



CCAFS site atlas

# Kagera Basin / Rakai Uganda

CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

Site Atlas

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Titles in this series aim to disseminate interim climate change, agriculture and food security research and practices and stimulate feedback from the scientific community.

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**Contact:**

CCAFS Coordinating Unit - Faculty of Science, Department of Plant and Environmental Sciences, University of Copenhagen, Rolighedsvej 21, DK-1958 Frederiksberg C, Denmark. Tel: +45 35331046; Email: [ccaafs@cgiar.org](mailto:ccaafs@cgiar.org)

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# Contents

<b>Chapter 1: Introduction</b> .....	iv
Regional Map.....	1
Topographic Map .....	2
Satellite Map .....	3
<b>Chapter 2: Climate and Climate Variability</b>	
Annual Rainfall .....	4
Annual Temperature .....	5
Aridity Index .....	6
<b>Chapter 3: Bio-Physical Characteristics</b>	
Altitude.....	7
Soil Type .....	8
Agro-Ecological Zones .....	9
Landcover .....	10
Landuse .....	11
Length of Growing Period 2000 .....	12
Length of Growing Period 2030 .....	13
Crop Suitability .....	14

Livestock Production Systems .....	15
Livestock Density .....	16
<b>Chapter 4: Socio-Economic Factors</b>	
Livelihood Zones.....	17
Human Population Density .....	18
Market Access .....	19
Poverty .....	20
Conservations Areas.....	21
<b>References and Data Sources</b> .....	22



## Introduction

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) seeks to promote a food-secure world through the provision of science-based efforts that support sustainable agriculture and enhance livelihoods while adapting to climate change and conserving natural resources and environmental services.

Climate change is an unprecedented threat to the food security of hundreds of millions of people who depend on small-scale agriculture for their livelihoods. Climate change affects agriculture and food security, and likewise, agriculture and natural resource management affect the climate system.

CCAFS has initially focused on three regions; East Africa (EA), West Africa (WA) and South Asia (SA) to carry out its research. The 15 CCAFS sites in these areas represent areas that are becoming both drier and wetter, and are focal locations that will generate results that can be applied and adapted to other regions worldwide. In this year, 2013, CCAFS is expanding its portfolio to additional sites in Latin America and South-East Asia.

These sites serve as the initial focus of CCAFS partnership-building and long-term research activities falling within the following CCAFS Research Themes; Adaptation to Progressive Climate Change, Adaptation through Managing Climate Risk, Pro-Poor Climate Change Mitigation and Integration for Decision Making. At all 15 CCAFS sites, baseline surveys have been conducted, including three levels of data collection and analysis at household, village and organizational levels (see: <http://ccaafs.cgiar.org/resources/baseline-surveys>).

More information on CCAFS work in all the three regions can be accessed at [www.ccaafs.cgiar.org](http://www.ccaafs.cgiar.org)

To better understand the CCAFS sites' characteristics, a list of geospatial indicators for climate variability, bio-physical characteristics and socio-economic variables have been mapped into site atlases.

This Atlas was developed for the CCAFS site at Kagera Basin / Rakai in Uganda, in East Africa Region.

# CCAFS Sites: East Africa



- Ethiopia: Borana (ET01)
- Kenya: Nyando (KE01)
- Kenya: Makueni (KE02)
- Uganda: Albertine Rift (UG01)
- Uganda: Kagera Basin (UG02)
- Tanzania: Usambara (TZ01)

CCAFS Country Sites

Citation: GeoMapa (2013a)



# Topography Kagera Basin

## CCAFS Site UG02, Kagera Basin / Rakai, Uganda



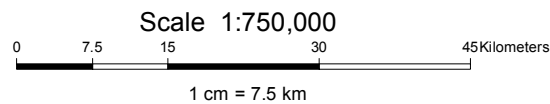
### Coordinates of the CCAFS Baseline Sampling frame

