Reference landscape: Kagera River Basin Profile

1. Introduction

The Kagera River basin is a transboundary geographic area comprised of ecological processes (functions) and features (natural and man-made) in which agriculture and natural resources can be managed to deliver a full range of ecosystem conservation, sustainable production, livelihood security, and institutional benefits. It occupies the upper west part of, and makes up 75% of the Lake Victoria basin, with total area of 59,700km^2, spread over four countries: Burundi (23%), Rwanda (34%), Tanzania (35%) and Uganda (8%) (Figure 1).

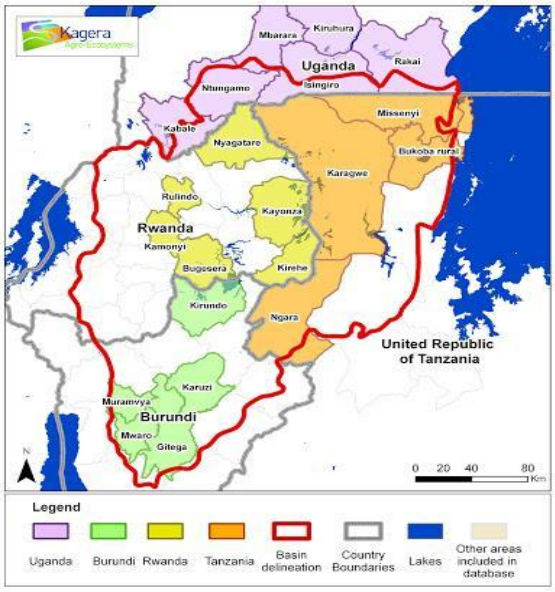


Figure 1: Map showing location of Kagera River Basin

This profile of the landscape was prepared as a resource for use during the Landscape Climate-Smart Agriculture (LCSA) training of trainers (ToT) for Tanzania under the Building Capacity for Resilient Food Security project that is funded by the USDA.

The landscape information comes from among others, the Kagera Transboundary Management Project (Kagera–TAMP), which was funded by GEF and implemented by FAO in collaboration with Governments of Tanzania, Rwanda, Burundi and Uganda and associated local communities. The initiative began in the year 2007 and ended in 2017 with some activities on-going under government funding.

It was prepared by IITAs research team led by Dr. Freddy Baijukya with support from the ToT facilitation team, with special focus on Tanzania side of the basin where the LCSA training was relevant.

2. Landscape description

2.1. Geography

The basin part of Tanzania occupies about 20,765 km^2 covering the whole of Karagwe, Kyelwa and Missenyi districts to 90, 85, 30 and 10% of Ngara, Bukoba, Muleba and Biharamulo districts, respectively, (see 1). Formed by two headstreams the Ruvubu (from north-east Burundi) and the Nyabarongo (from north-west Rwanda) the two converging at Rusumo Falls, the Kagera river provides sustenance of the basin providing the inflow into Lake Victoria of about 7.5 km^3 of water per year, of which 0.5 km^3 is generated within Tanzania by the rivers Ngono and Mwisa (FAO, 2016).

2.2 Climate

The basin falls in the high rainfall Lake region climatic Zone, with local climate moderated by altitude relief and water bodies. There are two main sub- climatic zones (i) the central area lying east of the Rwandan border where annual rainfall averages 800mm and pastoralism and annual cropping predominates and (ii) the higher altitude areas and the fringes of Lake Victoria, where higher rainfall, generally above 1000mm, and up to 2100 mm in the extreme north west of Bukoba district, which allows perennial cropping. The rainfall pattern is bimodal with two dry and two rainy seasons per year, with the wettest months in April and November. The longest dry season is May-June to September and a short dry season between December and February. The average annual temperatures are lower than 20^o C in areas near the shores of Lake Victoria and up to an average of 27^{o}C in the west. The average evapotranspiration is some 1200 mm per year. However, due to changing climate, the onset and amount of rains received are changing with increased occurrence of long dry periods.

2.3 Land use and livelihood situation

Land use in the Kagera Basin can be classified into natural and planted forests, wetlands and swamps and agricultural land. Agricultural land is used for livestock production, homegardens, mixed annual cropping and extensive cropping with fallow.

Figure 2. Typical Agricultural land in Kagera River Basin. The deep green vegetation is is the Banana-coffee gardens (kibaja) surroudned by the grazing land (rweya) with sparse trees.

