

Maize: Annual net revenue per acre (USH/acre)		
	Present 2024 (USH)	Future climate 2040 (USH)
BAU	164,322	115,473
SEM	367,901	271,869
Δ BAU vs SEM	203,580	156,396

Table 2 Maize annual net revenue per acre

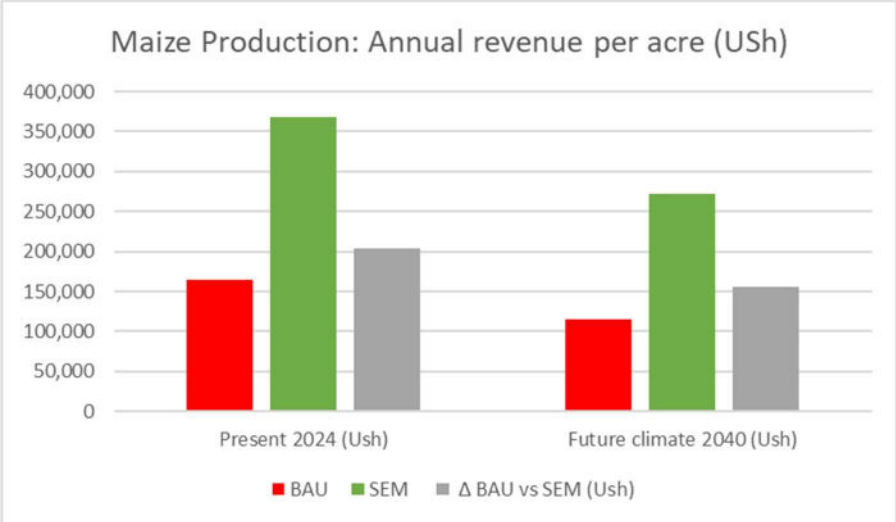


Figure 3 Maize annual net revenue per acre

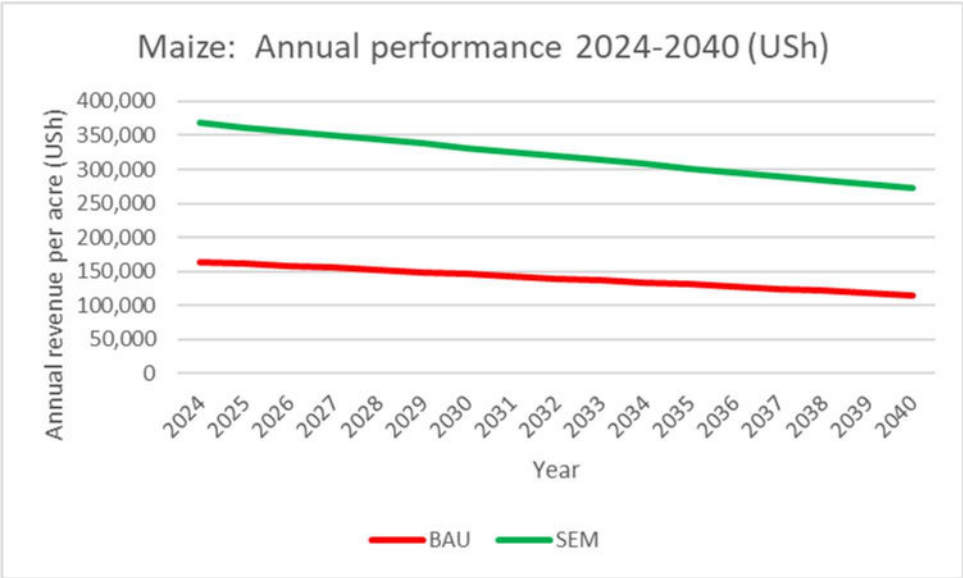


Figure 4 Maize annual performance 2024-2040

Figure 4 depicts both BAU and SEM scenarios' declining productivity and financial returns per acre over time. The cumulative losses from not adopting SEM (sum of annual differences between BAU and SEM) are estimated at USH3,060,000 during the scenario period (2024-2040).

### 5.2.3 Cooking Bananas (Matooke)

These are commonly grown staple foods used for cooking and essential to local cuisine. Their cultivation contributes to food security and livelihoods. In the Nkuringo area, bananas are cultivated throughout the year and harvested at any time of the year. In the Nkuringo area, Banana grows well only in the lower valley areas due to agroecological conditions (temperature, humidity, soil nutrient). Bananas are sold in local markets despite their high demand in tourist outlets. Poor road conditions are the major constraint for the banana trade in the region. Table 3

and Figure 5 show that the maize SEM alternative has a marked improvement in productivity with a doubling of potential benefits in both the present and future climate scenarios. However, the future benefits from SEM will decline from just over USH12 million per annum to just over USH9 million with expected future climate constraints.

Cooking Bananas: Annual net revenue per acre (USH/acre)		
	Present 2024	Future Climate 2040
BAU	6,627,222	4,639,056
SEM	12,982,563	9,087,794
Δ BAU vs SEM (USH)	6,355,340	4,448,738

Table 3 Cooking bananas annual net revenue per acre

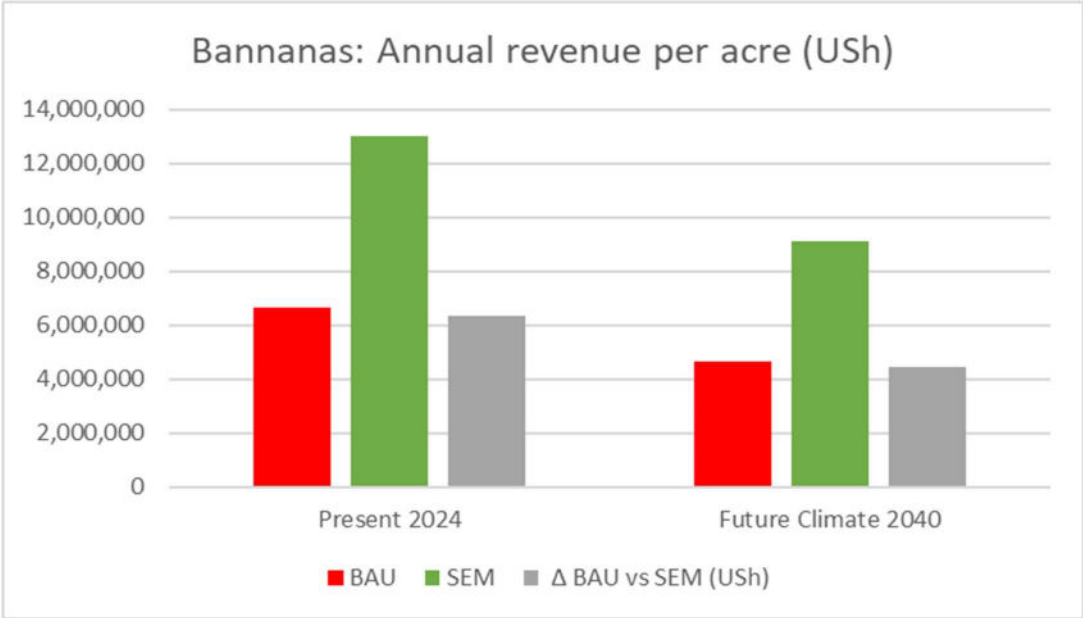


Figure 5 Cooking bananas annual net revenue per acre

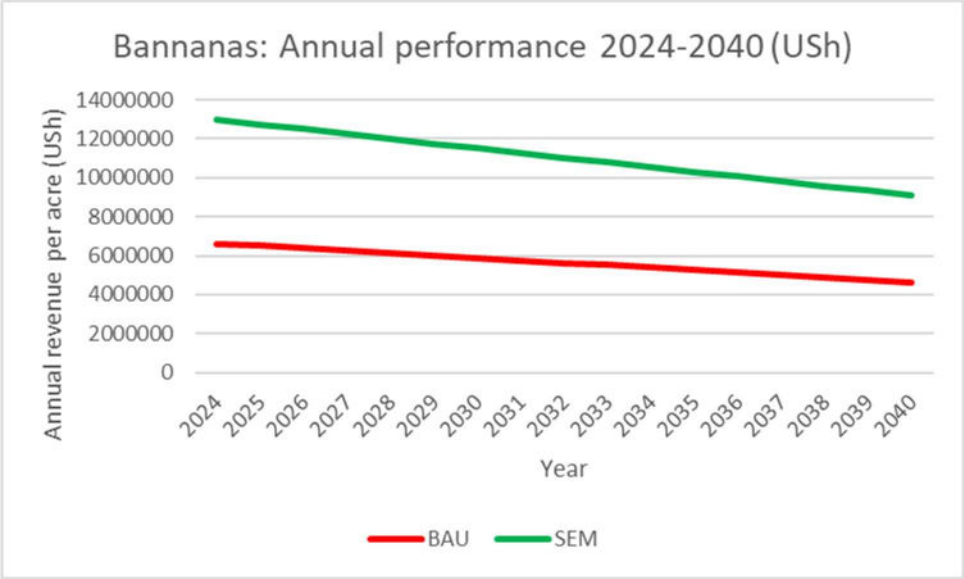


Figure 6 Cooking bananas annual performance 2024-2040

Figure 6 depicts declining productivity in cooking bananas and financial returns per acre over time for both BAU and SEM scenarios; the cumulative losses from not adopting SEM (sum of annual differences between BAU and SEM) is estimated as USH91,800,000 during the scenario period (2024-2040).

### 5.2.4 Sweet potatoes

Sweet potatoes are an important food crop in the Nkuringo region, a major food crop and can be marketed to supplement family income. They thrive even under marginal conditions, such as low soil fertility and limited moisture supply. Sweet potatoes are crucial to food security and livelihoods in the Nkuringo area, especially during major staples like banana shortages. They provide off-farm employment opportunities for women and youth. Their adaptability to various conditions makes them an essential part of Nkuringo agriculture. Table 4 and Figure 7 show that the SEM alternative has a marked improvement in productivity with a doubling of potential benefits in both the present and future climate scenarios. However, the future benefits from SEM will decline from just over USH500,000 per annum to just under USH360,000 with expected future climate constraints.

