Status, priorities and needs for sustainable soil management in Zambia

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Introduction

Zambia has an area of 750,000 km^2 with about
13.9 million people and ample land resources

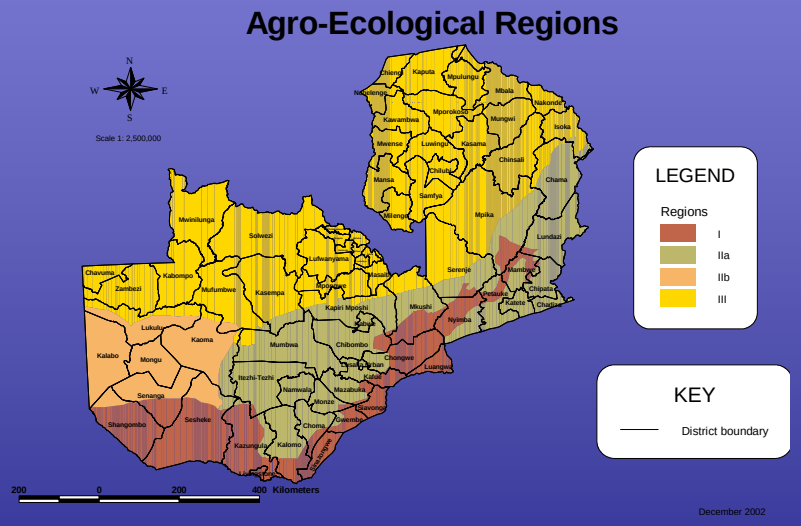
0ut of 9 million ha cultivable land,
only 14% is cropped in any year

About 55 - 60% of the land area is covered by
natural forest and
6% of Zambia‘s land surface is covered by water.

Agro-ecological regions and soil distribution

The country is classified into three agro-ecological regions based on soil types, rainfall, and other climatic conditions

Agro-ecological Region I
Annual rainfall is <750mm



The region contains a diversity of soil types ranging from slightly acidic Nitosols to alkaline Luvisols with pockets of Vertisols, Arenosols, Leptosols and, Solonetz.

The physical limitations of region I soils

Hazards to erosion,
limited soil depth in the hills and escarpment zones,
presence of hardpans in the pan dambo areas,
poor workability in the cracking clay soils,
problems of crusting in most parts of the Southern province,
low water-holding capacities and the problem of wetness in the valley dambos, plains and swamps.

Chemical limitations of region I soils

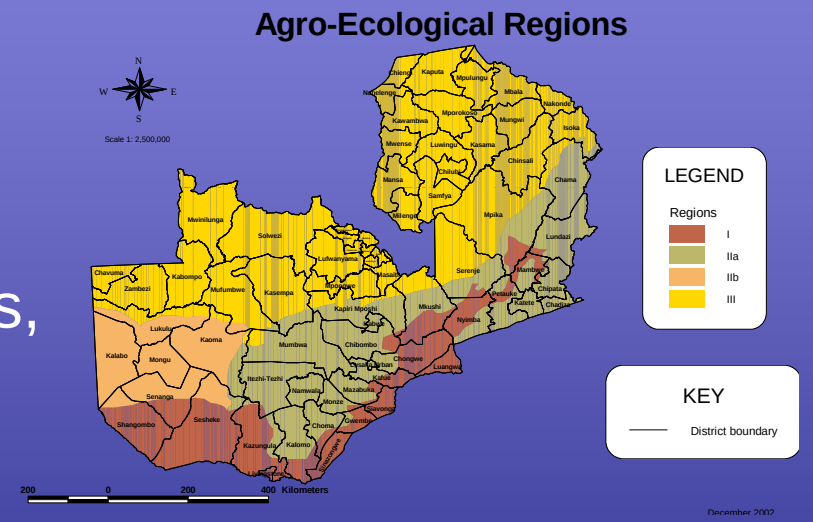
Some soils have salt content of which sodium is predominant, causing problems of sodicity and salinity, acidity and low nutrient reserves and retention capacity.