31.484E 0.621S  
 31.484E 0.713S  
 31.394E 0.713S  
 31.394E 0.621S



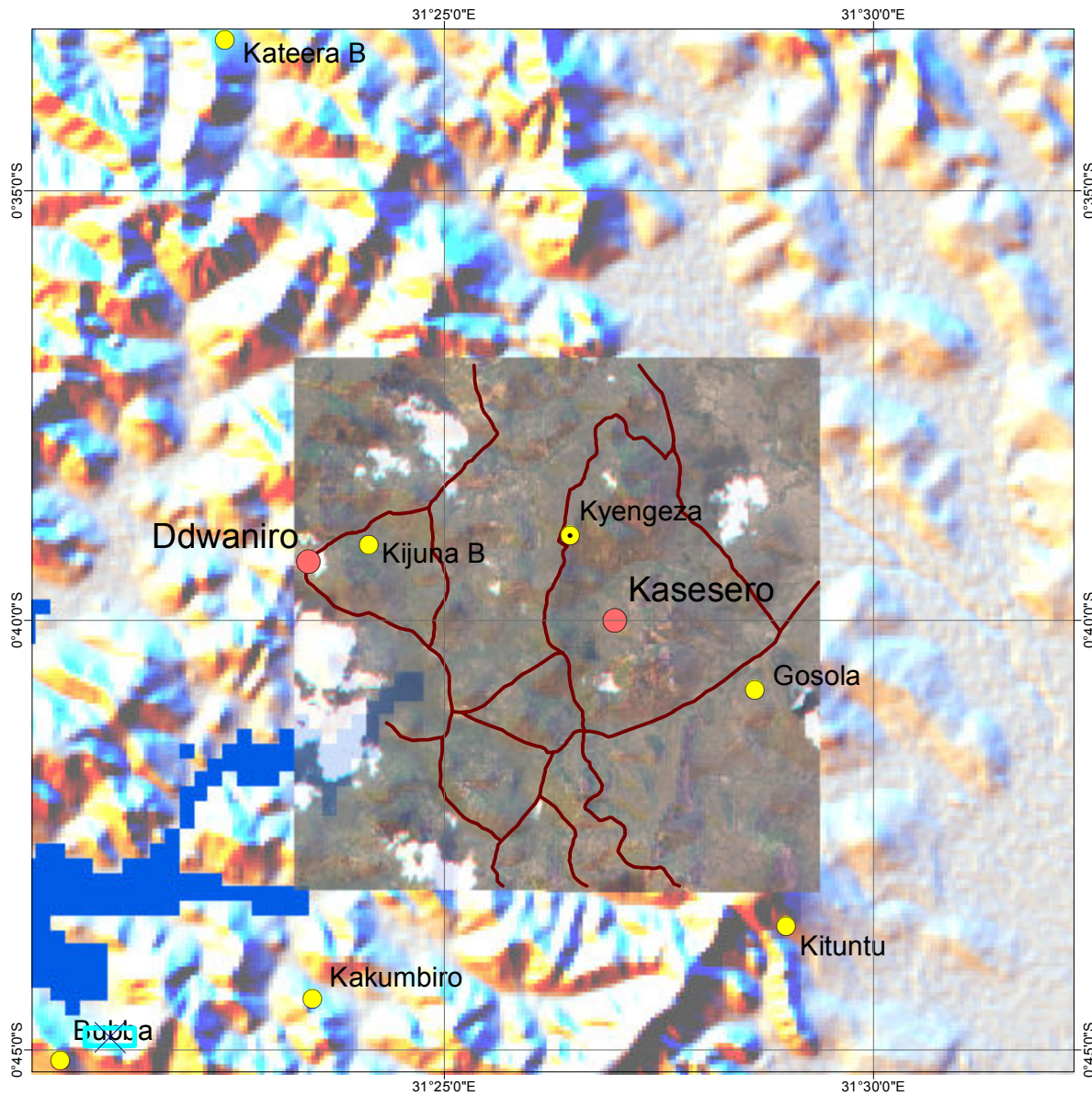
Sampling frame size: 10km x 10km

- Town
- Settlement
- International boundary
- Road
- River









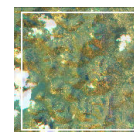
# Satellite Image Rakai



RapidEye imagery from 30-01-2011  
 at 5m ground resolution

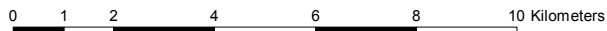
HBS= Household Baseline Survey  
 VBS= Village Baseline Survey  
 OBS= Organizational Baseline Survey