Sweet Potatoes: Annual revenue per acre (USH/acre)		
	Present 2024	Future Climate 2040
BAU	205,333	143,733
SEM	510,000	357,000
Δ BAU vs SEM (USH)	304,667	213,267

Table 4 Sweet potatoes annual net revenue per acre

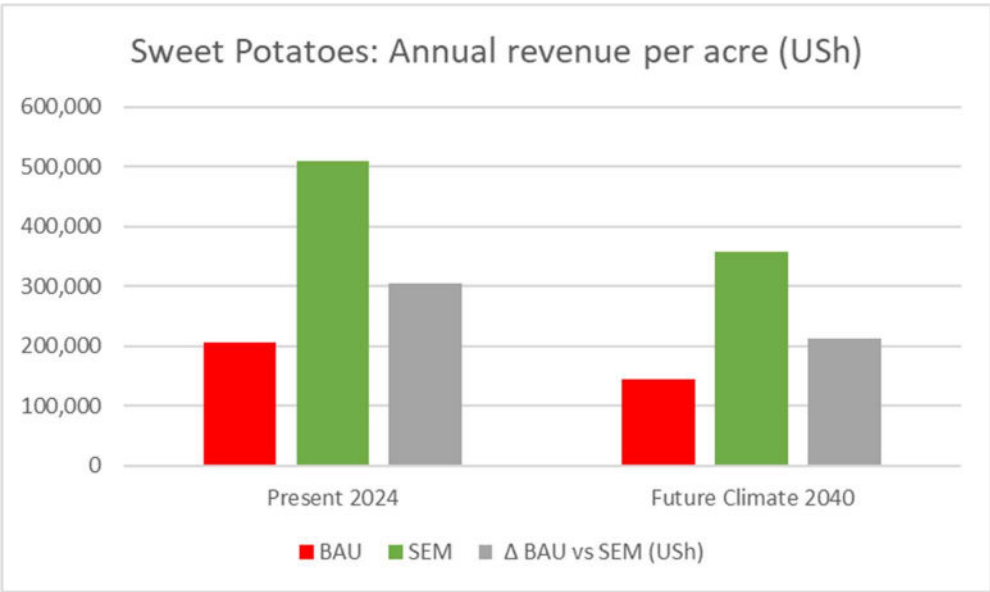


Figure 7 Sweet potatoes annual net revenue per acre

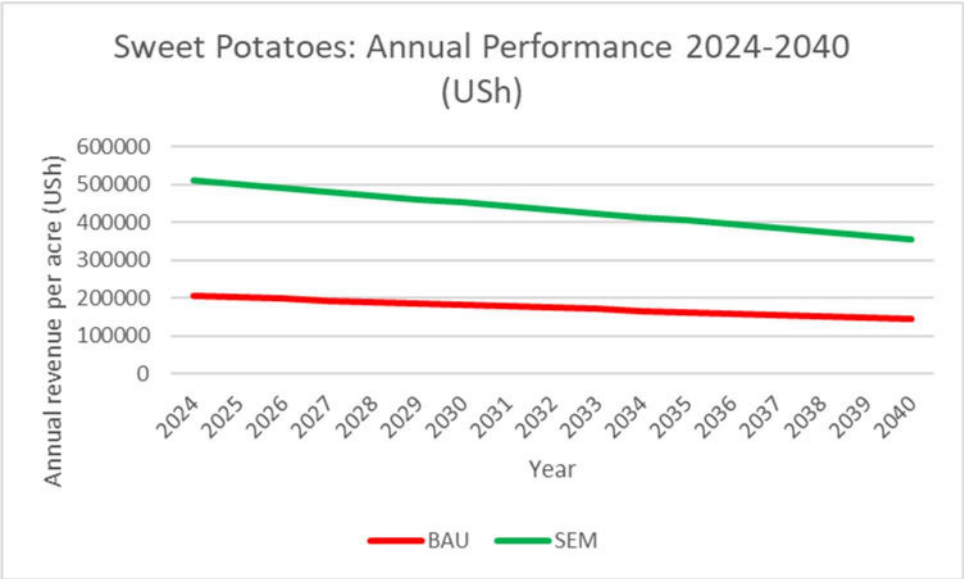


Figure 8 Sweet potatoes annual performance 2024-2040

Figure 8 depicts declining sweet potato productivity and reduced financial returns per acre over time for both BAU and SEM scenarios. The cumulative losses from not adopting SEM (sum of annual differences between BAU and SEM) are estimated at US\$4,400,000 during the scenario period (2024-2040).

## 5.2.5 Irish potatoes

Irish potatoes are a significant crop in Nkuringo, serving as both a staple food and a source of income for farmers. They are also an everyday food, especially in urban areas. They are consumed as steamed food, fried chips, or crisps.

Irish potatoes play a crucial role in food security and livelihoods, contributing significantly to Uganda's agricultural landscape. Harvesting occurs generally after three months after planting.

The challenges associated with Irish potatoes farming in Nkuringo include:

- Disease and pest management
- Climate variability
- Soil fertility and erosion
- Access to quality seeds
- Storage and post-harvest losses
- Market access and prices

Table 5 and Figure 9 show that the SEM alternative in Irish potato production has a relatively small but significant marginal improvement in productivity in both the present and future climate scenarios. However, with expected future climate constraints, the future benefits from SEM will decline from just over USH2.5 million per annum to just under USH1.8 million. In this case, the relatively small gains between BAU and SEM are due to potato cultivation already being an agri-technical input-intensive system (seed, fertilizer, and pesticides) compared to other farming activities.

Irish Potatoes: Annual net revenue per acre (USH)		
	Present 2024	Future Climate 2040
BAU	1,976,000	1,383,200
SEM	2,557,382	1,790,167
$\Delta$ BAU vs SEM	581,382	406,967

*Table 5 Irish potatoes annual revenue per acre*

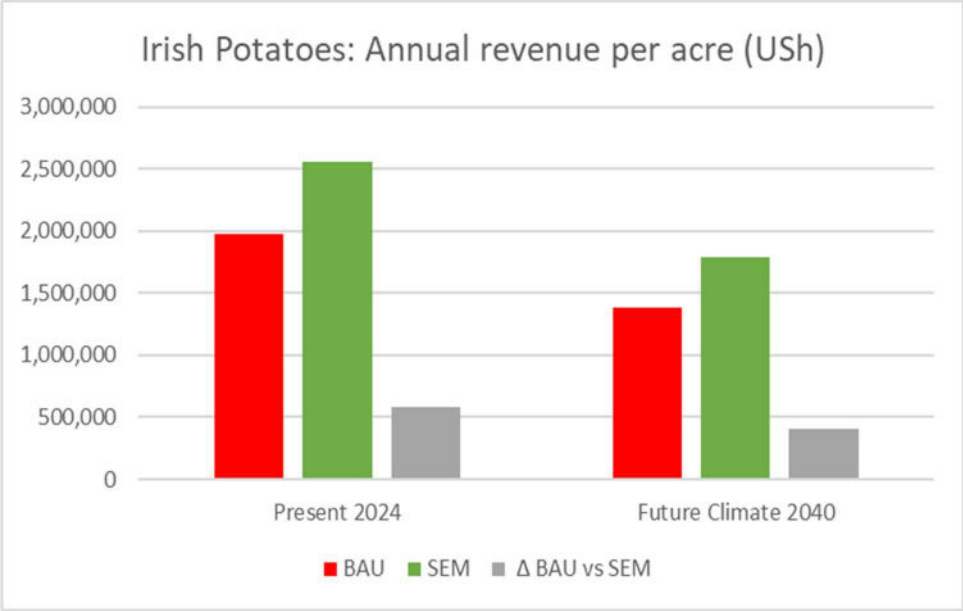


Figure 9 Irish potatoes annual net revenue per acre

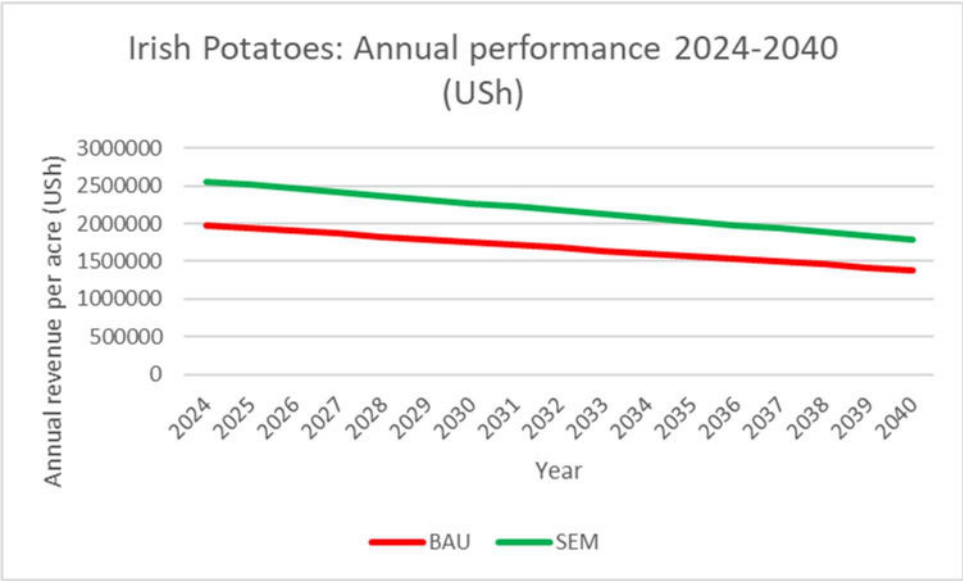


Figure 10 Irish potatoes annual performance 2024-2040

Figure 10 illustrates declining productivity and financial returns per acre over time in Irish potato production for both BAU and SEM scenarios. The cumulative losses from not adopting SEM (sum of annual differences between BAU and SEM) are estimated at US\$8,400,000 during the scenario period (2024-2040).

### 5.2.6 Eggplants

Eggplant cultivation has been recently introduced in Nkuringo and is proving to be a rewarding endeavor, when implemented with proper agronomic practices. However, eggplants are cultivated on a marginal basis, using intercropping techniques, for household consumption and local markets. However, despite the emerging market for Eggplants for the local tourism

accommodations outlets, hotels, and lodges, eggplant commerce is still constrained by several factors, including the inability of the producers to maintain the supply and the road conditions hampering the transportation of the produce. Table 6 and Figure 11 show that the SEM alternative has a marked improvement in productivity with a doubling of potential benefits in both the present and future climate scenarios. However, the future benefits from SEM will decline from just over USH1.2 million per annum to just under USH900, 000 with expected future climate constraints.