Agro-ecological Region II

Rainfall 750-1000mm.

Subdivided based on differences in soil types.

Sub-region IIa, soils are largely classified as Lixisols, Luvisols, Alisols, Acrisols, Leptosols and Vertisols



These are some of the best agricultural soils in Zambia and they host much of the country's commercial farming sector

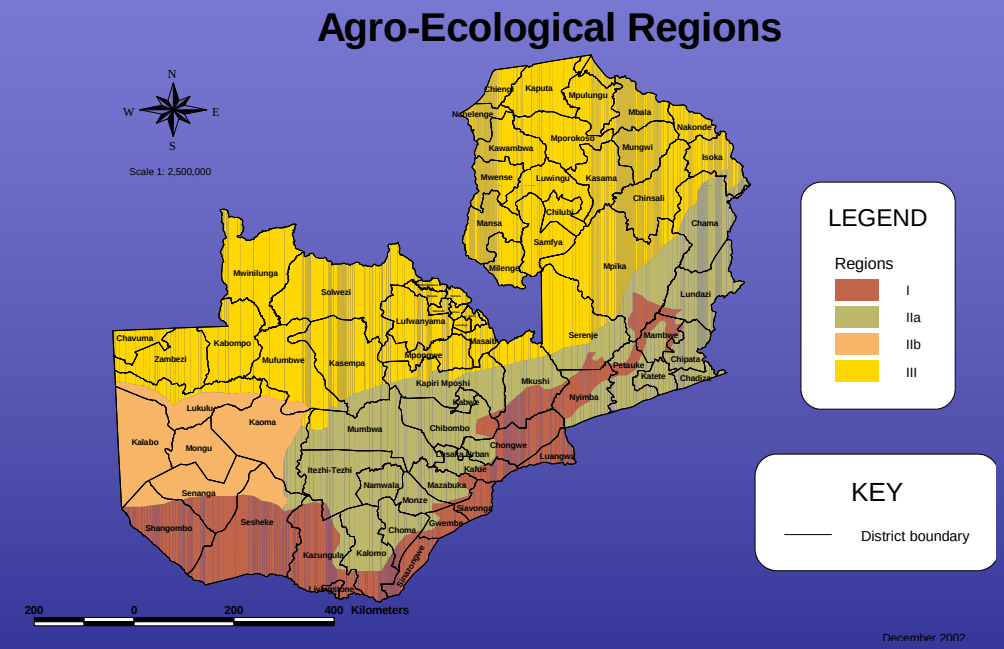
Agro-ecological Region II

Rainfall 750-1000mm.

Subdivided based on differences in soil types.

Sub-region IIb

Contains a range of Arenosols, Gleysols, Histosls, and Podzols



The physical limitations of region II soils

low water holding capacity,
shallow rooting depth,
rapid physical deterioration,
erosion hazard and poor workability