-  Road
-  Settlement
-  CCAFS VBS/OBS village
-  CCAFS HBS villages



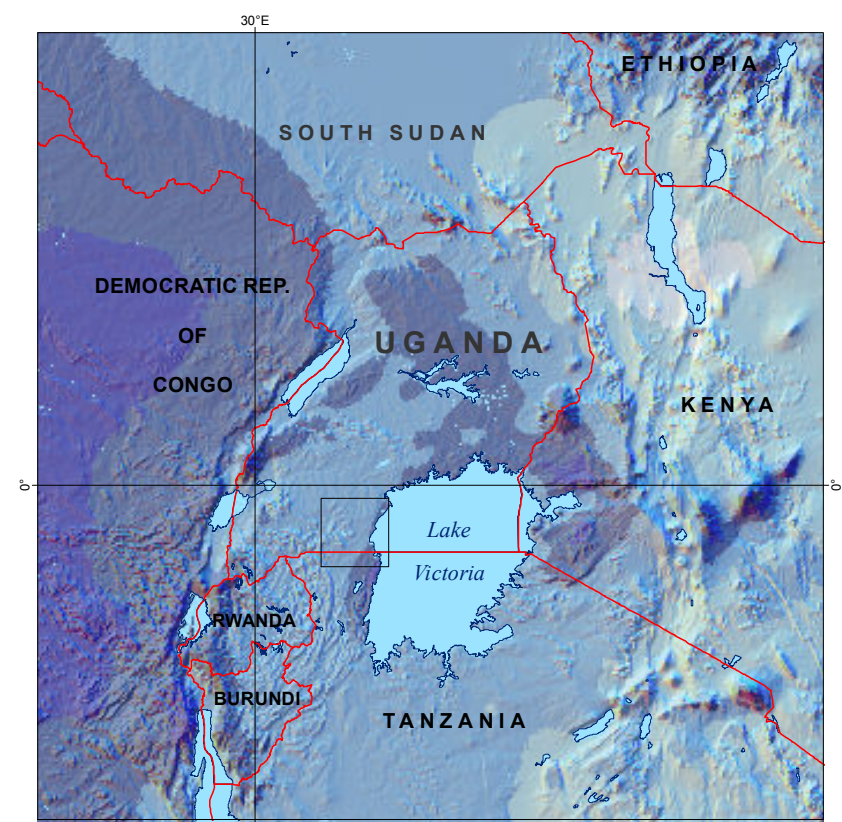
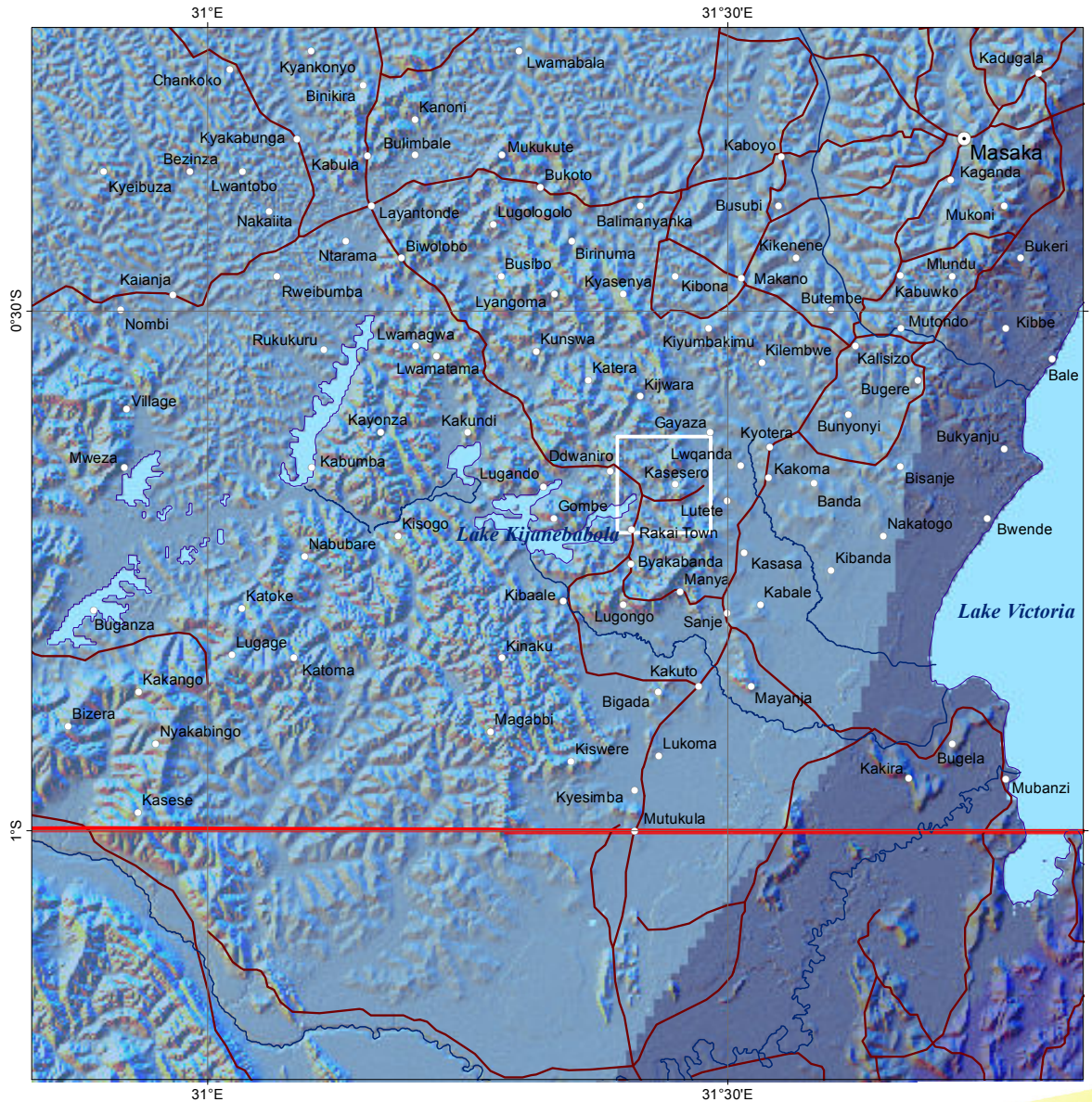
CCAFS Baseline Sampling Frame

