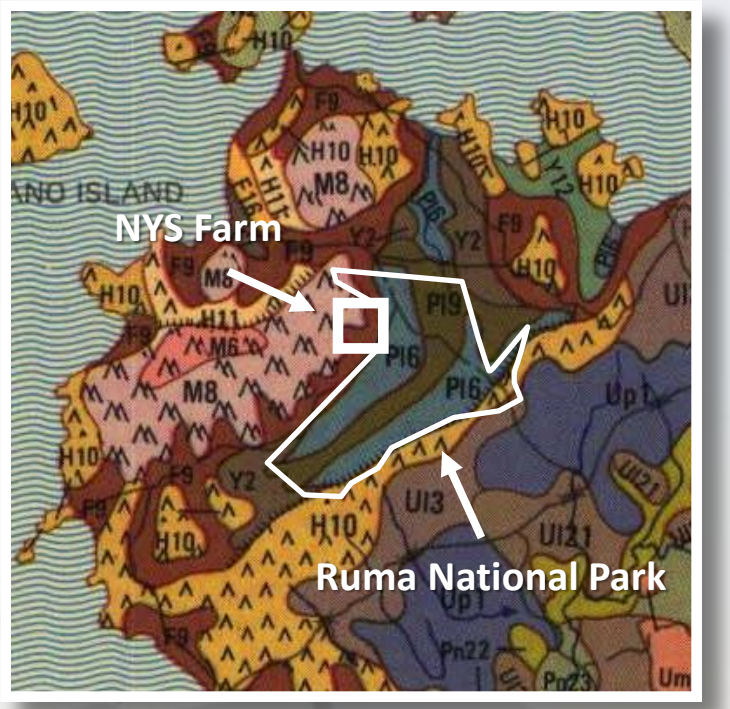
Sebastian Arnhold, Dennis Otieno, Bernd Huwe

Impact of land use on soil properties of the Lambwe Valley

First CREATE Workshop
19-20 February 2014
Maseno University

Background

Geology and soil of the Lambwe Valley



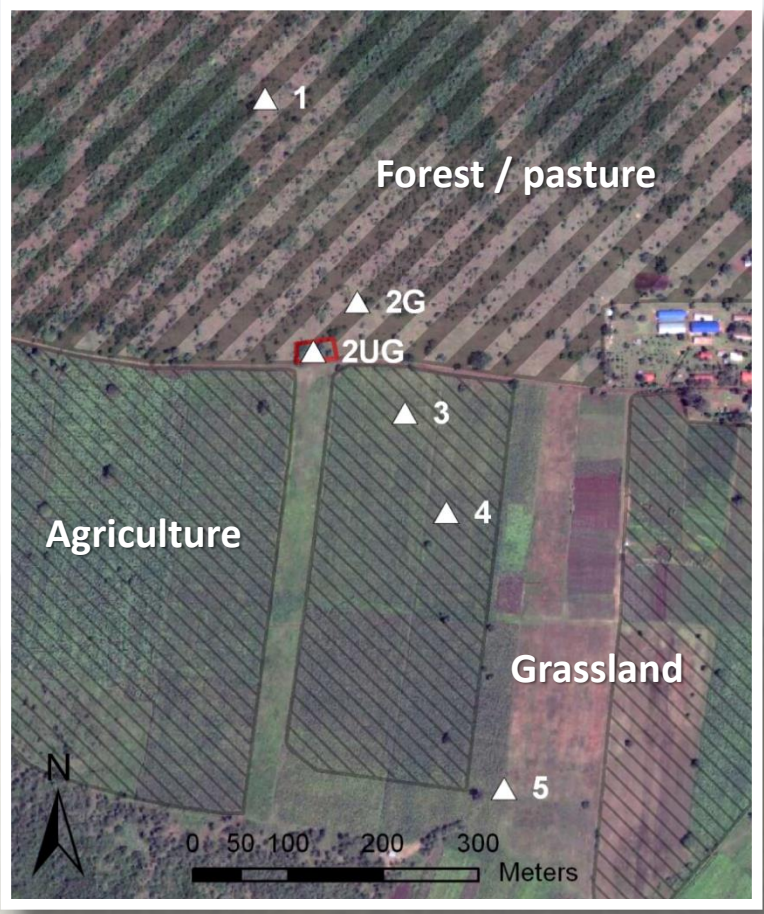
Exploratory Soil Map of Kenya 1980
(Scale 1:1000 000)

