Assessing the drivers of biodiversity loss caused by economic sectors in Uganda – BIODEV 2030 Project

1) Background: Mainstreaming biodiversity into development through sectoral voluntary commitments leveraged through multi-stakeholder dialogue

This study has been carried out as part of the BIODEV 2030 project "Facilitation of Commitments for Biodiversity". BIODEV 2030 is financed by the French Development Agency (AFD) and coordinated by Expertise France. In Uganda, the project is implemented by World Wildlife Fund for Nature (WWF). The overall goal of BIODEV 2030 is assisting 16 developing countries mainstream biodiversity conservation and restoration in their economy. This is pursued through a multi-stakeholder dialogue with the stakeholders who have the largest negative impact on biodiversity and leverage sector-based voluntary commitments to stop and reverse their impact.

The specific objectives of this study include the following goals:
  a) Analyse the threats to biodiversity and the drivers of its decline caused by economic sectors,
  b) Identify and quantify the economic sectors with a significant negative impact on biodiversity,
  c) Facilitate a multi-stakeholder dialogue to identify the two economic sectors with the largest negative impact on biodiversity.

2) Methodological approach: using 3 complementary tools for qualitative and quantitative analyses

Biodiversity loss was analysed through a **species** and **habitat approach**. The analyses have been performed at **national level** to identify the economic sectors with the most significant negative impact on biodiversity. Moreover, analyses were **also** performed at the **protected areas level**, which are key areas for conserving biodiversity, especially for threatened species. Furthermore, the analyses **combined qualitative and quantitative datasets**.

The approach is based on three complementary analyses:

*   A **literature review** to establish **the state of and threats** to **biodiversity** at species and habitat level.
*   Two **remote sensing analyses** to identify and quantify the **drivers of the biodiversity loss at the habitat level:**
    *   **A land cover land use change analysis** between **1990** and **2017** using the National Forest Authority (NFA) dataset**,**
    *   **An intactness analysis** of all the 722 protected areas using remote sensing imagery available in Google Earth,
*   **A STAR** (Species Threat Abatement and Restoration) analysis, based on scientific data collected by IUCN for global **threatened species** from amphibians, birds and mammals in Uganda, and also based on the IUCN Ugandan Red list species at the level of protected areas.

3) Results

3.1. From the literature analysis: a lack of quantification of the threats

More than 30 reports have been reviewed. Although threats have been recorded, their magnitude is not provided. Key threats include:

- Unsustainable land use management for food and energy,
- Government policies failing to promote environmental stewardship,
- Conflicting government policies.

To identify key biodiversity landscapes the following three data set were overlapped in GIS:

- The distribution areas of threatened mammal, bird, amphibian, reptile, fish and freshwater species, available at the global IUCN database from 2020 and Birdlife International from 2021,
- The Key Biodiversity Areas (KBA) layer from 2018 available at Wildlife Conservation Society,
- The Protected Areas (PA) layer from 2018 available at National Forest Authority.

The map shows the concentrations of threatened species in Uganda: darker is the green, more threatened species there are.

The analysis confirmed the **Albertine Rift** as a key biodiversity landscape with the highest number of KBAs and threatened species.