Scale 1:150,000



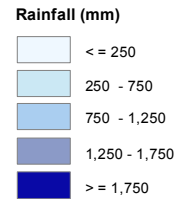


# Annual Rainfall

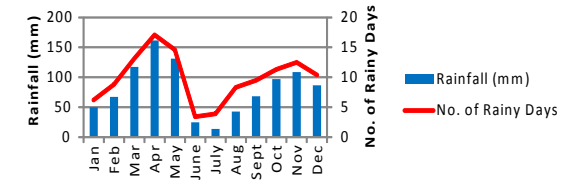


— International boundary  
 — Road  
 — River

Corresponds to the map on the left



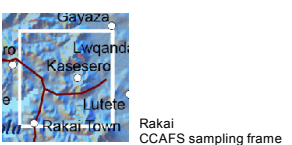
**Rakai Mean Monthly Rainfall Distribution**



Citation: Jones et al (2002)

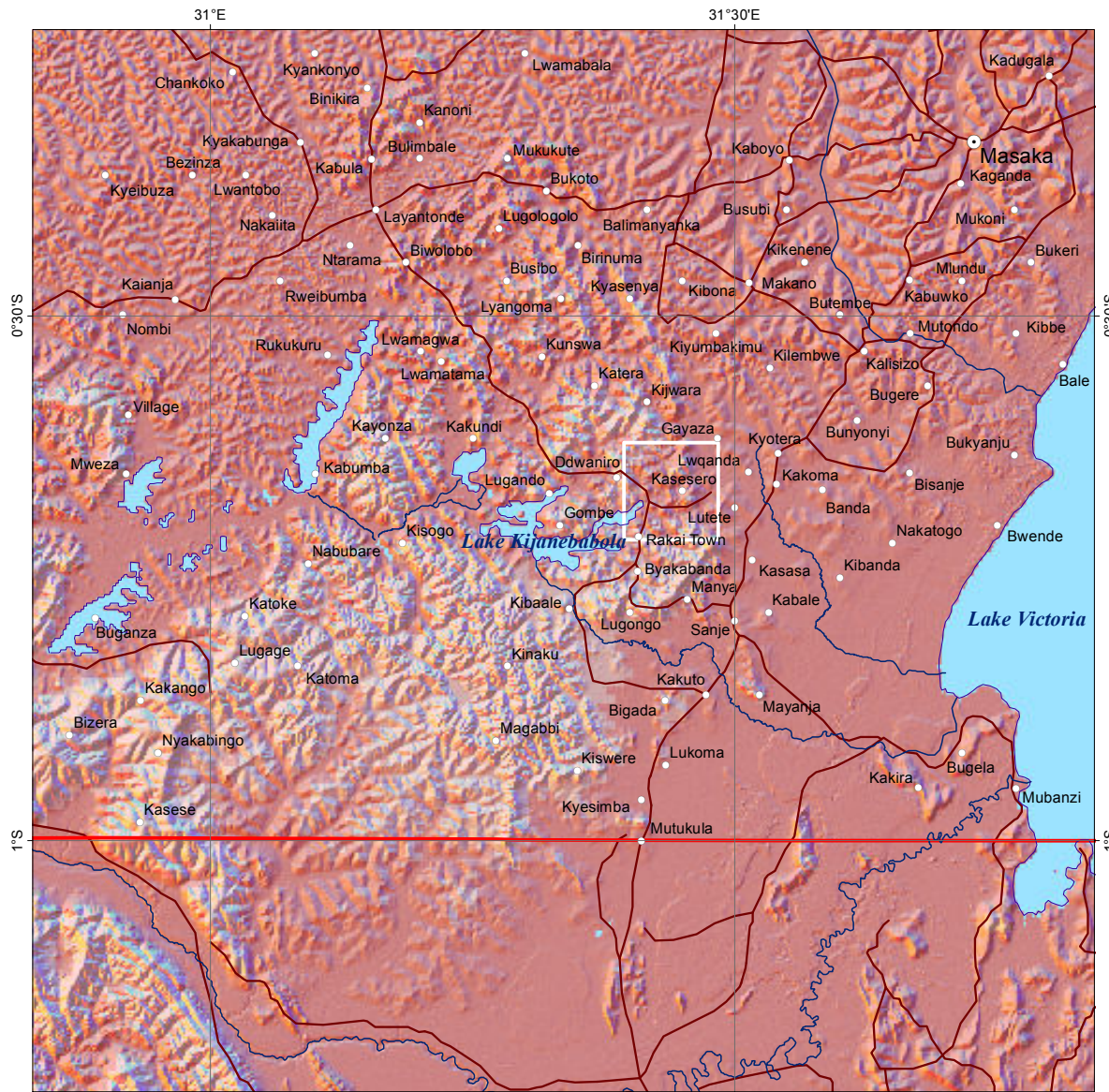
Annual Rainfall data of current interpolations of observed data, representative of 1950 - 2000