Eggplants: Annual revenue per acre (USH)		
	Present 2024	Future Climate 2040
BAU	609,143	426,400
SEM	1,264,931	885,452
Δ BAU vs SEM (USH)	655,788	459,052

Table 6 Eggplants annual revenue per acre

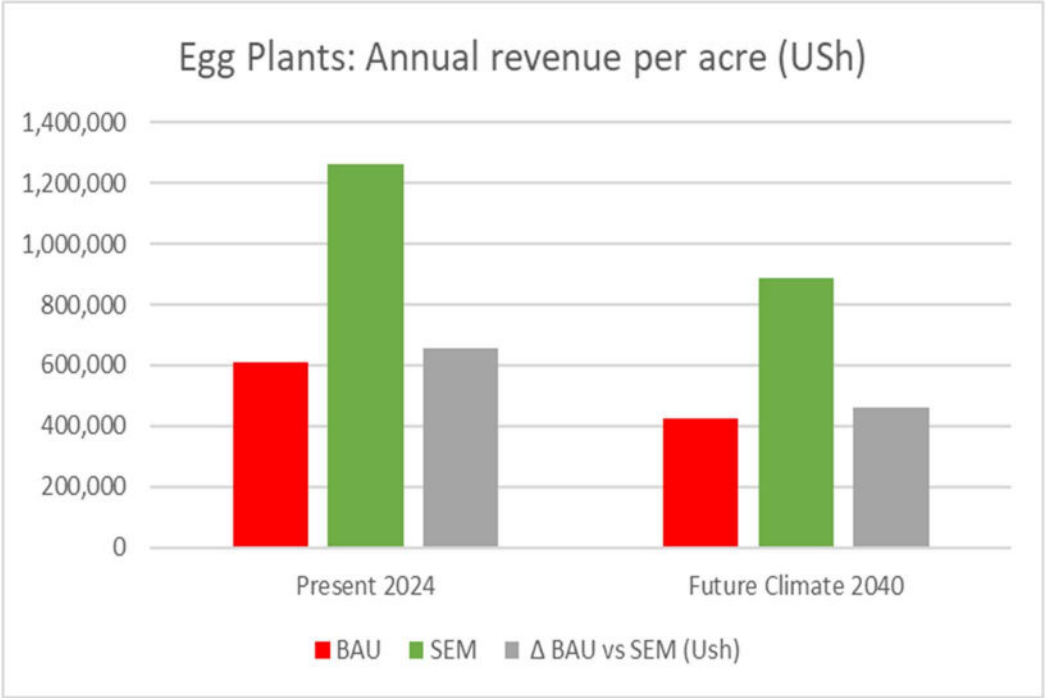


Figure 11 Eggplants annual net revenue per acre

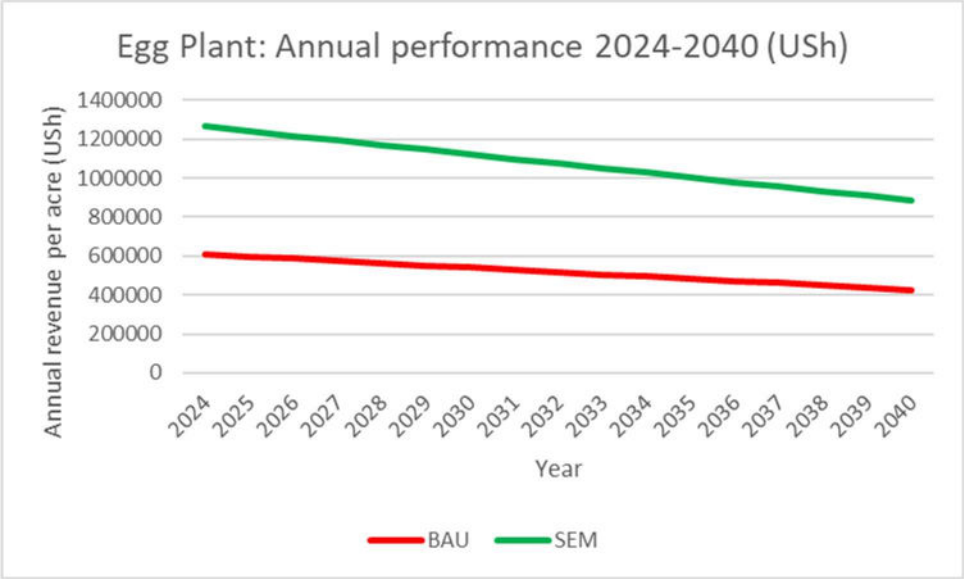


Figure 12 Eggplants annual performance 2024-2040

Climate change will affect both scenarios similarly, causing an overall decline in productivity. Figure 12 depicts declining productivity due to climate factors and financial returns per acre over time for both BAU and SEM scenarios. The cumulative losses from not adopting SEM (sum of annual differences between BAU and SEM) are estimated at USH9,500,000 during the scenario period (2024-2040).

### 5.2.7 Summary of Agricultural Activity Performance under SEM

Importantly, the adoption of the sustainable ecosystem management alternative (CSA techniques) improves productivity and potential revenues across every enterprise in both current and future climate contexts (Table 7). The mean increase in revenues across all enterprises studied is 117% under the SEM alternative (CSA techniques).

Cropping Enterprise	BAU 2018 (USH)	SEM (USH)	Increase from BAU	% increase from BAU	Cumulative loss per acre: 2024-2040 (USH)
Climbing beans	63,983	188,466	124,483	195	1,800,000
Maize	164,322	367,901	203,579	124	3,060,000
Matooke bananas	6,627,222	12,982,563	6,355,341	96	91,800,000
Sweet potatoes	205,333	510,000	304,667	148	4,400,000
Irish	1,976,000	2,557,382	581,382	29	8,400,000
Eggplant	609,143	1,264,931	655,788	108	9,500,000
Mean increase from BAU	N/A	N/A	N/A	117%	N/A

*Table 7 Summary comparison of agricultural enterprises performance under BAU & SEM*

It is important to note the order of magnitude difference in the value (financial price) estimate around Matooke banana revenues. This is not an error; it reflects the real difference in the potential values around banana cultivation. The critical cultural and economic importance of Matooke in Ugandan agri-food systems cannot be understated.

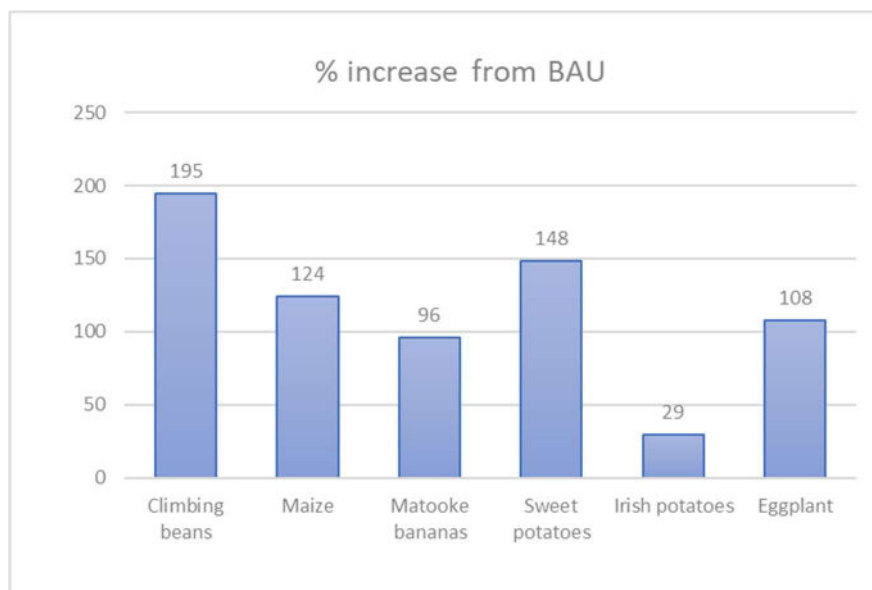


Figure 13 Percentage increase in enterprise performance under SEM intervention.

Figure 13 compares the marginal benefits in proportional terms (%) of the SEM alternative for each agri-enterprise. The largest difference is in climbing beans (195%), and the lowest change is in Irish potatoes (29%). The relatively small improvement in productivity of Irish potatoes under the SEM alternative is because this is already a highly input intensive production activity as a key cash crop on local markets and, for those who can afford to engage in it, is already produced as intensively as is practicable. These results clearly indicate the success of the Vanishing Treasures pilot CSA activities and important evidence of the economic and resiliency benefits to be gained from scaling these practices.

### 5.3 BAU vs SEM Household economy

The study utilizes “benefit transfer”, a method that relies on secondary data, to estimate values by transferring available information from original studies already completed. The study team conducted a value transfer using multiple point estimates (e.g., an average value), which is transferred from the original study and adjusted to account for inflation to bring the values to present-day terms. This approach allows the preparation of a function transfer based on the existing benefit measure to estimate the CSA and future climate scenario at the household level. The function is adapted to match the characteristics of the evaluated alternate scenarios and then used to forecast a non-market value estimate for the policy site.

As with the enterprises, a 3-step approach is taken to develop the scenarios. The baseline (BAU) is established using a secondary data source (Bush & Mwesigwa, 2008). Bush & Mwesigwa (2008) conducted a comprehensive household survey of economic and social costs and benefits to local communities from Bwindi Impenetrable Forest National Park, Uganda. They quantitatively measured household income and living standards of goods produced at the prevailing market

value of own-produced goods consumed in the home, monetary, non-monetary transfers into the household account, and income from wage labor in cash or the value of goods in kind. Their average household income estimate is adjusted to present value terms using the consumer price index to account for inflation from 2008 to the present day (2023). The BAU and SEM are again conditioned to develop a with/without comparison under a future climate context. Table 8 provides an illustration of the typical annual total household income and a way to compare BAU with SEM in two climatic contexts (“Present 2024” and “Future climate 2040”)

Household total annual income (USD)		
Scenarios	Present Value 2024 (USD)	Future Climate 2040 (USD)
BAU	1,445.21	1,011.65
SEM	1,690.90	1,183.63
$\Delta$ BAU vs SEM (USD USD)	245.69	171.98

Table 8 household total annual net income

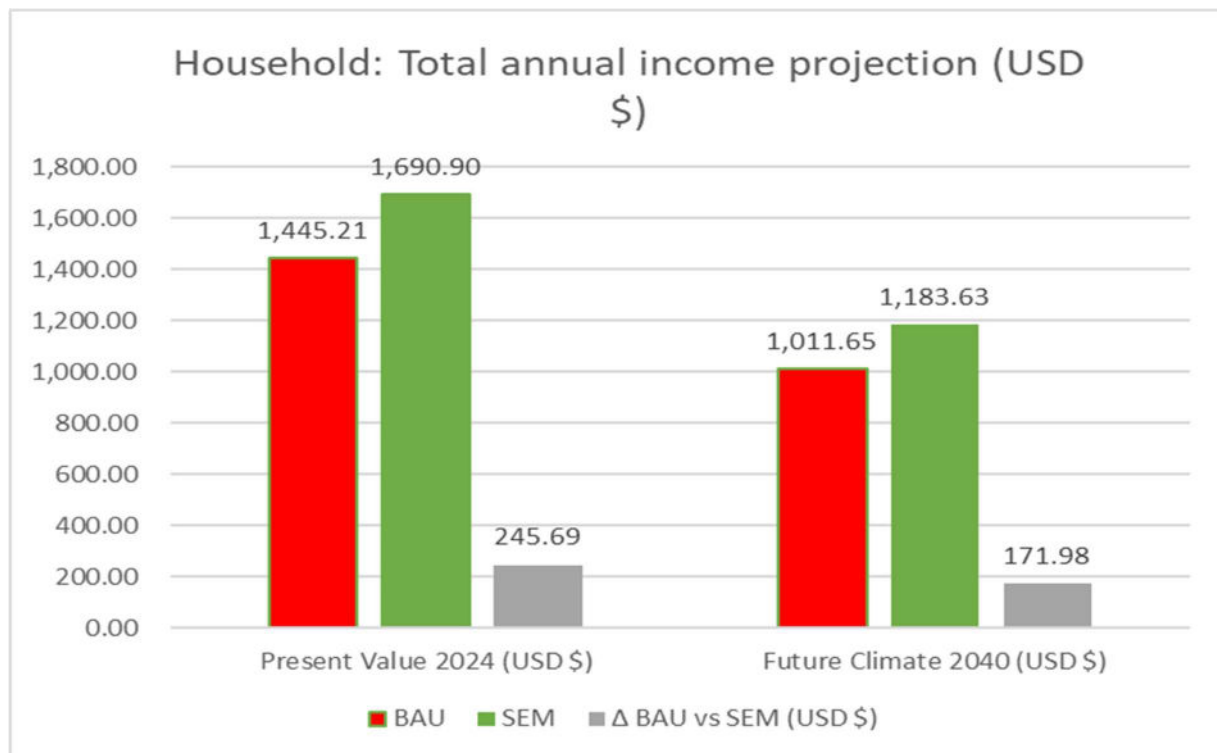


Figure 14 household total annual net income projection

As with the farm activity illustrations, figure 14 illustrates the impact of the climate adjustment on total household income. SEM is greater than BAU in financial terms (USD 245 compared to USD