2.3.1 Livestock production: is dominated by indigenous cattle the long horned Ankole and Zebu breeds which are low in productivity (produces 2-3 liters per day). Livestock production is practiced on areas with marginal climatic conditions (e.g. in Ngara, Karagwe

and Missenyi districts) or on steep land with shallow soils, and poorly drained flat valley floors in Bukoba and Muleba districts. Pressures of extensive transhumant livestock populations on communal grazing lands has major impact on the vegetation composition and is leading to proliferation of less palatable and more woody species (e.g *Solanum spp*. perennial grass species such as *Cymbopogon nardus* etc). The trend to more frequent burning for the regeneration of pastures is also favoring undesirable species. Grazing pressures are also leading to compaction and complete loss of vegetation on cattle tracks.

2.3.2 Crop production is dominated banana-coffee based farming systems which are similar in composition, but differ with respect to relative features such as rainfall, soil fertility, accessibility, population densities and crop acreage and yields. The dominant characteristic is the presence of three typical land use types (see Figure 3):

- Perennial banana-coffee based home gardens (*kibanja*): characterised by its perennial nature and multi-layers, its important number of crops and crop varieties, and by mobilizing and recycling of nutrients from the soil and organic residues.
- Small scale annual crop production (*kikamba*): comprises small fields of annual crops often located near the kibanja field. In many cases the kikamba field is a deteriorating kibanja field. Common *kikamba* crops include maize, beans, cassava, sweet potato, sorghum and millet. Soil fertility is much lower than in the *kibanja* system because few inputs are applied.
- Extensive annual crop production with fallow (*rweya-omusiri*): on the low quality grasslands (*rweya*), an important land use system is composed of patches of woodlot production and very extensive crop production (*omusiri*). Crop production is limited to cultivation of Bambara groundnuts and yams in rotation with long fallow periods of not less than 7 years, during which cattle are allowed to graze communally and grass cut for mulching the *kibanja*.

2.4 Population and livelihoods:

The Kagera river basin part of Tanzania supports the livelihoods of some 2.4 million people, the majority rural, depending directly on subsistence level farming, herding and fishing activities. The average effective population density is 97 people/ km^2. Most of the people are poor and they are unable to invest in improved resources management. Refugee movements in recent decades have further increased pressures on resources in the basin, raising actual and potential conflicts between interest groups and across countries.

The highly variable biophysical conditions and varied land use-livelihood systems developed by different socio-economic and cultural groups has led to the conservation and development of characteristic highly adapted species and high within-species diversity in the Kagera basin. However, the agro-ecosystems and biodiversity heritage are increasingly threatened by the overexploitation of resources and resulting degradation which are influenced by the

transboundary nature of the basin. There has been neglect of the importance of agro-biodiversity and the ecological functions to which it contributes. Existing institutions and local knowledge does not encompass how to cope under such changed circumstances, nor in response to insidious, unprecedented environmental changes.

3. Challenges facing the Landscape

3.1 Climate related challenges

In a survey conducted to explore farmers' perceptions of climate change, a group in the Kagera river basin in Bukoba district, highlighted the following changes:

- Longer rainfall period in the past; less reliable starting date of the growing season;
- Reduced sources of water; rivers and swamps drying out;

Regarding temperature change, CCAFS (2017) predicted an overall increase in the basin by over 2^{o}C by 2050 (Figure 2).