Citation: Hijmans et al (2005)





# Annual Temperature

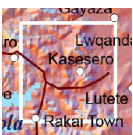


- Town
- Settlement
- International boundary
- Road
- River

Scale 1:750,000



1 cm = 7.5 km



Rakai CCAFS sampling frame

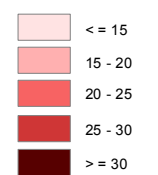
Annual Temperature represents annual temperature data of current interpolations of observed data, averaged for 1950 - 2000



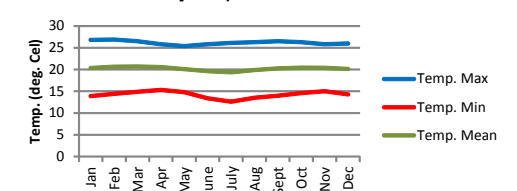
Scale 1:12,500,000  
0 125 250 500 Kilometers

Corresponds to the map on the left

### Temperature (°C)



### Rakai Mean Monthly Temperature Distribution

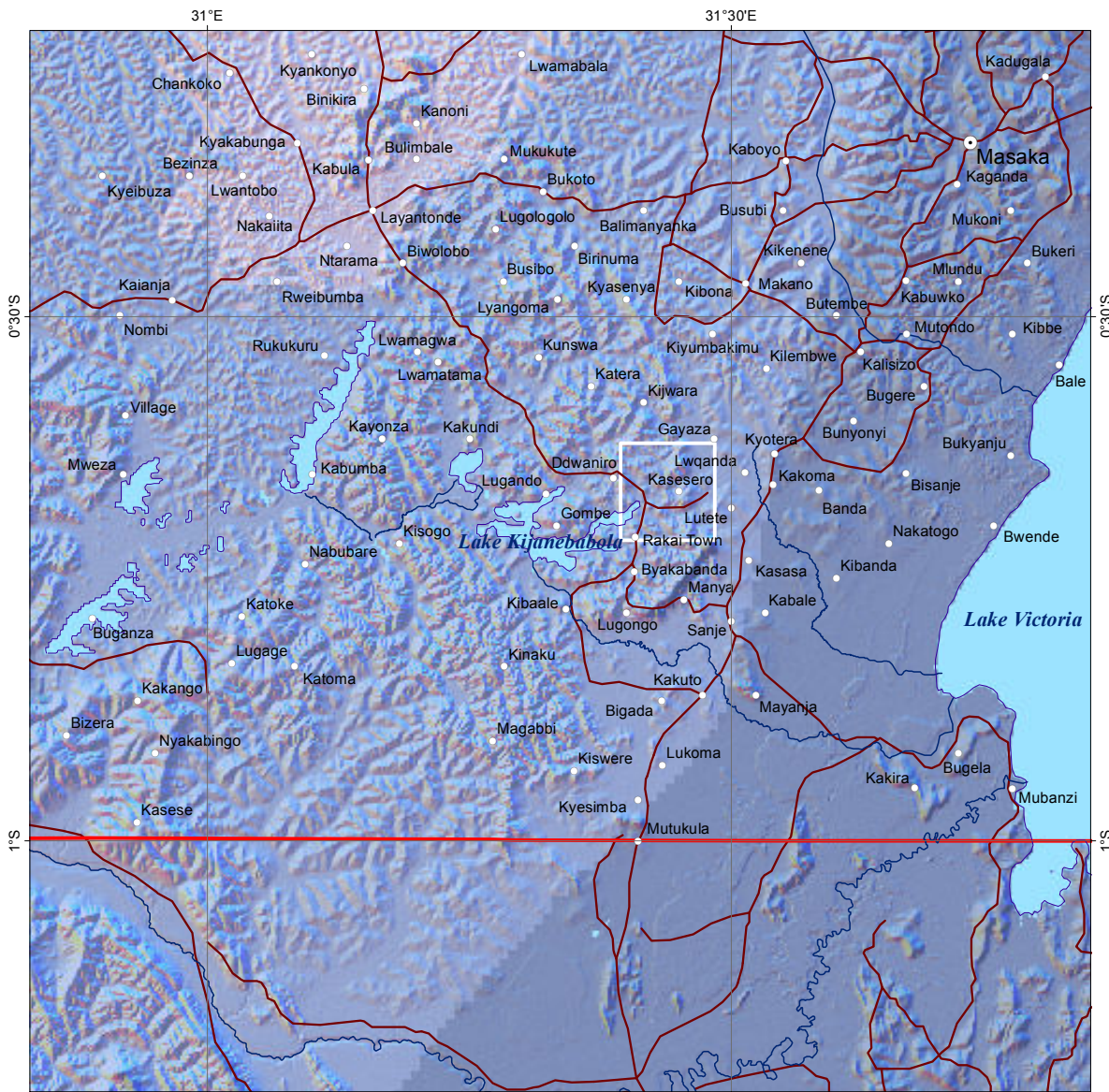


Citation: Jones et al (2002)

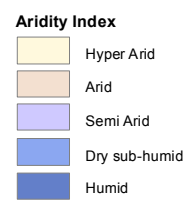