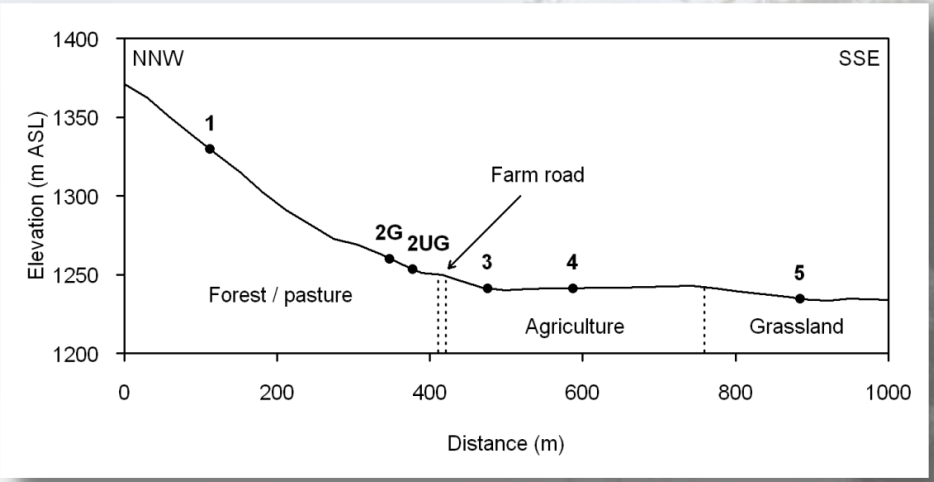
- Quaternary sediments in the valley surrounded by Tertiary volcanic mountains
- Deep clay soils in the valley (*Vertisols*, *Solonetz*) and shallow clay-loam soils on mountain slopes (*Regosols*)
- Local variations in topography, land cover, and agricultural activities influence soils

Goal: Description of the variability of major physical and chemical soil properties in the NYS Farm area

Methods

- Soil profile transect along elevation gradient and different land use types
- Livestock grazing and non-grazing





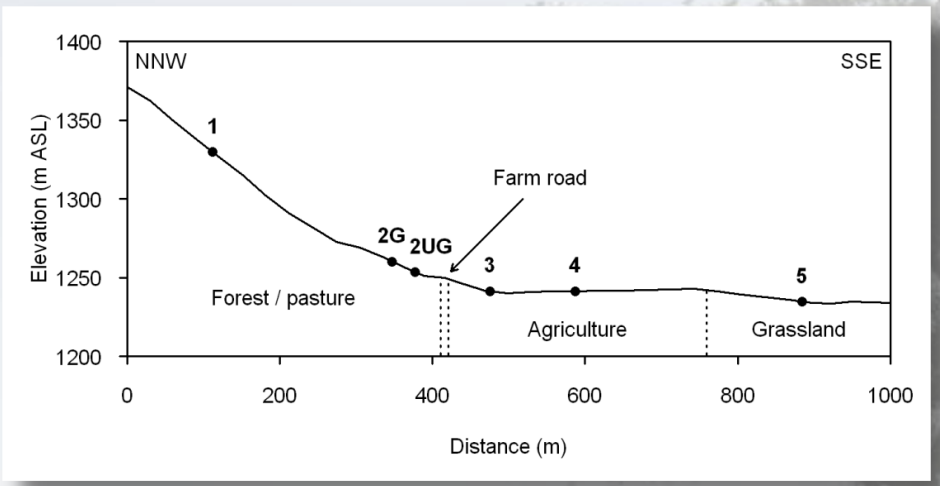
Elevation data from ASTER GDEM (product of METI and NASA)

- Analysis of major soil physical properties: coarse fragments, texture, bulk density
- Estimation of soil hydraulic parameters with ROSETTA: hydraulic conductivity, AWC
- Measurement of root distribution and contents of organic carbon and nitrogen