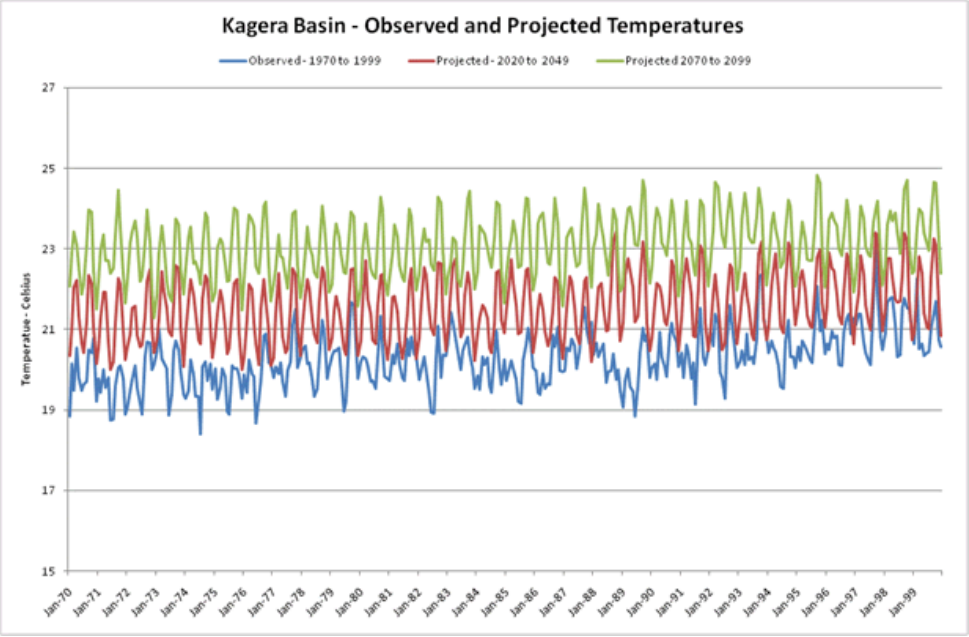


Figure 2. Observed and projected basin temperature from two time horizons

3.2 Ecosystem related challenges

The resource base and ecosystems face increasing pressures as a result of rapid population growth, agricultural and livestock intensification, progressive reduction in farm sizes and

unsustainable land use and management practices (Figure 4). Severe environmental impacts of land degradation has led to: -

- Reduced ecosystem services- regulating & supporting, including degraded land and water resources- quality and quantity, erosion, nutrient mining, pollution, reduced rainfall use efficiency and drought,
- Loss of wetlands and sedimentation/eutrophication of aquatic sedimentation of aquatic systems,
- Reduced ground and surface water supply,
- Reduced resilience (e.g. deforestation and increased burning of pastures with loss of many tree and pasture species)
- Loss of biodiversity (animal and plant species).
- over-exploitation of forests and woodland, especially loss of riverine forest, and unsustainable harvesting (timber, fuelwood, charcoal, brick making, etc.); and,

3.3 Production related challenges

- Overstocking and overgrazing of pastures and rangelands,
- Continuous cropping, with reduction in fallow and rotations, reduced crop diversity in response to markets (food and forage species/ varieties), repetitive tillage, frequent burning, and soil nutrient mining (lack of nutrient restoration practices);
- Encroachment of subsistence cropping into more fragile, drier areas, previously used/reserved for pasture and grazing, also into the wetlands;
- Communal areas, such as forested highland and riverine areas, grazing lands, riverbanks and cultivated steep slopes, are particularly affected by overexploitation and degradation.
- Loss of productivity of fruit trees (mangos and oranges) and crop productivity decline.

Cultivation on wetlands and on river banks

Framing on steep land

Overstocking / overgrazing

Figure 3. Examples of unsustainble land use practices in Kagera River Basin

4.4 Livelihood related challenges

- Reduced income and food insecurity because of low levels of agricultural productivity of crops and livestock.
- Increased poverty levels and undernutrition especially by women and children due to reduced access to agricultural inputs, resources and services.

3.5 Institutions/governance related challenges

- Limited or negligible government support and lack of incentives for natural resources management.
- Weak governance mechanisms for the common pool land and water resources and many resource users do not participate in decision making, especially the poor, women and youth**.**
- Youths out- migration because of labor shortage

4. The Intervention

The Kagera Transboundary Management Project (Kagera–TAMP) goal was adopted as an integrated ecosystems approach for the management of land resources, to generate local, national and global benefits, restoration of degraded lands and improved productivity, carbon sequestration and climate change adaptation / mitigation, agro-biodiversity conservation and sustainable use, increased food security and improved rural livelihoods and thereby, contribute to the protection of international waters, though:

- Improved information base on natural resources status and trends (land degradation, biodiversity loss), human pressures and impacts (vulnerability - food insecurity, climate change) and responses (current uptake of SLM practices in the basin for monitoring).
- Improved land use and agro-ecosystem management practices tested and adapted through Farmer Field School.
- Participatory land management plans developed and implemented in target communities, micro-catchments and wider land units (to address issues of tenure, access to resources, conflicts, etc).
- Capacities built on improved Sustainable land Management (SLaM) through farmer-farmer exchange visits, communications, training materials and workshops etc.
- Market opportunities and other cost-benefit sharing mechanisms for provision of environmental services (financial, non) identified, demonstrated and promoted for SLaM upscaling up leading to wide adoption/replication by farmers and herders.

Ecosystem approach

To optimize goods and services provided through land use management in the basin:

- Provisioning services: food, fodder, energy, fiber
- Regulating services: water regulation and purification, carbon and nutrient cycling, climate regulation, pollination, disease regulation,
- Socio cultural services: landscape (shade etc.), recreation, ecotourism
- Supporting services: necessary for the production of all other ecosystem services such as soil formation, primary production (photosynthesis)

Created Mechanisms for Rewards/ Payments for Ecosystem Services (PES)

- Not paid for through farmers/herders expected to conserve /safeguard resources and try to do so to protect their livelihoods) but through public funds: government programmes /grants for watershed management, so to protect their livelihoods) /grants for watershed management, biodiversity conservation etc.
- Markets: cap and trade markets for carbon sequestration (biomass, soil); biodiversity offsets (compensation); voluntary markets for offsets (compensation); voluntary markets for upstream land and downstream water quality and supply (watershed), certified quality products (Bio, Fair Trade geographical indication etc.).
- Non-monetary payments: users' rights (tenure, water consumption); tax exemption / facilities capacity building.