Citation: Hijmans et al (2005)



# Aridity Index

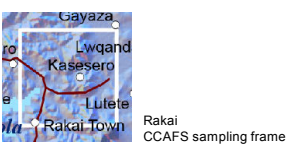


Scale 1:12,500,000  
0 125 250 500 Kilometers  
— International boundary  
□ Corresponds to the map on the left



Aridity Index indicates the level of dryness, taking evapotranspiration into account, at a given location of known rainfall

○ Town  
○ Settlement  
— International boundary  
— Road  
— River  
Scale 1:750,000  
0 7.5 15 30 45 Kilometers  
1 cm = 7.5 km



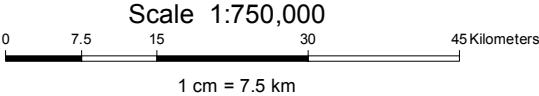
Citation: Trabucco et al (2009)



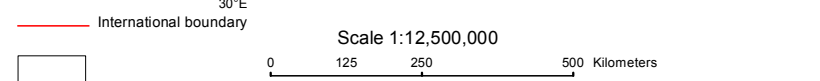
# Altitude



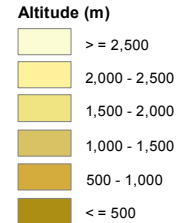
- Town
- Settlement
- International boundary
- Road
- River