172) due to the proportionate effect (SEM being a higher value than BAU). Importantly, production under SEM is expected to be higher (USD1,183) than BAU (USD1,011) by 2040, so there will still be gains in the future from adopting SEM. In financial terms, because of climate change, future gains from adopting CSA will not likely offset the total expected losses from the present under either the BAU or SEM scenario.

To understand the implications of these values, the study team compared them to national living wage estimates for Uganda. The calculation of the living wage is based on the Anker methodology, and it encompasses four elements considered vital for a decent standard of living: (i) cost of a basic but nutritious diet; (ii) cost of a basic but adequate and healthy - according to specified standards - housing; (iii) costs of other essential items, such as procurement of health care, education, clothing, etc., which are referred to in the report as Non-Food and Non-Housing (NFNH) expenditures; and (iv) a marginal supplement as a buffer to allow workers and their families to tackle their vulnerability to contingencies. Khan and Buyinza (2019) estimate the living wage, using the Anker methodology, of workers who live in rural areas near floriculture sector farms in Uganda to be USH652,311 (USD1,77) per month or USD2,124 annually. This remuneration is what wage-based employees need to receive monthly to be able to live a basic but decent life. Our context is slightly different in that we are considering completely household income from largely subsistence farming activities. Comparing SEM improvements in the present (2024) versus a future climate (2040) in present value terms, we see clearly that local incomes fall short of the living wage benchmark today and a wider gap by 2040.

## 5.4 Net benefits and financial appraisal of adopting CSA to Kisoro District

Understanding the implications of the household economic dynamics at a district level requires scaling impacts over the target population expected to be affected by the identified scenarios. Using Kisoro District data<sup>8</sup> for estimated population demographics, the study presents aggregated effects of adopting CSA to illustrate the scale of costs and benefits of action and to understand the potential returns to investment in different policy actions (table 9). The illustration uses the data derived from the recorded production experiences (2024) of the households in the Vanishing Treasures program's interventions but projects these impacts over the rural population in the whole district of Kisoro.

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<sup>8</sup> Uganda Bureau of Statistics , [population and census data projections](#) (accessed November 2023)

Kisoro District aggregate annual household income values (USD)		
	Present Value 2024 (USD)	Future Climate 2040 (USD)
BAU	109,257,876	76,480,513
SEM	127,831,715	89,482,200
Δ BAU vs SEM future (USD)	18,573,839	13,001,687

Table 9 Kisoro District aggregate annual household income values

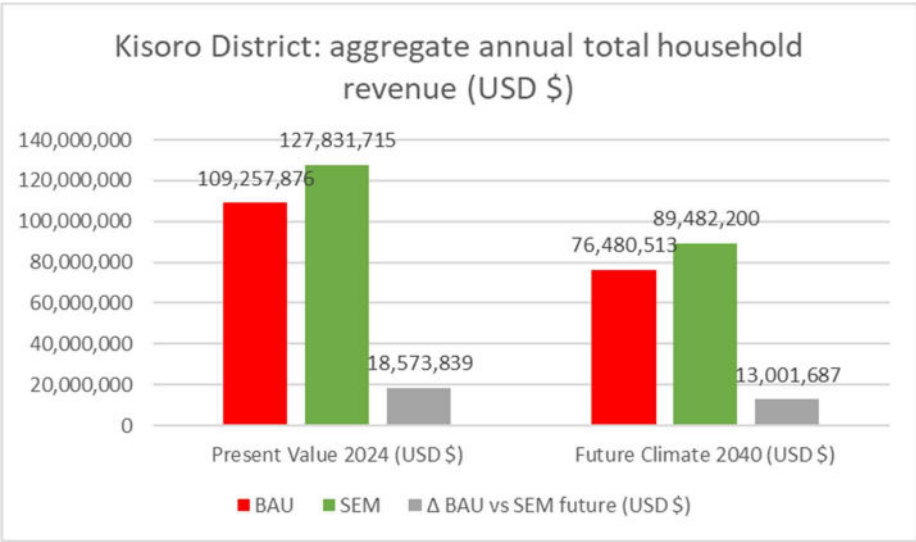


Figure 15 Kisoro District aggregate annual total household net revenue

In aggregating the household values to the district, we see the same trend as in the enterprise and household economy illustrations. However, here we concentrate on the magnitude of the difference between BAU and SEM in the future climate context. Adopting SEM as the best practice by all households can result in a 17% overall increase (marginal net benefit) in the financial value compared to BAU. It is important to remember that this is a temporally static comparison (2023 vs 2040) and that benefits will aggregate over time. In addition, the model does not account for popular demographic changes or potential changes in market prices.

The team used straight-line depreciation annual BAU and SEM estimates (figure 16) to illustrate the decline in production between today and midcentury (2040). Over time, the incremental cumulative loss of not pursuing SEM over BAU is estimated at just over USD310 million, even as productivity declines under climate change under both BAU and SEM practices.

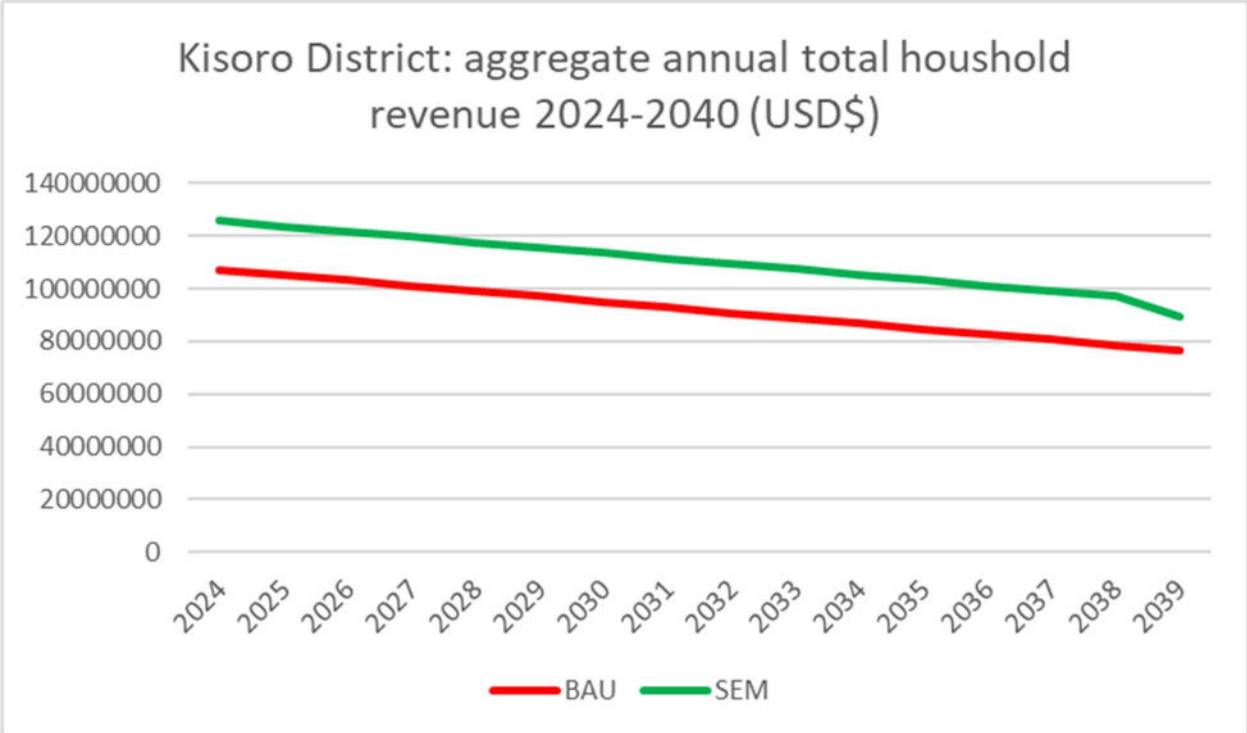


Figure 16 Kisoro District aggregate annual total household net revenue 2024-2040

Based on available data, the aggerate loss estimate is very crude, but it is a reasonable indicator of the trend to be expected. It shows that public investment in extending CSA techniques and assisting in marketing mechanisms at the local and national levels to help with farm competitiveness can have positive aggregate returns in the public interest.

### 5.5 Ecosystem services; damage costs from soil erosion.

The TSA focuses on one key ecosystem service, soil conservation, a critical issue related to poverty and economic growth in the district. The economic effects of forest loss on agriculture through soil erosion and loss of fertility are difficult to quantify, as the magnitude of effects is highly variable and situation specific. This is due to a variety of environmental factors such as soil type, topography, rainfall, human agro-ecological, and demographic factors such as type and extent of crops grown, farming practice (extensive or intensive), and population density. In addition, the calculation of the economic effects is complicated by factors such as the impacts of soil loss being spread over time. Nonetheless, the impacts of declining soil fertility are real and can be evaluated.

Households rely heavily on forests for fuel wood. Over-exploitation of forest resources will result in a decrease in the capital stock of wood. As fuelwood becomes scarce, households will turn to crop residues or grass for fuel (as has already happened in Rakai and some other parts of Uganda). Further degradation of the soil and declining crop residues will result in the use of animal manure as fuel, should there be no other options for intensification of agriculture, the result being

further decline in soil fertility. The result will be a loss of crop and livestock residues and nutrients to the agricultural system (a central technical innovation in CSA to increase productivity).