The second **most important key biodiversity landscape** identified through this analysis is the **North-western shores of Lake Victoria**.
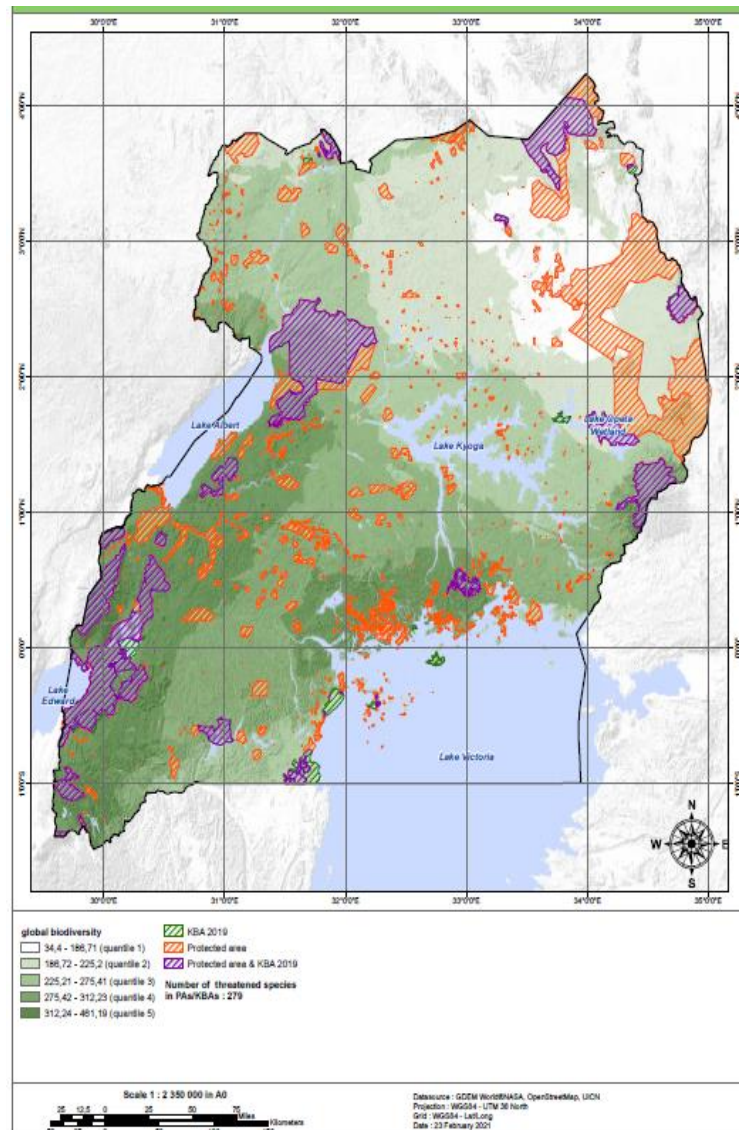
Map 1: Global biodiversity score for Uganda, for 2020
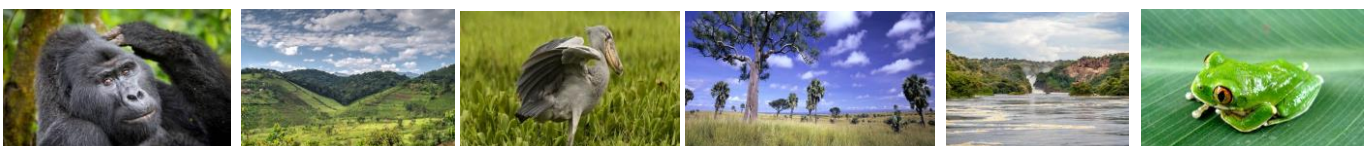
3.2. Main results from the remote sensing analyses

3.2.1. At national level: the two major threats from economic sectors are subsistence agriculture and plantations

Table 1. Land cover and land use change between 1990 and 2017

classes	1990	2017	1990-2017	ratio
Farmland subsistence	84,052	104,827	20,775	25%
Grassland	53,404	51,206	-2,198	-4%
Woodland	35,448	12,390	-23,058	-65%
Bushland	15,572	16,642	1,070	7%
Tropical high forest	7,432	5,241	-2,190	-29%
Wetland	5,021	7,856	2,836	56%
Tropical high forest low stock	2,274	1,021	-1,252	-55%
Farmland commercial	686	1,824	1,138	166%
Built up	362	1,387	1,025	283%
Plantation Broadleaved	166	841	675	406%
Plantation coniferous	157	758	601	383%
Impediment	51	87	36	71%
Water	36,917	37,460	542	1.5%

From the land cover land use change analyses (made between 1990 and 2017), **woodland** and **tropical high forest** have been the most negatively impacted habitats, having lost respectively 65% and more than 29 % of their surface area.

During that same period, **subsistence farmland expanded by 20,775 Km²**. **Broadleaved and coniferous plantations expanded the most in relative terms;** 405% and 382 %, respectively.

The results from the land cover and land use change matrix showed that **at the national level, subsistence farmland is the main threat to the tropical high** forest in particular and other natural habitats in general, **followed by plantations and commercial farmland.**

NB: The increase of water and wetlands could in part be due to more extreme rainfall that is not sufficiently captured by tall woody vegetation (forest, woodland and partially bushland). Without the forests and woodland to intercept the extreme rainfall, the hydrological cycle shortens, and rainwater accumulates at valley bottoms as wetlands and lakes.