Rakai CCAFS sampling frame



- International boundary
- Corresponds to the map on the left

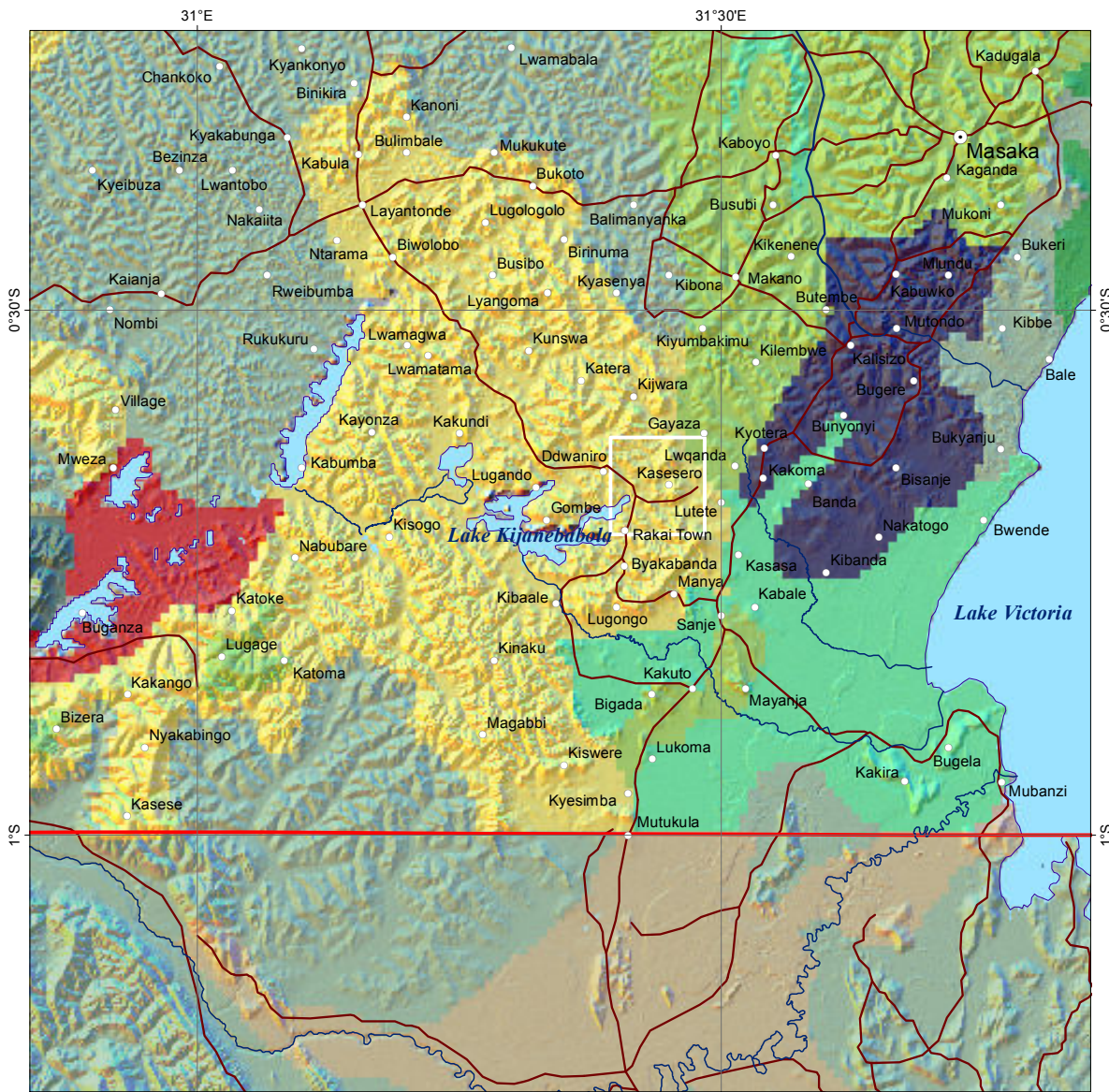


Altitude indicates the height above sea level in meters

Citation: Jarvis et al (2008)