Results

Profile 1

Profile 2G



Profile 3

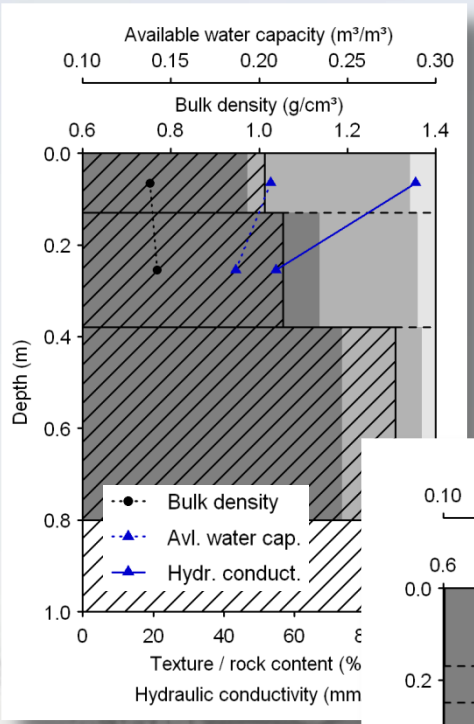
Profile 4

Profile 5

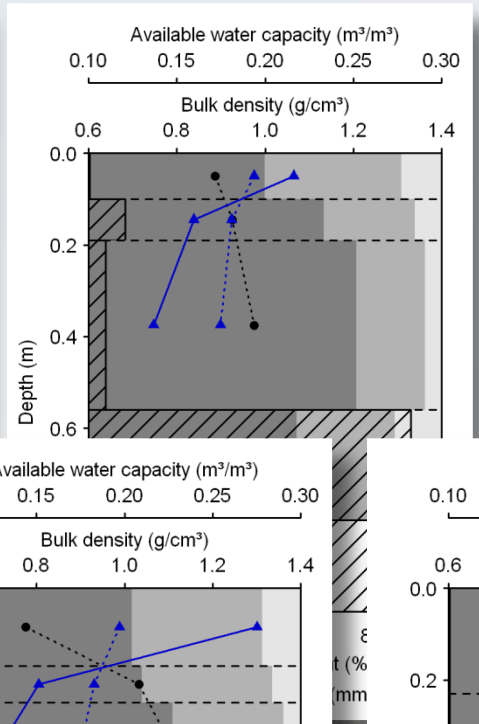
- Low soil depth on mountain slope with high proportion of volcanic gravel and rocks
- Increasing soil depth and change of parent material along the transect