3.2.2. At the Protected areas level: the two major threats from economic sectors are subsistence agriculture and plantations

The same analysis for the 722 protected areas showed that:
- The rates of expansion of the subsistence farmland and the commercial farmland are higher in PAs rather than at the national level, while the plantation coniferous in PAs is equivalent with the one of national level.
- The rate of loss of the Tropical High Forest is higher in PAs rather than at the national level.

The intactness of the 722 protected areas was assessed visually from LANSAT 8 imagery available in Google Earth.

The results of this analysis showed that the top five threats were observed in 92% of 722 protected areas. These five threats are related and result from frontier natural resource depletion. The main threats from economic sectors are (i) small holder farming and (ii) small holder plantations.

Table 2: Threats most recorded in all 722 Protected areas.

IUCN threat	# PAs
2.1.2 Small-holder farming	578
4.1 Roads & railroads	471
1.4 Village settlements	435
2.2.1 Small-holder plantations	222
7.1 Fire	196
3.2 Mining & quarrying	32
1.2 Commercial & industrial areas	24
2.1.3 Agro-industry farming	23
2.3.2 Small-holder grazing, ranching	22
5.3 Logging & wood harvesting	11
2.2.2 Agro-industry plantations	10
1.3 Tourism & recreation areas	6

3.3. Main results from the STAR analyses

3.3.1. At the national level: the two major threats are 'annual and perennial non timber crops' followed by 'logging & wood harvesting'

The STAR assessment of 101 threatened species (50 mammals, 49 birds, 2 amphibians), shows that the activities with the highest impact are on the threat abatement are: (1) **Annual and perennial non-timber crops** and (2) **logging and wood harvesting**.
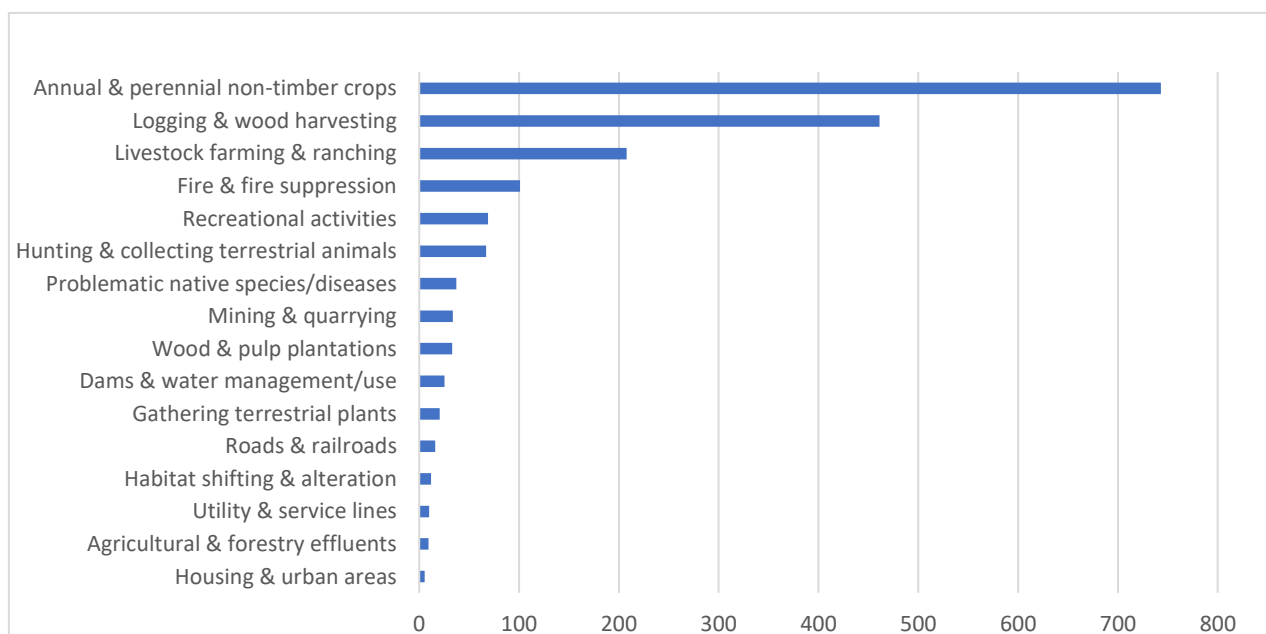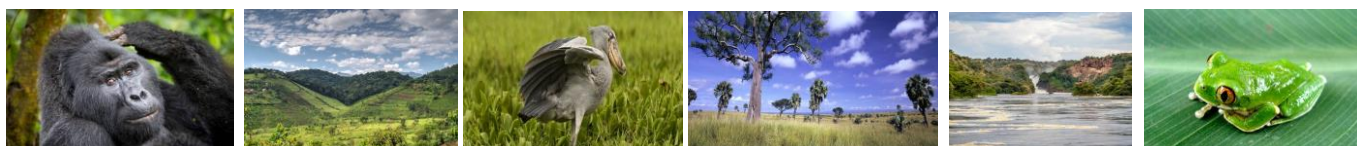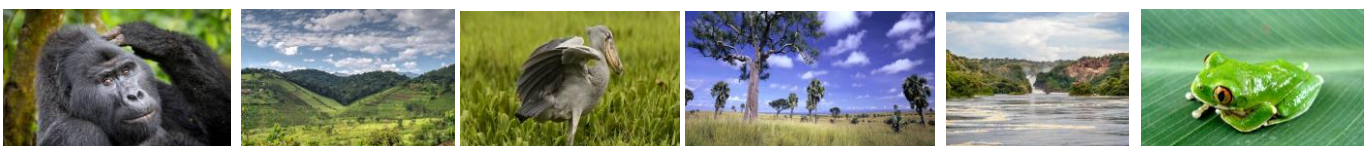

