Farmers' Perceptions of Land Degradation in South Kivu, Eastern DR Congo

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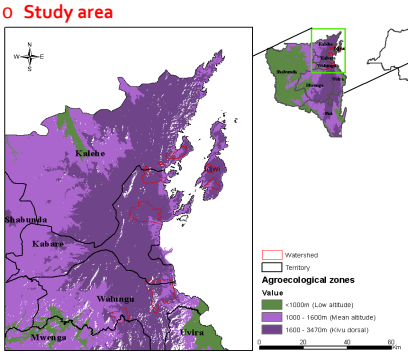
Introduction and objective

- Human-induced pressure on soil resources is expected to vary across South Kivu due to variability in rainfall, soil types and land use, and differing socioeconomic conditions (population density, access to land, agricultural extension services, road infrastructure, access to markets). But few reliable data on land degradation in Kivu are available.
- Understanding farmers' perceptions of land degradation provides insight into the real limits of agricultural production processes (e.g., Okoba *et al.*, 2005) and is a prerequisite for guiding land conservation actions.
- **This study aimed at assessing how the diversity in biophysical and socioeconomic contexts in the Kivu dorsal affect crops choice, farming practices and the resulting status of soil degradation as perceived by farmers.**

Methodology

Study area



- The Kivu dorsal is located in the eastern part of the DRC (Fig. 1).
- 8 watersheds in 4 Territories : Kalehe, Kabare, Walungu, Idjwi.
- **Survey conducted** within **55 villages** dominated by smallholder farming systems.

Fig. 1. The three agro-ecological zones of South Kivu in which the Kivu dorsal and the studied area are located.

Survey methodology:

(1) household and **community surveys** conducted in **720** farmer's fields, during the first rainy season in 2015; **socioeconomic** and **environmental data** obtained from key informants and administrative services.

(2) Survey questionnaire (structured): (a) **main characteristics** of the households; (b) **crop** and **farming practices** on farmer's main plots and (c) **farmers' perceptions** of the status of soil degradation.

Survey data analysis:

- Descriptive statistics: percentage frequencies; Chi-square methods (for statistical significances of different attributes);
- Principal components analysis (PCA) (for farm categorizations)
- Correspondence analysis (CA) for profile analyses.

Results

Profiles of crops and farming practices by farm types

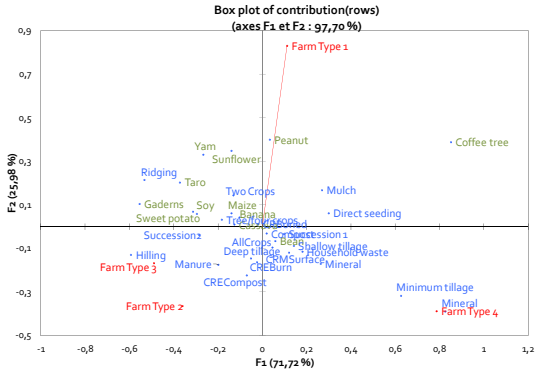


Fig. 2. Map of profiles analysis for crops, farming practices and four farm types.

- Four farm types were identified based on household available resources. Farm types 2 & 3 are not significantly different, while farm types 1 & 4 are significantly different and opposed.
- Wide diversity of crops (Fig. 2)
- Crops vary by farm type (p<0.0001).
- Different combinations of farming practices in each farm type.

Perceived soil degradation status

- Index of land degradation varies from 1.66 to 2.89 across watersheds (on a scale from 0 to 4) (Fig. 3a);
- Topographical location explain major differences in farmer's perception of the status of degradation (Fig.3b);
- Significant differences (p<0.0001) in **farmer's perception of the status of land degradation across watersheds** (Fig.3c).

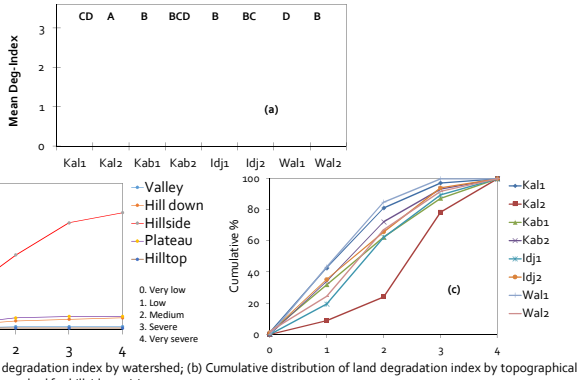


Fig. 3. Graphs of: (a) Average degradation index by watershed; (b) Cumulative distribution of land degradation index by topographical location and (c) by watershed for hillside position.