The damage cost of the diversionary use of farmyard manure from organic fertilizer to fuel can be calculated by the replacement cost approach, i.e., the cost of replacing the nutrients in farmyard manure (FYM) with chemical fertilizer, which is available on local markets. Bush et al. (2004) calculated the replacement cost of FYM in the agricultural system at just over Ush 300,000 per household per year, estimating that the average value of woodland to soil nutrient conservation is just over USD160 per household per annum. That figure is comparable to other estimates for Uganda by Nkonya and Kaizzi (2003), who calculated that 95% of farmers in the survey were taking out more nutrients from the soil than they (and nature) were putting back. By measuring how much nitrogen (N), potassium (P), and phosphorus (K) was being mined, the study team calculated that if the loss in soil fertility were to be fixed by adding chemical fertilizer, it would cost an average of 21% of the total current value of maize production (USD153 per household per annum).

Taking the Bush et al. (2004) price and adjusting it to current value terms (CPI adjustment), the annual cost per household is estimated at USD 531 and multiplied by the current projection of households (2024: 75,600), the district aggregate total economic cost of soil degradation is estimated at approximately USD 40,143,600 per annum. Although the approach to calculation uses household-level data, the value accrues at a district level, as we are considering gross values as public goods as a pose to benefits that are assignable privately to a clearly defined individual or group. In essence, this is a present cost to productivity. If it could be negated, then the gross benefits would increase correspondingly.

## 5.6 Investment appraisal: the cost of shifting from BAU to SEM and net benefits

How do you rationalize an investment in making the necessary change? We used a simple compound growth calculator to illustrate a level of investment that might generate up to USD 309 million in benefits (close enough to the cumulative loss estimate of USD 310 million). An initial investment of USD 5 million in agricultural extension and marketing services to promote CSA could be made at the district level, with a further USD 3 million per annum investment in operating costs each year for a 17-year period. At an annual rate of return of 17% per annum (based on the returns to CSA improvements), the project could generate the USD 309 million target and return the initial capital investment (Table 10).

Compound growth parameters (USUSD)	
Initial investment	5,000,000
Annual return	17%
Annual inflation rate	0% (present value terms)
Years of growth	17
Annual investment	3,000,000
Total investment	56,000,000
Total growth	253,069,734
Future value	309,069,734

*Table 10. Compound growth parameters*

The total amount of investment would be USD 56 million, equating to approximately USD 740 per household in the district over the 17-year lifetime of the project (approximately USD 43 per household per annum). The model is calculated in present value terms, so it does not need to account for inflation. As a rough estimate in understanding the investment needs and scale benefits, it shows that 1) the sums of funding needed to make transformative change are well within the budgetary scope for a small to medium-sized multilateral development facility, and 2) there is merit in doing a much more detailed project development and investment appraisal to pursue such funding. There are clear public benefits in terms of contributions to poverty reduction and economic growth in the face of a changing climate.

## 6.0 Discussion, Recommendations and Conclusion

### 6.1 Discussion

As contemporary efforts to protect mountain gorillas and their habitats from the ongoing threats imposed by human activities continue, the ecosystems and biota we have been protecting will not remain the same. Conservation planners must change the way decisions are made because aspects of the environment that have been considered relatively constant, including weather patterns, water supply, temperature extremes, and even biotic communities, are changing. The findings outline the need for urgent coordination of conservation efforts with emerging climate adaptation and mitigation frameworks, underscoring the vital role of forests in poverty alleviation and economic security, as well as the role of climate and social and economic research in developing and delivering evidence-based policy.

The adoption of CSA practices in rain-fed agricultural systems increases crop yields compared to conventional farming practices amidst progressive climate change, conservation, and community well-being. CSA could accelerate implementation efforts of climate change adaptation for food production by providing cost-effective and sustainable strategies for soil, water, and nutrient management, which is a critical step toward improving food security. More scientific field studies would be necessary to investigate the effectiveness of these climate-smart agriculture practices further systematically for improved crop production in different agro-ecological zones and their effects on soil nutrient cycles on both mid- to long-term basis and carbon conservation and profitability. CSA affects carbon stock and flux, which is of interest in the policy dialogue around climate mitigation and the financial mechanisms to reward mitigation that are being developed in the regulatory and voluntary carbon markets. Finance from such sources could be used to invest in agricultural extension and marketing services to promote CSA to counter the estimated USD 310 million decline in aggregate household revenues.

Harnessing streams of climate finance presents a critical opportunity to help fund the CSA agenda. Policy coherence is critical in developing appropriate action plans and investment strategies. For example, the National Development Plan is not an investment plan. Rather, it defines the vision, principles, and strategies that the Central Government, Local Councils, and farmers/rural households may apply to develop policies and investment plans that are relevant for improving agriculture-based livelihoods, and the financial mechanisms remain largely undercapitalized. This study estimated that an investment of USD 56 million over 17 years over a range of food production and income-generating agricultural activities could potentially mitigate the costs identified, and in development finance terms, is not an unreasonable sum of capital to allocate to solve the problems. This issue connects directly to the National Development Plan pillar on agro-industrialization (Chapter 5) as we see the seed of an investment plan to capitalize on the scaling of activities to support CSA.

Climate financing is principally oriented around carbon storage and is typically used to address the fundamental drivers of greenhouse gas emissions. Funds can be provided in two ways: through concessional climate finance (results-based climate finance) or carbon market mechanisms. In the first case, the buyer supports the host country in reaching or exceeding their NDC targets by agreeing to purchase carbon credits that will be generated in the future. By promising to pay for the results, such an ERPA helps reduce investment risks and catalyze finances from other sources, such as the private sector. Alternatively, the country may opt to trade carbon credits internationally, using available carbon market mechanisms. In this case, the country might benefit from selling carbon credits at a market-based carbon price that is higher than the cost of generating those emission reductions. However, only the buyer can use these emission reductions towards their NDC compliance when carbon credits are sold. Under other broad classifications, targets are set, and revenues are generated based on milestones and deliverables or simply on the number of credits generated and delivered over a performance period. The approach requires careful preparation of verifiable targets, including criteria about environmental performance, that require scientific measurement, monitoring, and verification.

Legal and regulatory loopholes and conflicting positions focusing on the park authorities and revenue sharing, whilst the revenue-sharing (RS) and compensation policies are established, there remain problems in their execution. The study presents a number of critical recommendations in two broad areas that prove impactful in terms of scaling action and adaptation to climate change that could benefit conservation and community well-being.

Tourism revenue sharing remains a compelling but challenging approach to deliver satisfactory benefits to local communities. The main problems relate to effective organizational and institutional architecture to deliver effective participatory planning, efficient implementation, legitimate monitoring methods, and equitable control and adjustment of policies and practices amongst stakeholders. It has proved difficult to deliver benefits consistent with local people's expectations and to reach the most deserving people or groups within communities. Whilst UWA park management is committed to the TRSP and believes in its potential, they are often frustrated by the centralized bureaucracy surrounding its deployment. The heavy bureaucracy also affects local people's attitudes toward the TRSP, and in many cases, they are not convinced that their involvement will produce meaningful outcomes. The decentralized framework within which natural resources are governed offers both opportunities and constraints to the efficient, effective, and equitable deployment of RS funds, yet this remains one of the critical local sources of investment that could help finance CSA.

## 6.2 Management and Investment Policy Recommendations

**6.2.1 Agricultural extension:** NAAS: Agricultural productivity in terms of production per unit area is declining in much of Uganda, and if current and future policy is to turn this around, it has to address the production constraints reviewed throughout this report. Agricultural service provision (i.e., extension and advisory services) could address most of the listed constraints if effective and well-resourced. The successful expansion of NAAS will be crucial in fulfilling this role. A clear economic case to support further investment in these issues emerges from this report. The Uganda [public investment plan](#) 2021-2025 earmarked US\$ 605 billion (approximately USD 426 million) to support agricultural development actions outlined in the NDP. How much of that investment plan was realized and the mechanism for targeting and distributing the funding should be of critical concern to district authorities. In particular, the next round of planning for the following NDP and medium-term expenditure framework (PIP) must be underway.

A near-term opportunity could be to coordinate existing and planned multilateral and bilaterally financed projects. For example, the GEF High Impact Program on Food, Land Use, and Restoration (FOLUR). The Uganda 5-year project under FOLUR focuses on coffee and corn. The Project is executed with UNEP support under the National Implementation Modality (NIM). UNEP/VT could discuss how the project could undertake minor adjustments to integrate small corn (maize) producers in critical areas (e.g., near buffer zones such as in Kisoro).

**6.2.2 Uganda Wildlife Authority Torusim Revenue Sharing Program (TRSP):** Revenue sharing alone cannot meet the growing demands of local communities for basic development services. The demand needs to be assessed to define the niche for the TRSP. The TRSP can and should only act as an incentive to fill gaps in local development investments where they clearly address conservation needs. It is not a substitute for general development finance investment in agriculture and rural development services. Nevertheless, as a starting point, it is critical to expand the objective of the TRSP' objective to include:

- Increase the capacity of LC members to participate in and manage the RS scheme.
- Facilitate LC's access to the benefits of RS and HWC compensations
- Improve and diversify the livelihood of LC in the frontline and buffer zones of the PAs.
- Improve selected essential services to LC, such as water supply, agricultural extension services, adult education, household infrastructure, and local access roads (to improve access to markets and increase tourism visitation and safety.)

To this end, the VT Project could assess the cost and dedicate resources to support the review of the TRSP. In addition, a communication strategy with the participation of high-end tourism operators, promoters, and communicators, national and international, who can lobby at the highest possible level (presidential level), is advised. A critical element of the above-indicated TRSP review is to improve monetary flows and related benefits (impact). Thus, a range of activities needs to be planned and coordinated with the UWA:

- a) Reorganize and diversify monetary flows to increase the TRSP revolving (i.e., the fund is replenished annually with the previous year's tourists entry fees):
  - Review and propose an adequate structure for fund management and investments.
  - Simplify procedures by considering the recommendations in the RS Guideline, e.g., eliminate long chains of funds flows.
  - Shift from fee-based revenue to a flexible and diversified visitation policy-based revenue generation approach.
  - Assess the potential returns from an all-included fee vs separate entry fees and user/services fees.
  - Introduce tour operators' fees: national and international.
  - Introduce gorilla visitors' levies and fees: entry, user, and service fees. Annex 2 provides examples of nature-tourism-related revenue-sharing mechanisms.
  - Revise the 20% gate collection vis-à-vis specific community needs (improving adult education, agricultural system and related income, access to essential services.
  - Increasing investment and returns from diversifying tourism packages: bird-watching fees, agro-tourism fees, targeted on-site visitor donations (e.g., to improve local elementary schools).
  - Develop standards for piloting high-end tourist-friendly agro-tourism sites and assess investment needs, demand, and projected revenue.
  - Train producers to design, manufacture, and sell higher-quality souvenirs (art and crafts).
  - Define other potential visitors' contributions.
  - Define options for attracting the public and provide co-financing to improve LC access to basic needs.
  - Assess Gorilla revenue's capacity to support other PAs in Uganda and reorganize contributions using a realistic, cost-effective, and efficiency-based approach. Limit the scope of contributions to other PAs and prioritize local communities.