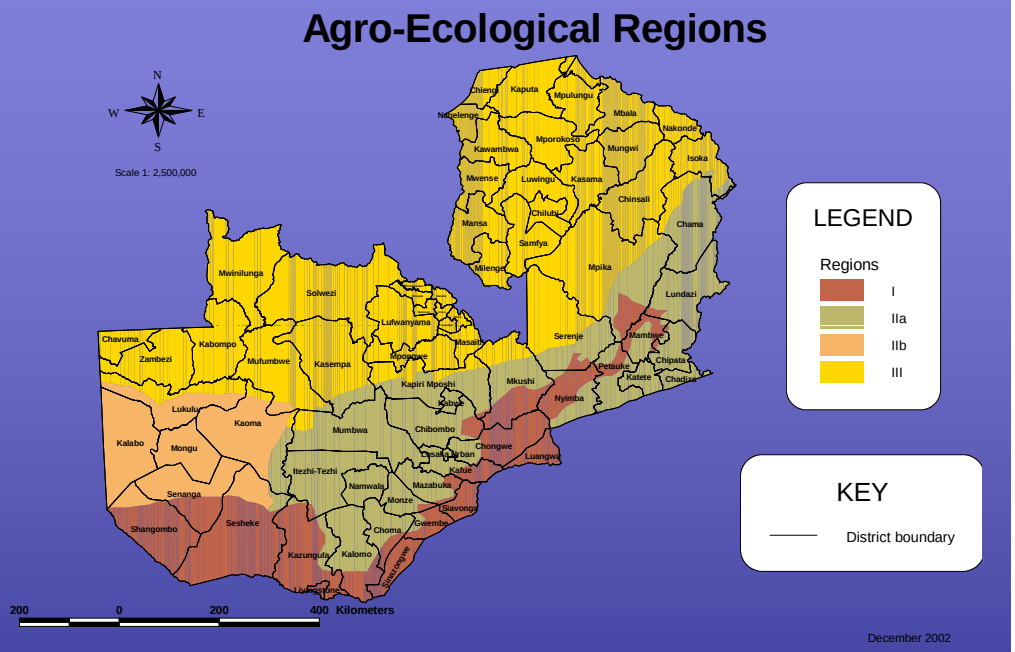
Chemical limitations of region II soils

low nutrient reserves and retention capacity,
low calcium, magnesium and phosphorous,
low organic matter content and high acidity in some pockets

Agro-ecological Region III

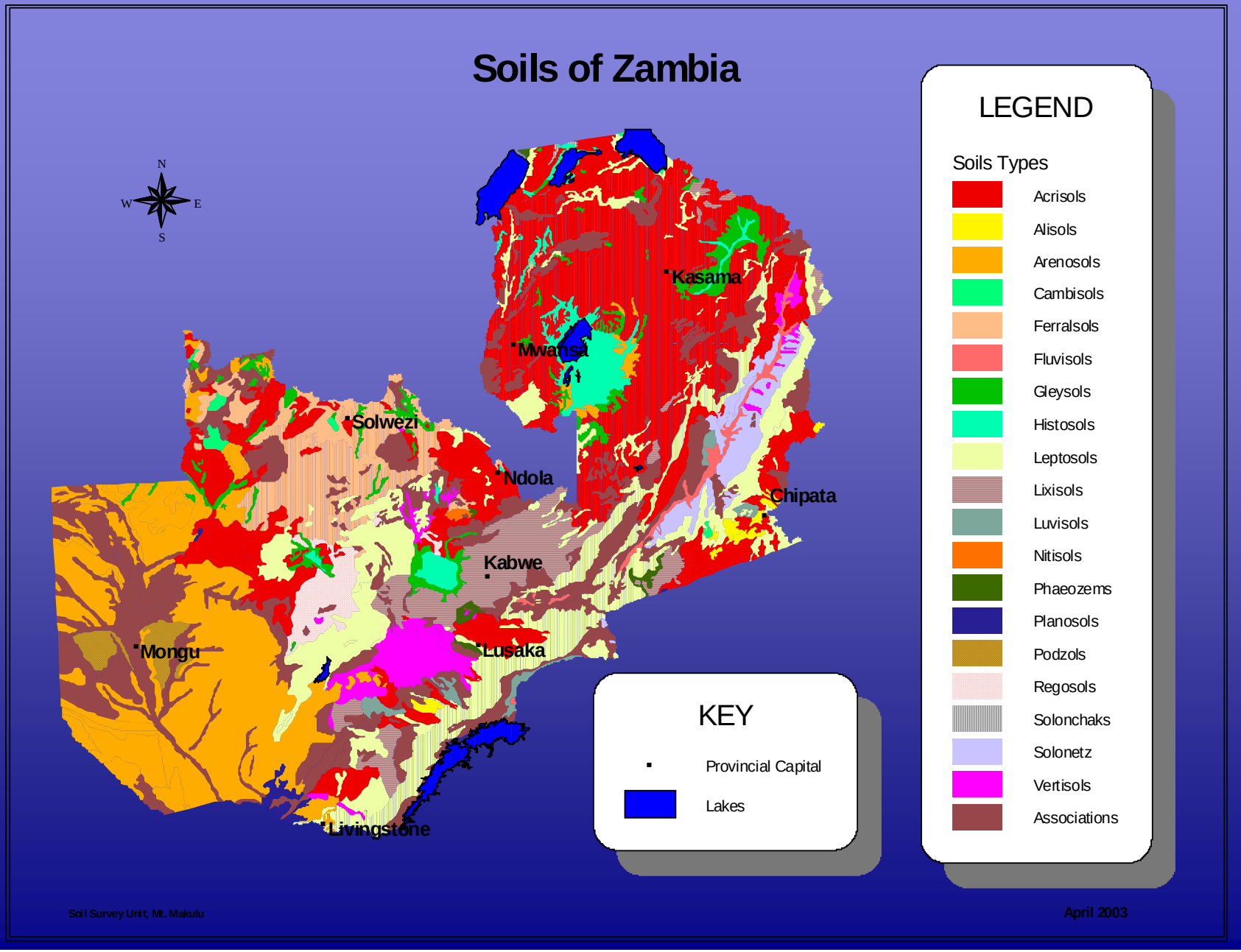
High rainfall region of Zambia >1000mm per annum.