Results

Profile 1

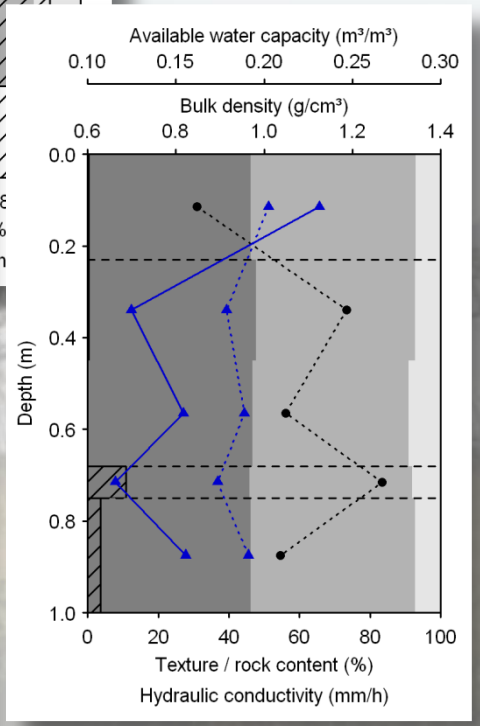


Profile 2G

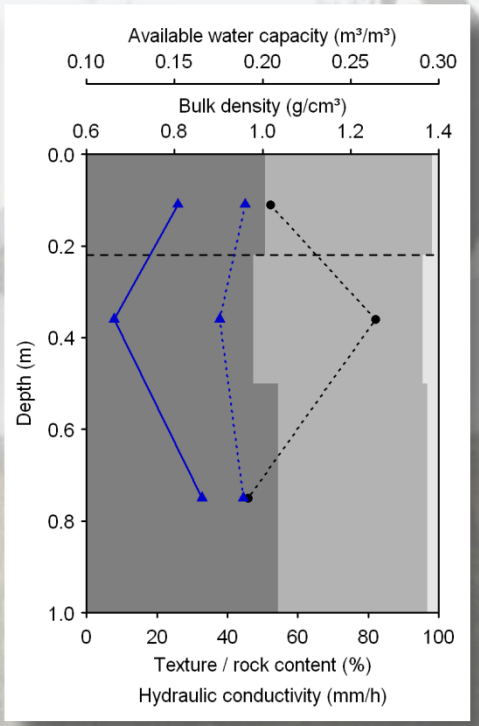


- Subsoil clay enrichment on slope and homogeneous texture in the valley
- Compaction and decline of hydraulic parameters due to agriculture

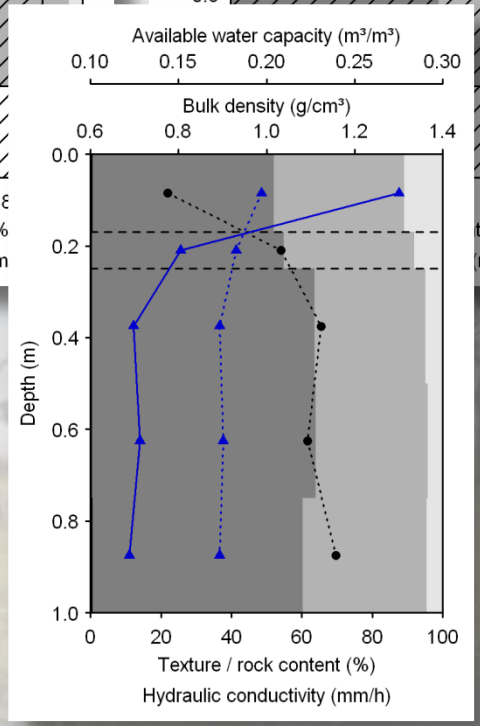
Profile 4



Profile 5



Profile 3



Results

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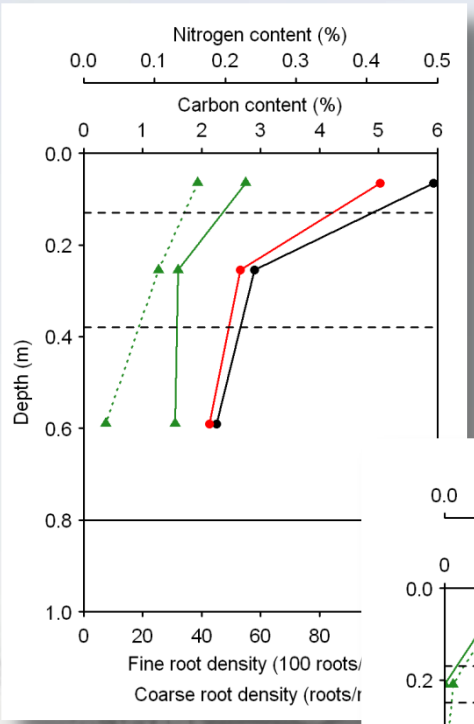
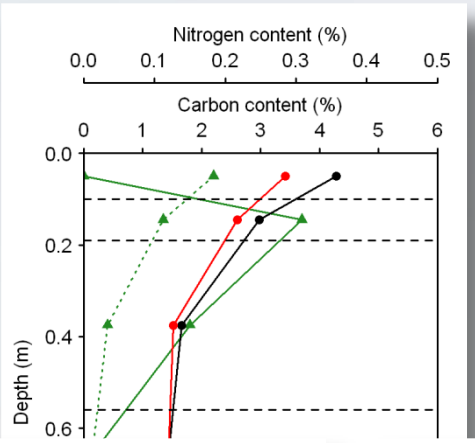
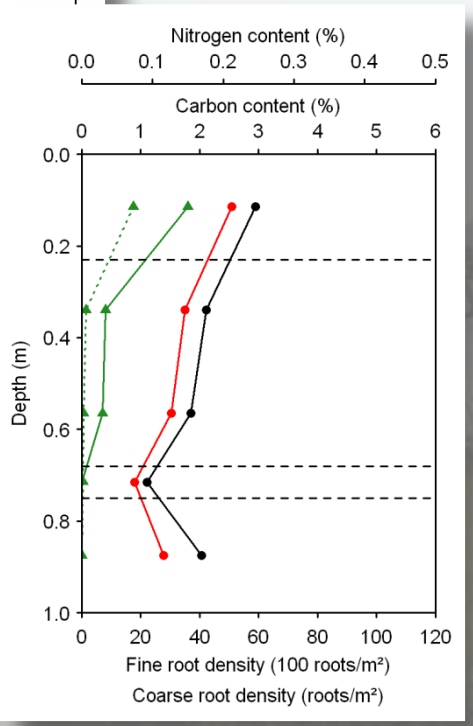