5. Benefits

Transboundary coordination, information sharing and monitoring at different levels (between countries, districts and or villages focus to:

- Control soil erosion
- Reduced pressure on wetlands
- Control of bush fires and reduction of biomass burning
- Management of livestock movement and livestock diseases
- Enabling policy, planning, and legislative conditions by harmonization of policy conflicting policers at ministerial level, local bylaws and identified opportunities to change behavior through district partnerships and community/catchment interventions

- Enhanced capacity and knowledge of interdisciplinary teams (of farmers, extension workers, and land use planners) at district levels for promotion of integrated and sustainable land and agro-ecosystem management (SLM)/watershed approaches to increase productivity, climate change mitigation, etc.
- Improved land management practices:
  - Soil fertility restoration to increase land productivity,

- Soil erosion control (reduce land degradation hence productivity and improved quality of water.
- Improve water management (rain water harvesting, soil moisture conservation, hence crop productivity.

6. Impact/outcome

6.1 Improved transboundary coordination and information sharing (Country to country; District to district; village to village) with focus to;

- Control of soil erosion
- Management of river banks
- Reduced pressure on wetlands
- Control of bush fires and reduction of biomass
- Management of cross border livestock movement

6.1.1 Transboundary policy

- Transboundary policy/legal issue harmonization (Ruzika and Mheto, 2012)
- Transboundary livestock issues / establishment of cattle corridor (Jonas B; Kizima 2013)
- River and Lake water Management (collaboration with other project Lake Victoria Environmental Management Project LVEMP 2013

6.1.2 Mou for collaboration and data sharing (among big initiatives)

- Nile Basin Initiative NBI /LIVEMP (GIS data base and Monograph_
- Lake Victoria Basin Council / LIVEMP control and sediment monitoring
- VI-Agroforesrty (SLM practices and carbon trading)

6.2 Enabling policy, Planning and legislative conditions for SLM (Action)

- Regular regional and district decision making meetings put in place
- Periodic assessment of land use systems, land degradation and SLM livelihood
- Capacity building of interdisciplinary SLM teams at district level for integrated ecosystem/ watershed approaches

6.3. Participatory stakeholder process

6.3.1 Community catchment planning

- Local diagnosis (natural resource, land degradation SLM and livelihoods
- Community action plan (to address the problem)

6.3.2 District land use planning

- Integrated SLM in district plan and budget
- Partnership: investments, microcredits, PES
- SLM knowledge: Data, training materials. Media
- Regulations – bye laws and conflict resolution
- Multisector approaches + enabling policy

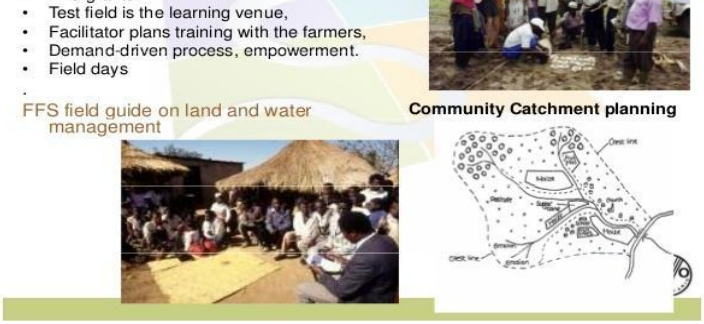
6.3.3. Strengthened governance

- Participatory negotiated territorial approaches
- Harmonize and implementation of national strategies
- Long-term vision, rolling plan based on result based monitoring

6.4. Appropriate SLM technologies for different agroecosystems identified

- Cross slop barriers
- Integrated soil fertility and moisture management
- Rain water harvesting
- Livestock and rangeland management
- Sustainable forest management
- Aquaculture
- SLM approaches

6.5 Capacity building of community members on SLM



7. Lessons for success

7.1 Participatory process with stakeholders

Diagnosis —action plan—impact and monitoring

7.2 Change behavior

- Code of conduct: commitment to conservation by farmers (farm plan); community (catchment plan) + Government (economic reasoning)

7.3 Improve livelihood

- Improve productivity and reduce risk

- Adaptive management to address needs and demand of diverse land users

7.4 Support and incentives

- Continuous technical support/ change

- Territorial development. Tenure security and access over natural resources

- Financial incentives; PES, credit, Investment

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