Predominant soils: Acrisols, and some Ferralsols developed under conditions of high leaching intensity

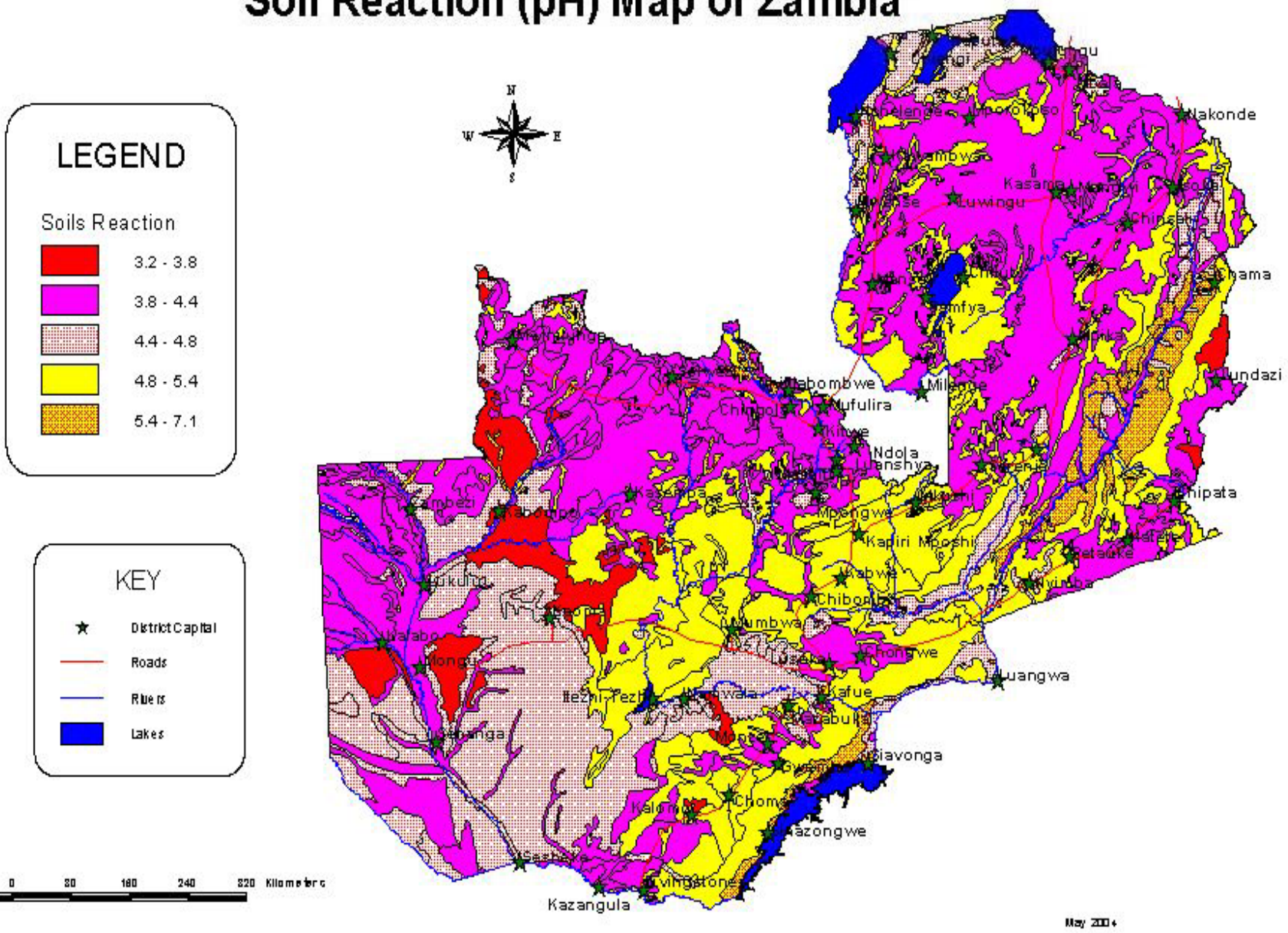


Soils are characterized by soil acidity, low bases retention capacity, low soil organic matter, low general soil fertility and soil degradation

Major Soil group classification



Soil Reaction (pH) Map of Zambia



Main Challenge of Agriculture Productivity in Zambia

The declining soil fertility

- soil erosion and degradation and little or non-use of manure or chemical fertilizer and the ravages of erratic rainfall.

Need to improve and manage soil fertility in Zambia

There are several options of positive soil fertility management practices available to farmers

Summary of soil fertility management practices in Zambia

Technology Category		Practice	Advantage
Cultural Practices	Crop rotation	Legumes after cereals	Reduction in fertilizer use, Improved soil fertility, pest and disease control, weed control (e.g. striga)
	Agro forestry improved fallow	2-3 year fallow phase with tree species like *Gliricidia*, *Acacia, Leucaena*, *Sesbania, Tephrosia*, etc	Improve soil fertility, control and avoid soil erosion, cost effective or reduce the use of chemical fertilizer, improve soil structure

Summary of soil fertility management practices in Zambia

Technology Category		Practice	Advantage
Cultural Practices	Green manure crop fallows	Velvet beans and Sun hemp either incorporated or left on the surface	Improve soil structure and fertility, leading to vigorous growth of the following crop and reduce erosion
Compost manure practices	Mixed plant residues, animal dung, earth / soil materials, wood ash, water		Improves soil structure, reduce erosion and improves water and nutrient holding capacity of the soil

Summary of soil fertility management practices in Zambia

Technology Category		Practice	Advantage
Erosion control practices	Conservation tillage	Ripping, basins and minimum tillage	Erosion control and rain water infiltration
	Contour conservation	Vertiver grass	
Liming	Dolomitic (more magnesium than calcium) or calcitic (more calcium than magnesium) lime		Reduces soil acidity, make nutrients readily available for crop uptake and eliminates aluminium toxicity

Summary of soil fertility management practices in Zambia

Technology Category	Practice	Advantage
Inoculum	*Rhizobia* inoculum	Enhances biological nitrogen fixation in legumes and increases yields
Fertilizers*	Basal and top dressing fertilizers	Supply the nutrients needed for enhanced crop production

*Wherever possible, it is recommended that farmers should combine organic and inorganic nutrient sources for sustainable crop production

Thank You

for your attention