- b) Community needs
  - Assess the cost and priorities of LC needs.
  - Based on past trends and future projections, determine targets for fee collections, distribution, and funding for HWC compensation.
  - Develop and assess the cost of community-based conservation plans, including maintenance of access trails to wildlife sighting spots and tourist safety.
  
- c) Resources distribution to ensure LC are the primary beneficiaries of the RS scheme:
  - Assessing LC needs, such as LC livelihood plans (VT Programme) and community conservation plans, will replace the RS formula and local governments' appropriations.
  - Minimize local districts and sub-counties fees (percentage allocations).
  - Train LC leaders, determine the level of LC participation in managing the RS scheme, and plan and program LC participation accordingly.
  - Include clear considerations of gender and equity when defining how benefits are distributed at the community level.
  - Assess the LC needs of HWC by assessing past trends of conflict events and future projections.
  
- d) Transparency and accountability
  - Use a result-based budgeting approach to manage TRSP funding and introduce guidelines for financial reporting and transparency
  - Introduce external monitoring and impact evaluation supported by national or international NGOs.

**6.2.3 Develop the climate and environmental policy design and implementation capacity within local government:** Future climate change will have profound impacts on poverty levels in the target populations over time. This will create further strain on community & park relations. Despite the burgeoning threat of future climate change undoing development gains, reconciling development needs with biodiversity conservation is possible if well-targeted and investment in rural development is scaled. It requires coordinated action between conservation agencies and local governments. Ecosystem services and ecosystem conservation need to be incorporated at the district planning level. Therefore, the assessment of loopholes in district-level development strategies is the starting point. This will enable the identification and design of new policies or revision of existing ones.

Some high-level guidance on approaches to mainstream climate change issues can be found in the “National Climate Change Mainstreaming Guidelines<sup>9</sup> (2014), but it is weak on operational guidance on how to implement the recommendations at the district level. Local government needs to develop their own operational approaches to allow the inclusion of stakeholders from all governance levels during the review or formulation process. Adopting a “bottom-up” approach will to create awareness among actors, foster ownership of the policies, and coupled with other factors, enable effective implementation. This requires structural reform in local government focused on climate finance and management to mainstream climate issues in the design and

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<sup>9</sup> National Climate Change Mainstreaming guidelines (2014): <https://ccd.go.ug/wp-content/uploads/2018/04/National-Climate-Change-Mainstreaming-Guidelines-.pdf>

implementation of sectoral policies in agriculture, infrastructure education etc. Kisoro government should develop the capacity and role of the Technical Planning Committee to address climate change mainstreaming and the possible development of a dedicated focal point or environmental sub-committee. The TPC can develop plans and priorities for actions to:

- Mobilize and train communities on climate change effects and responses
- Integrate climate change mitigation and adaptation measures into the District Development Plans
- Develop and implement climate change adaptation micro-projects at the community level
- Monitor and report on climate change programs within the district
- Consider making ordinances/bye laws that will help in disaster management and response, or to mitigate risks in the first place

**6.2.4 Develop the district framework for climate investment and a performance management plan to access national adaptation and international mitigation finance to support CSA:** Market-based approaches, like payment for ecosystem services (PES), can be critical tools to raise funding to preserve these services. PES incentivizes the conservation and responsible management of natural resources by compensating individuals or groups who actively protect and maintain ecosystem services e.g. carbon and biodiversity. This model not only promotes environmental stewardship but also raises awareness about the interconnectedness of human wellbeing and ecosystem health, addressing issues such as poverty alleviation. By establishing a PES applicable to tourism activities, operators could market at a premium certified “Climate-Smart Tracking Gorilla Tours”. In addition revenues could be applied to developing new or provide enhancements to existing local trust funds e.g. Bwindi and Mgahinga Conservation Trust to distribute the revenues efficiently. District- and sub-county officials lack knowledge to translate ecosystem services and climate change issues into locally appropriate and adaptive practices and actions. This constrains efforts to mainstream climate change issues in planning and budgeting right from the local levels.

A key near term opportunity exists to resolve critical funding gaps to scale action around climate smart agriculture. Climate change mitigation and co-benefits (social and biodiversity) can go hand in hand if considered from the early stages of the project. Careful integration of sustainable development goals into a carbon credit project’s design can ensure their successful delivery. Nature-based climate solutions produce higher valued carbon credits with multiple co-benefits (social and environmental) or bundled with sustainable development goals keep on creating higher or premium values. Whilst there will be significant challenges to raising the capital; models to generate and mobilize climate funding already exist through the experience of national organizations such as ECOTRUST. The district should establish a climate finance committee to:

- Integrate climate change adaptation within the district budgeting and public finance management processes
- Work with different agencies and the private sector to mobilize external funding for climate change financing

- Establish a contingency fund to handle climate change related disasters that are beyond the planned/ expected/or foreseen

### **6.2.5 Establish a partnership to strengthen research-policy linkages to support decision-making and district performance monitoring (environmental, social, and economic):**

National and international research institutions need to strengthen partnerships with local government ministries so that key information needs are reflected in their research agendas and scientific evidence is used to inform policy planning and decision-making. This is particularly important, crosscutting issue, when considering accessing climate finance, where in market-based mechanisms payments are conditional on social and environmental performance (systematic environmental, social and economic monitoring). Critically research data needs to clearly meet policy needs and be made available in time to influence the planning and budgeting cycles. Thus, involving policymakers and managers in co-design (as the TSA model promotes) will improve the orientation to the needs of different stakeholders and governance levels. The District Technical Planning Committee should:

- Explore partnerships with qualified research institutes nationally and internationally to develop a comprehensive science based framework for monitoring environmental performance, including carbon
- Develop the legal and organizational framework to manage carbon and biodiversity standards, in coordination with national efforts, e.g. REDD+ and the evolving voluntary carbon market framework.
- Identify potential areas for carbon and biodiversity crediting and conduct preliminary assessment of the potential for project development.
- Develop interactive platforms for sharing data and information on project an program performance

## **6.3 Conclusion**

Negative environmental externalities such as forest and biodiversity loss have functional ties to other issues, such as climate change at a local and international level. Understanding the economic benefits and costs (and the economic gains or losses) scenarios between the different policy levels and actors will also help us to understand the source and nature of externalities and be helpful in planning for their mitigation. The span of impact between policy levels is a clear example of interdependency where ineffective implementation of policies at national and district levels results in a lack of enabling strategies at lower levels. The resolution requires governance responses at all levels simultaneously. Understanding the overall effects on the household economy from CSA interventions and the threat of climate change provides important quantitative evidence to prioritize action.

The implementation of improved landscape management and its closer integration with agricultural improvement is not easy to implement on any scale larger than a few villages. Thus, to go beyond community-level action must involve multi-agency partnerships. The challenge for policy is not just to rectify the past problems of protected area management and development initiatives aimed at achieving conservation goals but also to develop the institutions and shape

human behavior towards biodiversity of which people are a part. Unless the stocks and flows of benefits at different policy levels are well understood, the magnitude of externalities cannot be effectively factored into planning local-level actions to mitigate them. These need investment, but funds are not limitless; choices must be made. District and local policy planners can use the economic evidence presented in this report to support decision-making. We need to rapidly move to integrate adaptation project experiences such as those from Vanishing Treasures into mainstream practice. The project approach is good for real-world experimentation, but to scale impact we need long term financial mechanisms, endogenous expertise and active ownership and participation by local stakeholders and beneficiaries' ownership in policy design, management and governance.

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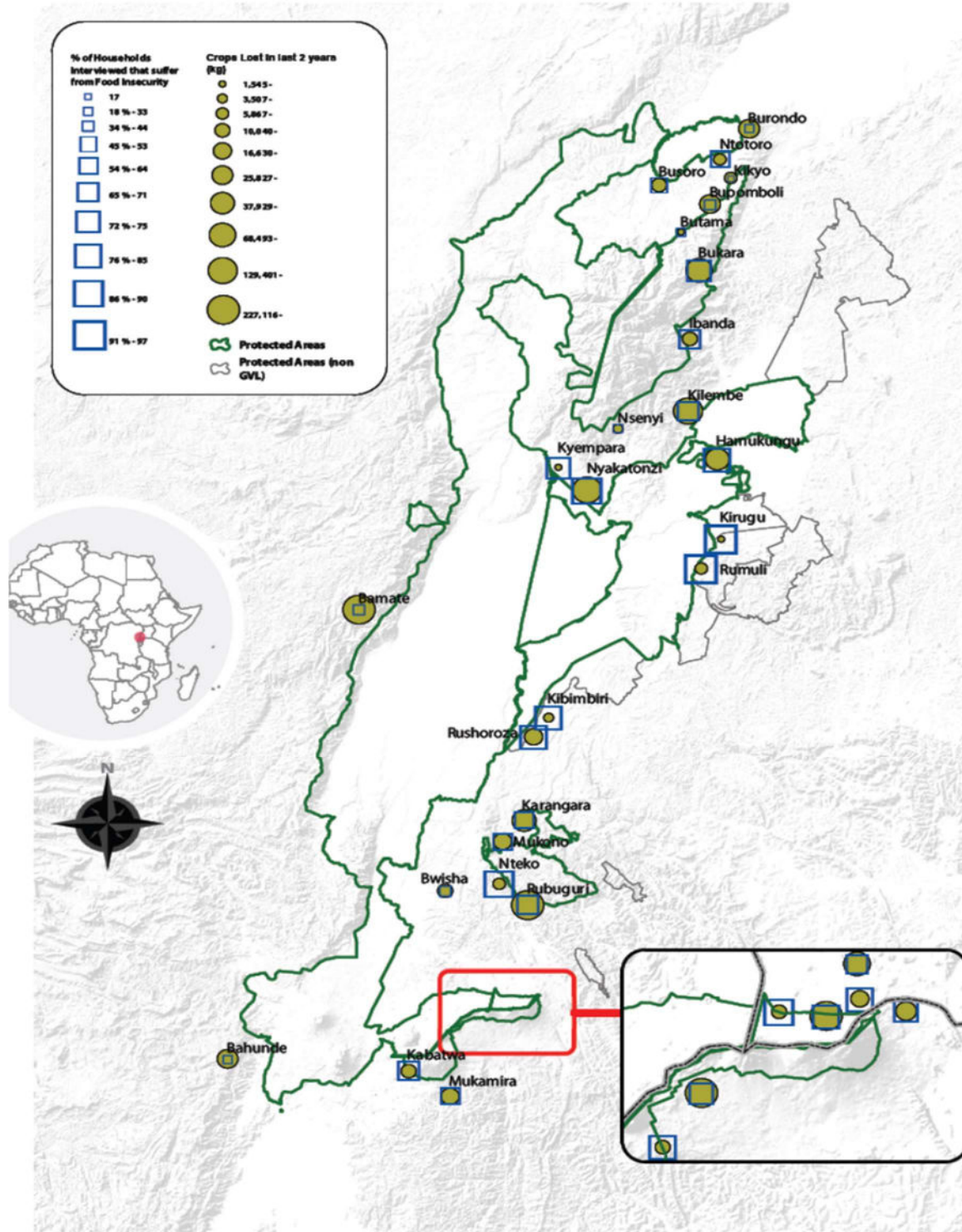
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# Annex 1: Greater Virunga Landscape – Human Wildlife Conflict & Food Insecurity Locations and Magnitude.