Types of soil degradation

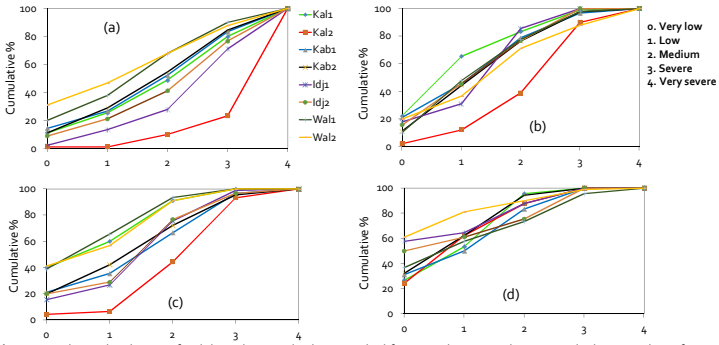


Fig. 4. Cumulative distribution of soil degradation index by watershed for: (a) soil erosion; (b) nutrient depletion; (c) loss of organic matter (OM) and (d) soil compaction

- **Significant differences** (p<0.0001) are observed in farmer's perception of the three types of degradation: soil erosion (Fig.4a), soil depletion (Fig.4b) and loss of soil OM (Fig.4c).
- For all three types of degradation (Fig.4a,b,c), the **Kal2** watershed has a high proportion of fields with severe and very severe degradation status.
- **Soil erosion** is the main cause of degradation for more than **74% of farmers (Fig.4a)**.
- Soil compaction is mainly viewed as a consequence of soil erosion(Fig.4d).

Correlation between degradation status and relevant variables

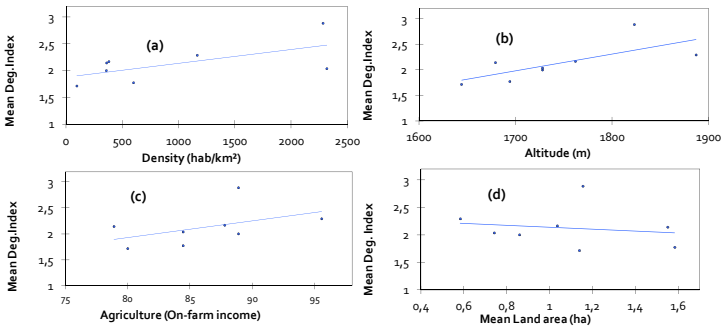


Fig. 5. Relationship between degradation status and (a) population density; (b) plot altitude; (c) agriculture as source of income and (d) mean land area.

- A **positive correlation** is observed between **population density** and degradation status (r=0.64) : Watersheds with high population density have also high frequencies of severe and very severe status of degradation (e.g., Kal2,Idj1 & Idj2) (Fig.5a).
- A positive correlation is observed between plot altitude and degradation status (r=0.72) (Fig.5b).
- Crops and farming practices adopted by most of farmers in the study area have positive correlations with degradation status (Fig.5c).
- Negative correlation is observed between average land area and degradation status (Fig.5d).

Conclusions

- **Heterogeneity** observed in **biophysical** and **socioeconomic contexts** affected the **status of degradation as perceived by farmers**;
- **Crops** and **farming practices** vary **depending on each site** and their **available means**;
- **Strong links were observed** between the **status of degradation and** the **topographical location**, the **crops** as well as the **practices** adopted in farmer's fields;
- Analysis of **soil degradation** processes was **better understood** after analyzing **socioeconomic** and **biophysical contexts** of the concerned areas.

Reference

Okoba Barrack O. and Jan De Graaff, 2005. Farmers' knowledge and perceptions of soil erosion and conservation measures in the central highlands of Kenya. Land Degradation and Development, Vol. 16, Issue 5, page 475-487, September/October 2005. doi:10.1002/ldr.678.