Profile 2G

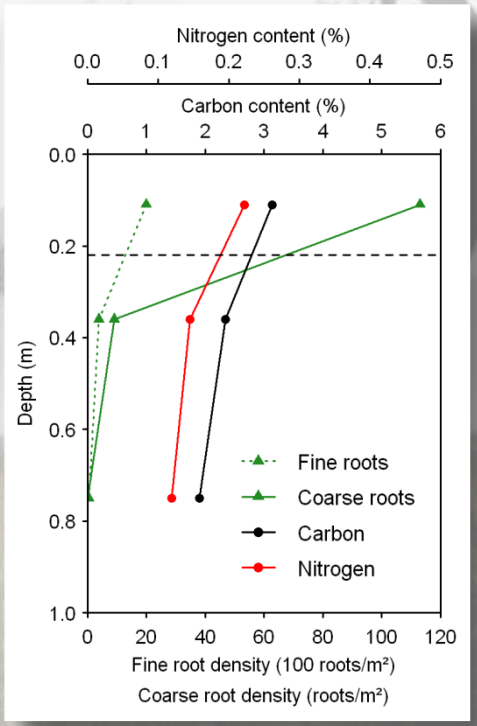


- Highest root densities on mountain slope and in grassland area
- Relatively low carbon and nitrogen contents in agricultural areas