Figure 1: START results (IUCN, 2021)

Figure 3: Location of the areas where the annal and perennial non-timber crops have the highest impacts on threatened species (red color).

Figure 4: Location of the critical areas where logging and wood harvesting have the highest impact on threatened species (red color)

The maps show a high level of congruence, suggesting that the threat from 'annual and non-timber perennial crops', and 'logging and wood harvesting' are correlated.

3.3.2. At the Protected Area level: the two major threats are subsistence farming and timber plantations

The results of the STAR analysis carried out for the 722 protected areas show that the most impacting activities on threatened species in Protected Areas are farming and timber plantations.
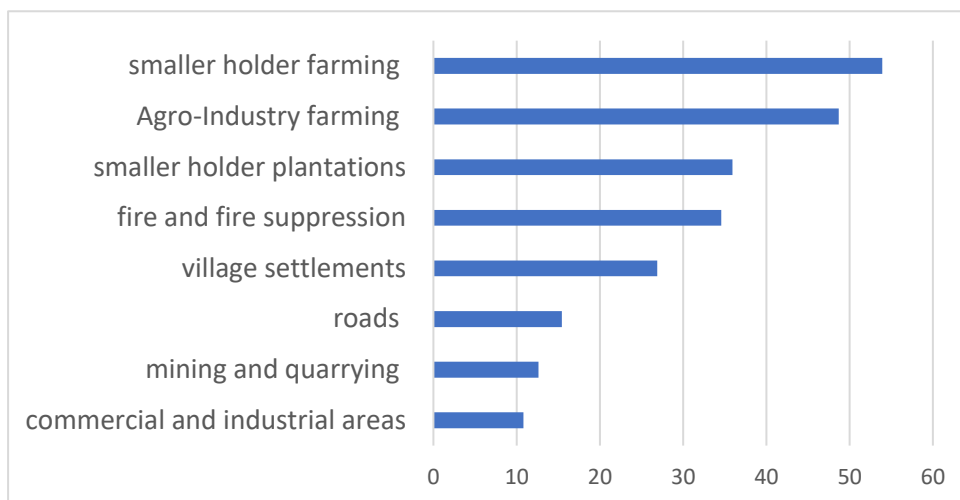

Figure 5: START score at the PAs level.

4) Conclusion

All three different analyses (literature review, remote sensing and STAR) identified the same two sectors with the highest negative impact on biodiversity: farming and forestry (plantations, logging and wood harvesting)

Remote sensing analyses allowed to quantify the threats already identified in the literature from the economic sectors in terms of habitat loss, based on the NFA data set.

STAR analysis provided additional information on threats to threatened species level.

Under the new 'programmatic approach' of Uganda, the threats can be aligned with the 'Agri-industrialization' program and 'Climate Change, Natural Resources, Environment and Water management' program.

Similarly, these threats can be aligned with the Convention on the Biological Diversity sectors of agriculture and forestry.