Source of data: Eilu et al 2017  
Map creation by Geo Gecko

Though not well recorded and often hidden, conflicts between humans and wildlife are a well-known cause of retaliatory killing of wildlife. Such as the infamous case of a woman who killed a mountain gorilla that was feeding on her banana garden in BINP. Eilu et al (2017) in a study commissioned by GVTC to understand the causes of natural resource based conflicts in the GVL, revealed that crop raiding by wild animals from the GVL PAs resulted in a loss of USD 49 – 103 per household per annum and on average 0.75 acres of crop loss per household. Results show that 65% of the households (n = 1,041 households) suffered food insecurity by losing 1,995,581 kilos of crop to crop raiding by wild animals from the PAs. The spread and extent of HWC and food insecurity was mapped and is illustrated in the figure above. The map shows that HWC and associated food insecurity is widespread within the GVL. Although the study did not relate HWC and food insecurity to poaching and wildlife crime, it did reveal that 68% of the communities are dependent on natural resources. This implies that these communities are engaged in poaching and wildlife crime to compensate for losses resulting from crop raiding by wild animals.

## Annex 2. Example of tourism-based revenue-shared options

PAs, local governments, and communities can share tourism-based revenue-sharing options. The percentage of the share will vary depending on the local context. Some options could only be shared, for example, by the PA and the community only, because the financial capacity of the option will not be sufficient to support local governments in a meaningful manner:

<b>Revenue option</b>	<b>Description</b>	<b>% to PAs</b>	<b>% to local government (to reinvest in local tourism)</b>	<b>% to community projects (or fund)</b>
<i>Entrance fee policy (not a rigid single-entry fee)</i>	<i>A flexible (seasonal) entry fee policy allowing access through the community land/PA and access to basic visitors services such as restrooms, shelters, information centre. The flexible policy allows changes and adjustments to the fee level. Therefore it will have different types fees: single entry, multiple entry, individual, group, vehicle, season, annual, special Holidays's fee or special days to increase royalties from concessionary sales.</i>	<i>To be determined (TBD)</i>	<i>TBD</i>	<i>TBD</i>
<i>Admission fees</i>	<i>Collecting a fee for the use of a facility or special activity. For example: community center events/shows, other community facilities such as a community coffee processing area..</i>			
<i>User fees</i>	<i>Fees paid by visitors to use other facilities within the community land/PA: parking, camping, guide use, household farming demonstration areas, special events, commercial photography and filming, special private events, etc.</i>			
<i>Licenses and permits</i>	<i>Fees paid by private tourism companies to operate on the community and PA property, e.g., tour operators, guides, transport providers and other uses.</i>			
<i>Royalties and sales revenue</i>	<i>Money from sales of souvenirs</i>			
<i>Concession fees</i>	<i>Charges or revenue shares paid by concessionaries that provide services to PA visitors. E.g., souvenir shops, hotels, family -owned bed &amp; breakfast, community restaurants.</i>			
<i>Taxes (%)</i>	<i>Such as on hotel bills, all-terrain vehicles, VIP helicopter transport, and other commercial vehicles</i>			
<i>Leases and rent fees</i>	<i>Charges for renting or leasing park property or equipment.</i>			
<i>Voluntary donations</i>	<i>Including cash, 'in-kind' gifts and labor (often received through "Friends of the Gorilla Forest" type of organizations).</i>			
<i>Partnerships</i>	<i>Business partnerships with other high-revenue tourism attractions or PA in the region or at the national level. E.g., Museums, memorials, historical sites, private tourist attractions.</i>			

Source: Adapted from Flores, M. et al. 2010, *Financial Planning for National Systems of PAs.*

## Implementation of Vanishing Treasures Project in

# **VANISHING TREASURES** PROTECTING ENDANGERED MOUNTAIN SPECIES

## **Nkuringo Buffer Zone, BINP October 2020 – January 2023**



THE GOVERNMENT  
OF THE GRAND DUCHY OF LUXEMBOURG

## **Project Summary**

Vanishing Treasures Project is a global project funded by the Government of the Grand Duchy of Luxembourg through UNEP/GRASP with the main aim of enhancing climate resilience of mountain communities, species and ecosystems by applying climate-smart conservation and ecosystem-based adaptation approaches in support of sustainable livelihoods and land-use. The project was designed to respond to human-wildlife conflict, promote alternative livelihoods and mitigate the impacts caused by climate change and socio-economic pressures. The total project funding by the Government of the Grand Duchy of Luxembourg USD 199,414 to address the project objectives.

UNEP/GRASP in partnership with IGCP have implemented the Vanishing Treasures project as a pilot in the eight villages of Nombe in Rubuguri Town Council and Mutugunda, Ntungamo, Kirenjeri, Murole, Kikobero, Kakoka and Nyarusunzu in Nkuringo Town Council along the Nkuringo buffer zone of the Bwindi Virunga landscape. The project has worked with a total of 120 households that were selected by the community members.

## **Project purpose**

### **1. Buffer Zone Management Plan**

- Evaluation of the previous Buffer Zone Management Plan (BZMP) of 2015 – 2019
- Development of the new Buffer Zone Management Plan 2022 – 2026 BZMP.

### **2. Community Livelihood**

- Food security
- Climate Smart Agriculture
- Domestic energy cook stoves
- Clean water supply

## **Vanishing Treasures Project supporting IGCCP Five Year Strategic Plan 2020 – 2024**

- **SO2:** By 2024, men and women in park adjacent communities perceive that the positives from mountain gorilla conservation are equitably distributed and outweigh the negatives.
- **SO4:** By 2024, habitat and buffer zone safeguarding processes contribute to healthy mountain gorilla populations while protecting community rights.

## **Project implementation approach;**

1. Collaborative partnership and stakeholder participation to achieve the project goal and developing sustainability strategies.

**Partner / Stakeholder institution**  
Kisoro District Local Government

**Support towards VT implementation**

Technical support;

- Expertise in several trainings (Agriculture, water hygiene and sanitation, PIP approach, developing BoQs and supervision of water tank construction) among others.

Uganda Wildlife Authority

- Hiring process of consultants for various interventions  
- Procurement process of the contractors for rainwater harvesting tanks

Vanishing Treasure Project Task Team

- Attend VT meetings as and when called upon without delegating to any other person.  
- Provide technical input and guidance towards the smooth implementation of the VT project.  
- Provide and aligning project activities to government policies and guidelines.  
- Monitor / track project to be implemented on time and ensure quality outputs / outcomes.  
- Be accountable to stakeholders and partners by giving periodic progress updates / reports.

NCCDF

- Advising the project through various project engagements  
- Identifying the project geographical scope  
- Participated in the consultancy hiring process

Beneficiary communities

- Participated in selecting the PIP farmers and water user committees.  
- Implementing various livelihood interventions.

**2. PIP approach:**

- PIP is an acronym for Plan Integre' du Paysan which is translated as Integrated farmer plan. PIP is an approach that brings household members together to assess their current situation and identify various activities that can help them to develop or achieve household set goals. The approach enables household members to define their current status, develop the household vision, make a family inventory, a SWOT analysis and develop a 5 year household development plan.

- The approach encourages farmer to farmer knowledge transfer approach whereby every trained PIP farmer has to train other farmers on the PIP approach and practices. Once all households in the village have adopted the PIP approach, it is then scaled up to the village level where the village makes a village PIP plan.

## Interventions and Milestones under Vanishing Treasures Project include;

### Objective 01: Buffer Zone Management Plan

Area of intervention

Evaluation of Buffer Zone Management Plan (BZMP) of 2015 – 2019

Project achievement

- The old management plan was evaluated, and recommendations informed the development of the new BZMP 2022 - 2026

Sustainability st  
Community and  
and consultation  
shared with them

Development of the new Buffer Zone Management Plan 2022 – 2026 BZMP.

- Hired the services of a consultant to develop the new BZMP.
- The New BZMP is in place

New BZMP sha  
stakeholders for  
implementation

### Objective 02: Improving Community Livelihood

Area of intervention

- Project achievement

Sustainability st

Increasing food security through climate smart agriculture

- A community livelihood baseline survey was done with the support of a consultant to guide the implementation of livelihood interventions.
- Capacity building on climate smart agriculture and conservation for 120 selected households
- Climate resilient, pest resistant and high yielding seedlings / input have been to the distributed to 120 selected households for piloting.
- Adoption of good agricultural practices (organic manuring, compost making, planting in line,
- Increased nutrition, sanitation and hygiene practices at household and community levels

- Farmers' intera  
erosion and agri  
support of the di  
staff and consult

Climate Smart Agriculture

Capacity building

- Community understanding of PIP Vanishing local climate smart the Treasures and their ability to adapt to climate change and example (forests, land, Gorilla, water, honey, honeybee, life, bees among others) among the PIP households. Extension office.

- Community's appreciation of the value of domestic selected PIP-far inter-relationship of the ecosystem (droillage crimes brou productivity, bees, soil fertility, and organic fertilizers for household lead planning and forest value and rainfall, proper development char use of organic fertilizers activities (reduced idleness in bars prac and mid-level extension officers)

- Landscape restoration and mid-level extension officers) (well balance by gender and village representation), however, the demonstration of PIP quick-wins then continued follow-up and monitoring capacity imp to function. - Kitchen / vegetable gardens, - excl

Domestic energy cook stoves

- 314 domestic energy saving cookstoves constructed. - 120 PIP farmer

- Kitchen / vegetable gardens, - good sanitation and hygiene facilities, -fruit growing, -banana rearing, -domestic energy saving gained in c cook stoves, solar power, energy saving co rainwater harvesting, -erosion control practices and construction of c manure making. stoves

Clean water supply

Constructed 05 Rainwater Harvesting Tanks of 30m3 capacity with a roof catchment in the villages of Mutugunda, Kirenjeri, Murole, Kikobero and Nyarusunzu in Nkuringo Town Council. 05 gender balance committees, form construction open maintenance of

Implementation of PIP Approach

- Almost 95% of PIP households have 5 year development plans - Farmer to farmer approach where has to train at least

Behavioral attitude change,

## Vanishing Treasures Project Contribution to the 17 SDGs

### Observations and Lessons Learnt

► The relevance of the project components to people's day to day livelihood (food security, sustainable land and soil conservation management, good agriculture practices, household planning)



► The issue of pollution emerged, in one study, the food of Mt. Gorilla was found to have pollutants which are attributed to chemicals that are used in farming activities.