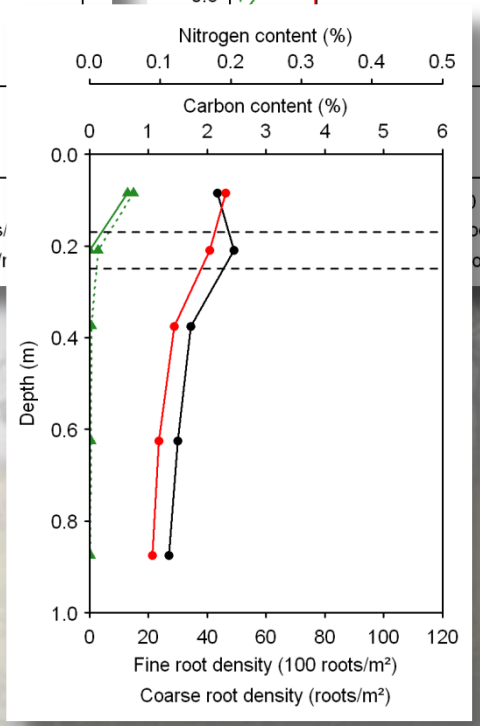
Profile 4



Profile 5



Profile 3



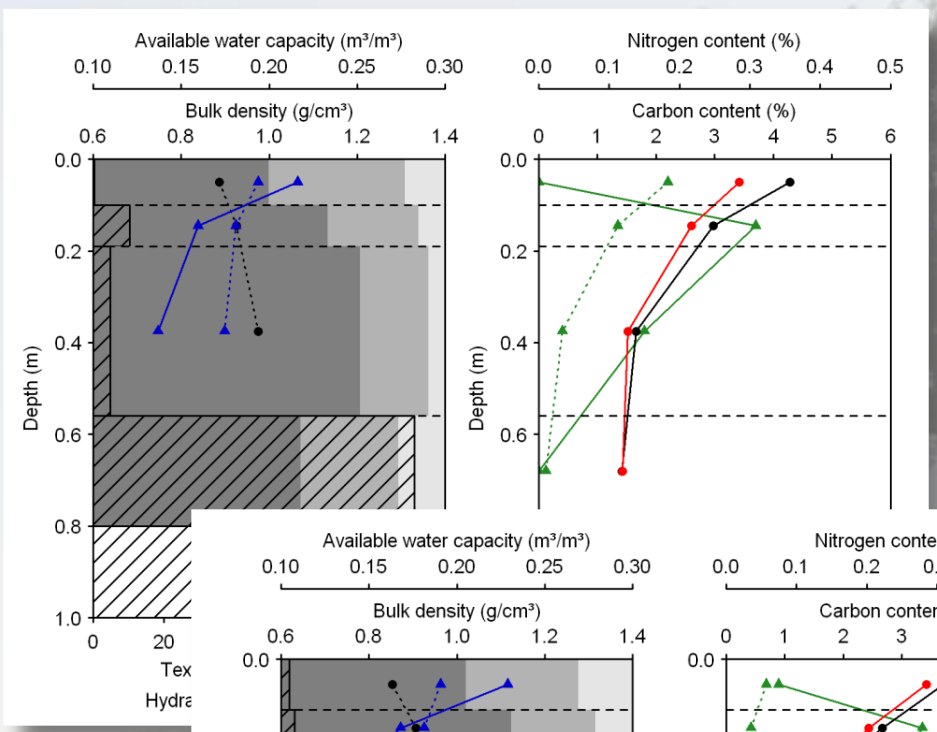
Results

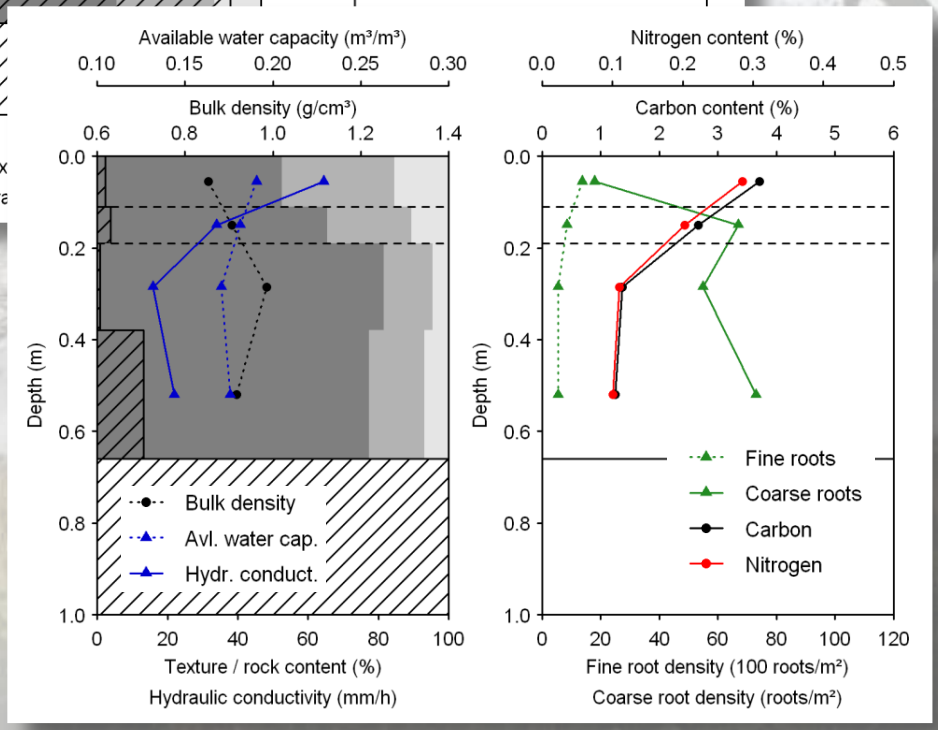
Effects of grazing and non-grazing

Profile 2G

Litter layer (3.0 cm)

Profile 2UG





Conclusions

- Geology and topography are the major controlling factors of soil properties
- Land cover and agricultural activities affect soil structure and nutrient distribution
- Exclusion of grazing has only minor effects on soil properties

Thank you !!!

Contact:

Dr. Sebastian Arnhold
Department of Soil Physics
University of Bayreuth

Phone: + 49 (0) 921 - 55 21 93
Mobile: + 49 (0) 172 - 84 70 949
Email: sebastian.arnhold@uni-bayreuth.de