An Interdisciplinary Study of the Extent of Soil Degradation in Southern Africa

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INTRODUCTION

- Southern Africa is a region highly vulnerable to soil degradation due to a high proportion of subsistence farmers, dryland climate (Figure 1), and poor political, economic, and social structure
- An interdisciplinary understanding of both the environmental extent and the social, economic, and political drivers of soil degradation in Southern Africa is necessary to develop effective strategies to prevent future loss of soil biological productivity and improve food security.

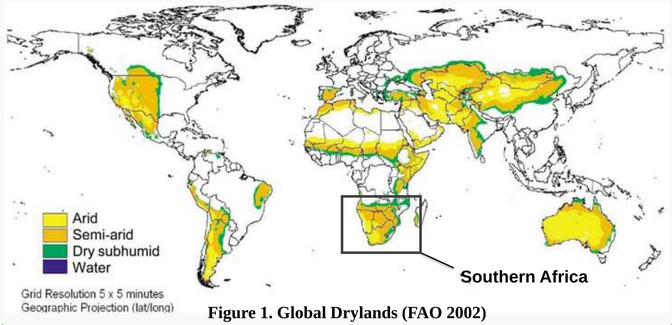

Figure 1. Global Drylands (FAO 2002)

OBJECTIVE

Determine the extent and most severe forms of soil degradation in Southern Africa and identify key social, economic, and political factors increasing vulnerability to soil degradation in this region. Requirements for an effective soil conservation strategy are suggested.

METHODS

- Extent and forms of soil degradation in Southern Africa were determined through analyzing academic literature as well as the Harmonized World Soil Database (HWSD), and Land Degradation Assessment for Dryland Areas (LADA), comprised of global remote sensing and GIS data, digital models, rural appraisals, expert opinion, and soil and vegetation sampling.
- Economic, political, and social drivers of soil degradation were determined through the academic literature as well as consulting development indicator data from World Bank, UNDP, and Population Research Bureau databases.

RESULTS AND DISCUSSION

Extent of Soil Degradation in Southern Africa:

- According to the HWSD, low nutrient availability and retention capacity are the most severe forms of soil degradation in Southern Africa (Figure 2). Results are supported by nutrient balance data (Craswell et al 2004) showing severe nutrient deficit in the region.

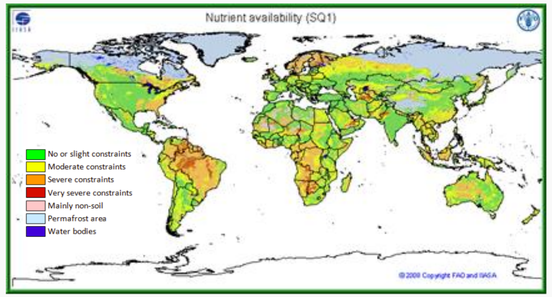

Figure 2.. Global Nutrient Availability based on HWSD (IIASA/FAO, 2008)

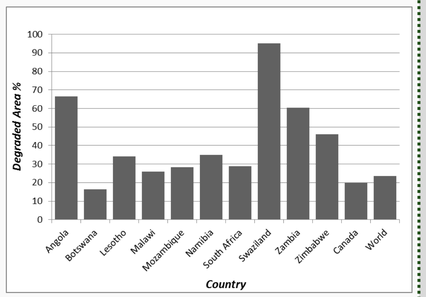

Figure 3. Area Degraded based on LADA (Adapted from Bai, 2008)

- According to LADA average degradation in Southern Africa is 38.2%, 162% of the global average (Figure 3).
- Human-induced soil erosion is occurring in Southern Africa to a lesser degree than other regions in the world (Lal 2001). Soil degradation in cropped drylands of Sub-Saharan Africa is severe, and results in yearly net primary productivity (NPP) loss of 57%. Global yearly cropped dryland erosion average is 35% with a 40% loss in NPP (Zika and Erb 2009).

Social, Political, and Economic Factors Driving Soil Degradation

- Based on literature, poverty is the main contributor to soil degradation globally. Southern African nations have 13.1% of Canada's GNI, 12.5% of Canada's energy consumption (as kg oil equivalent/capita), and 4.6% of Canada's health expenditure, and Canada's AIDS prevalence is 1.29% of Southern Africa's based on development indicators.
- Poverty driven by economic and political factors specific to Southern Africa. Main political factors are war, land tenure, and national debt, leading to low investment in agriculture and weak or non-existent risk management strategies. The main economic driver is globalization, specifically the import of competitively priced products, reliance on cash crops, presence of multinational corporations, and dependence on food aid, leading to weak inter-regional trade and poor development of the local agricultural sector.

CONCLUSIONS AND RECOMMENDATIONS

- Southern Africa is a global hotspot for land degradation, with nutrient depletion being the most serious form of soil degradation. Poverty is the main driver of soil degradation and is exacerbated by economic and political issues, mainly globalization, land conflict, and poor governance.
- Use of organic or inorganic fertilizer is necessary to prevent further soil degradation. Subsidization of mineral fertilizers and extension of conservation techniques is needed. Reduced tillage, agroforestry, composting, intercropping, and legumes in rotation are techniques applicable to the region. Competition for crop residues may be an issue.
- Awareness, participation, and cooperation of all stakeholders (farmers, government, funding institutions, private sector, NGO's), organization of farmer groups for dissemination, and government support are all key factors in successful soil degradation mitigation strategies.

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