► Climate change effects were observed mainly in terms of weather variability, irregular rainfall patterns, prolonged drought and landslides.

► Inappropriate use of chemical for pesticides and herbicides is a major threat to the bees hence contributing to the low crop yields which eventually leads to food insecurity (there is need to find out ecological friendly alternatives to reduce on the threat to bees).

### ► **Common practice of hiring land for agriculture in Congo; two possible reasons**

There is no animal crop raiding in Congo hence crops are safe

High crop yielding – due to soil erosion on the hill-tops, soil fertility is eroded downstream to congo.

► Access to safe water in the project area is still a very big problem, where people walk for about 2 hours to the water stream on very steep terrain (e.g Ntungamo village)

- ▶ There is visible appreciation of the project activities and its approach by the government authorities at all levels, community members and UWA (demand to scale – up to other villages)
- ▶ There is evidence of a transformed community, village awareness campaigns on restoration of the vanishing treasures....a positive mindset change (two testimonies on land use and illegal entry into the park, reduced time spent in bars, men have started joining women in garden activities, reduced domestic violence cases at village level and increased level of community participation in decision making during village meetings)
- ▶ There is need to conduct a mid-term review of the new BZMP implementation

### **Challenges**

Animal crop raiding is a threat to food security efforts,

- people have abandoned their gardens; low land areas are more fertile and productive hence contributing to food insecurity in the area.
- children miss school as they guard the crops from being raided during school days
- Men and women's lives are at stake as they sleep out in the night to guard crops from being raided.

### **Recommendations**

- There is need to introduce soil scanning techniques to guide proper utilization of appropriate manure for different crop varieties to improve yields.
- There is need to do studies into the waste management practices within the park edge communities and the tea plantations (plastic bottles and polythene bags) which pose a threat to the eco-system.
- There is need for the follow up on the implementation of PIP approach to the 2<sup>nd</sup> and further generations to the level of the villages PIP that has not been possible during the period of project timeframe.

### **Vanishing Treasures Project pictorial**

Stakeholders' involvement and consultations



Community engagements on livelihood interventions



Capacity building trainings on PIP approach and mindset change



PIP 5year household plans



Domestic energy saving cook stoves



Integrated Water Resources Management / erosion control practices



30m3 Rainwater Harvesting Tanks with a roof catchment



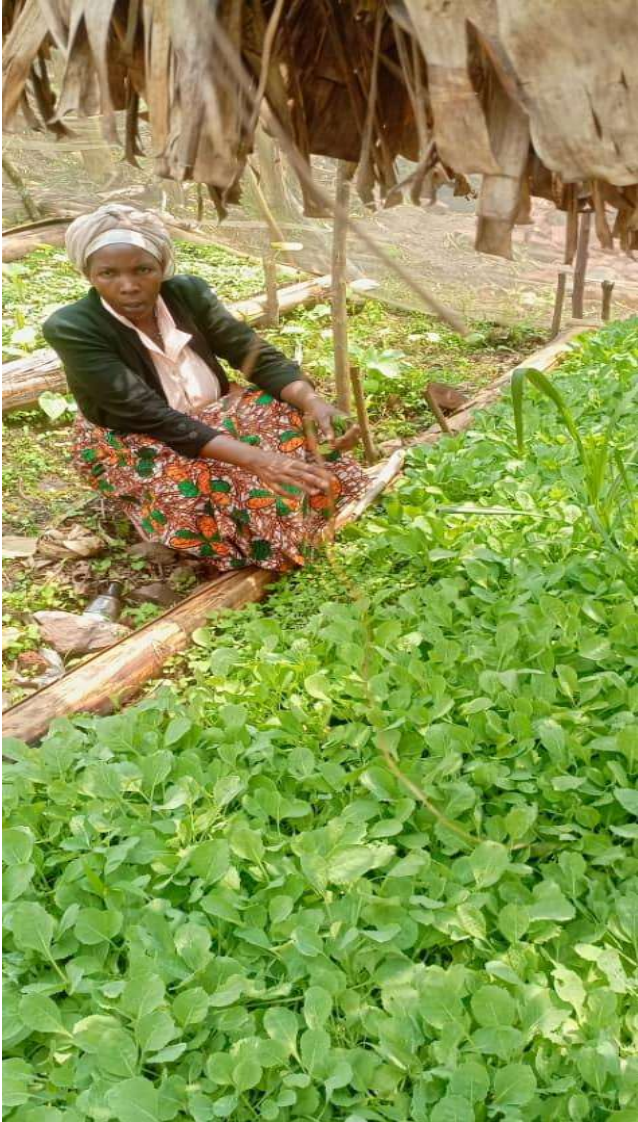
Compost / organic manure making



Supply of climate resilient agricultural crops / fruit and vegetable varieties



Vegetable growing for nutrition, food security and income generation



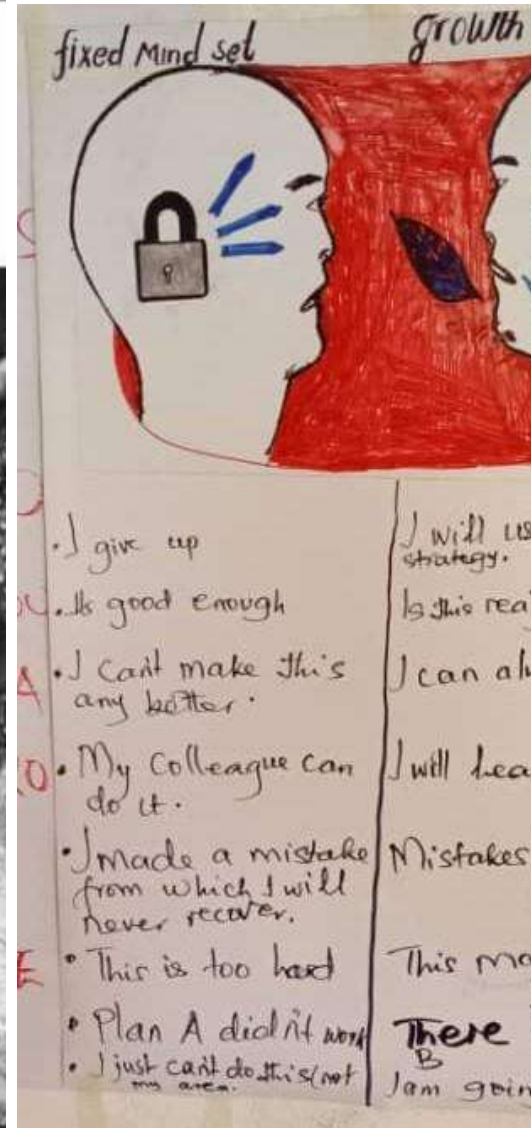
Handover of Vanishing Treasures Project at Mutugunda village communal Water Tank





## FOOD FOR THOUGHT

In African schools, English is compulsory while agriculture is optional. That's why we speak good English with no food.



## Annex i

At the initiation of Vanishing Treasures project, community members identified the indicators of food insecurity in their communities; these were listed as follows;

1. Planting and no crops harvested
2. Buying food from outside our villages
3. Going to work without eating anything
4. Stealing of crops from gardens
5. No food stores/granaries in homes
6. Reduced quantity of food served at home
7. People despite of having money, can not find food in the market to buy
8. Children are always crying because they are hungry
9. No vehicles come to pick foodstuffs from our communities
10. Domestic violence due to failure by men to buy food for families
11. Failure of children to go to school
12. Increase of food prices
13. The price of casual labour has gone down
14. Exchange of labour for food
15. No communal meals anymore
16. In our communal markets food stuffs are bought in a shortest time / sometimes food stuff is bought and finished on the way before it reaches the market
17. Reduced number of children produced
18. Few gardens/ limited land for cultivation
19. No fallowing due to limited land
20. Calculated number of times for meals compared to previously when people would eat all the time / families eat once a day
21. Low incomes among communities
22. No packed lunch for school going children, we pay for them to eat at school. For those unable to pay children stay hungry
23. All produce is eaten and nothing is left for seed / sell
24. Increased snacks and bakery shops in trading centers
25. People no longer visit others carrying food stuffs
26. Men spend most of the times at bars, they abandoned work to women
27. Land for production does not increase yet the population has increased

## Annex ii

## AGRICULTURAL INPUTS SUPPLIED BY IGCP UNDER THE VANISHING TREASURES PROJECT 2022/2023

CROPS	Total quantities	NOMBE	MUTUGUN DA	NTUNGAM O	KIRENGERI	MUROLE	KIKOBERO	KAKOBERO
Loquats	170	21	21	21	21	22	21	22
Apples	160	20	20	20	20	20	20	20
Strawberries	160	20	20	20	20	20	20	20
Strawberry guavas	160	20	20	20	20	20	20	20
Grapes	100	12	12	12	12	15	13	12
Lemons	250	30	30	30	35	30	30	35
Grafted Avocadoes	300	37	37	39	37	37	37	37
Pineapples	150	18	18	20	20	20	18	18
Guavas	280	35	35	35	35	35	35	35
Cassava	500kgs	62.5kgs	62.5kgs	62.5kgs	62.5kgs	62.5kgs	62.5kgs	62.5kgs
Orange	16 bundles	2 bundles	2 bundles	2 bundles	2 bundles	2 bundles	2 bundles	2 bundles
Fresh potatoes								
Pumpkins	8 tins	1 tin	1 tin	1 tin	1 tin	1 tin	1 tin	1 tin
Calliandra	8 kgs	1 kg	1 kg	1 kg	1 kg	1 kg	1 kg	1 kg
Sweet elephant grass	8 bags	1 bag	1 bag	1 bag	1 bag	1 bag	1 bag	1 bag
Onions	2 kgs	0.25kg	0.25kg	0.25kg	0.25kg	0.25kg	0.25kg	0.25kg
Bilinjal	5 tins							
Water melon	4 tins	0.5tin	0.5tin	0.5tin	0.5tin	0.5tin	0.5tin	0.5tin
Beet root	8 tins	1 tin	1 tin	1 tin	1 tin	1 tin	1 tin	1 tin
Green pepper	8 tins	1 tin	1 tin	1 tin	1 tin	1 tin	1 tin	1 tin
Carrots	20 tins	2.5 tins	2.5 tins	2.5 tins	2.5 tins	2.5 tins	2.5 tins	2.5 tins
Egg plants	8 tins	1 tin	1 tin	1 tin	1 tin	1 tin	1 tin	1 tin
Chinese cabbage	20 tins	2.5 tins	2.5 tins	2.5 tins	2.5 tins	2.5 tins	2.5 tins	2.5 tins

Compiled by  
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