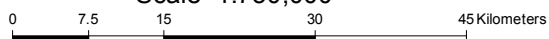


# Soil Type



- Town
- Settlement
- International boundary
- Road
- River

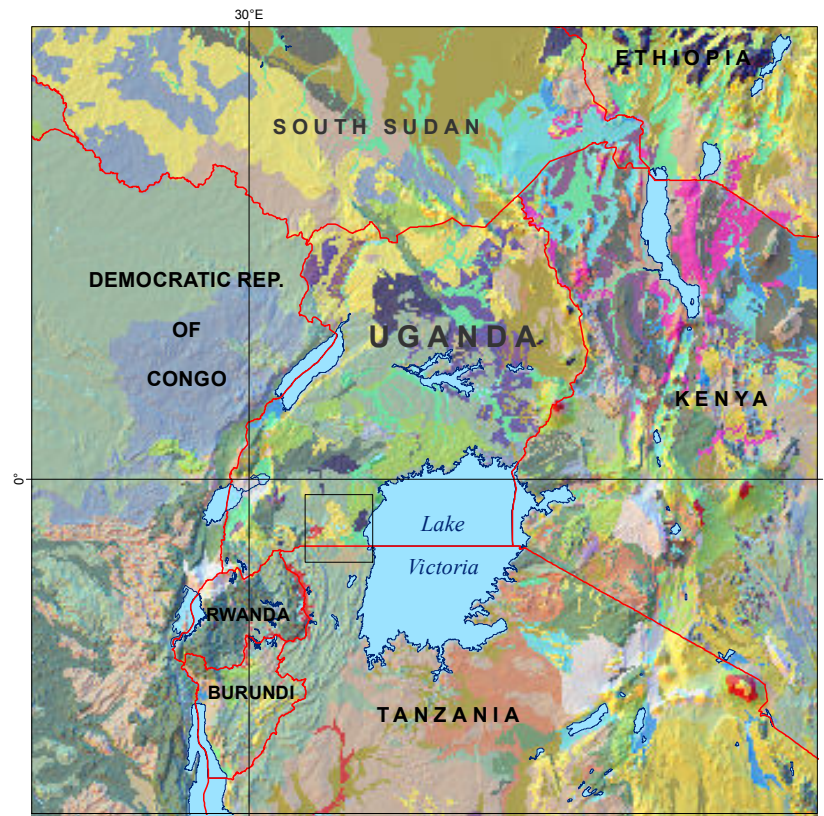
Scale 1:750,000



1 cm = 7.5 km



Rakai CCAFS sampling frame



Scale 1:12,500,000  
0 125 250 500 Kilometers

- International boundary
- Corresponds to the map on the left

**Soil Type \***

- Acrisols
- Alisols
- Cambisols
- Ferralsols
- Fluvisols
- Gleysols
- Histosols
- Leptosole
- Nitisols
- Podzols

\* Legend corresponds to left map

Soil Type refers to the soil group as per the FAO classification. Soil groups are defined by their parent material and morphogenetic characteristics in terms of structural properties and texture (sand, silt and clay content), as well as organic matter content.



# Agro-Ecological Zones

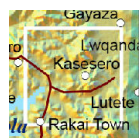


- Town
- Settlement
- International boundary
- Road
- River

Scale 1:750,000



1 cm = 7.5 km



Rakai CCAFS sampling frame



Scale 1:12,500,000  
0 125 250 500 Kilometers

- International boundary
- Corresponds to the map on the left

### Agro-Ecological Zones \*

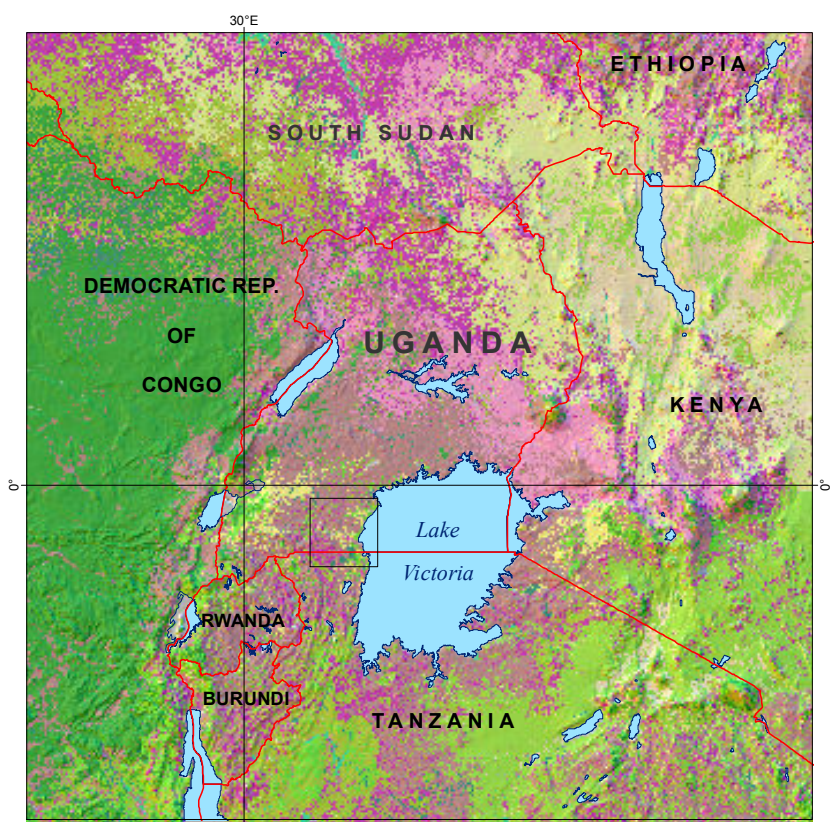
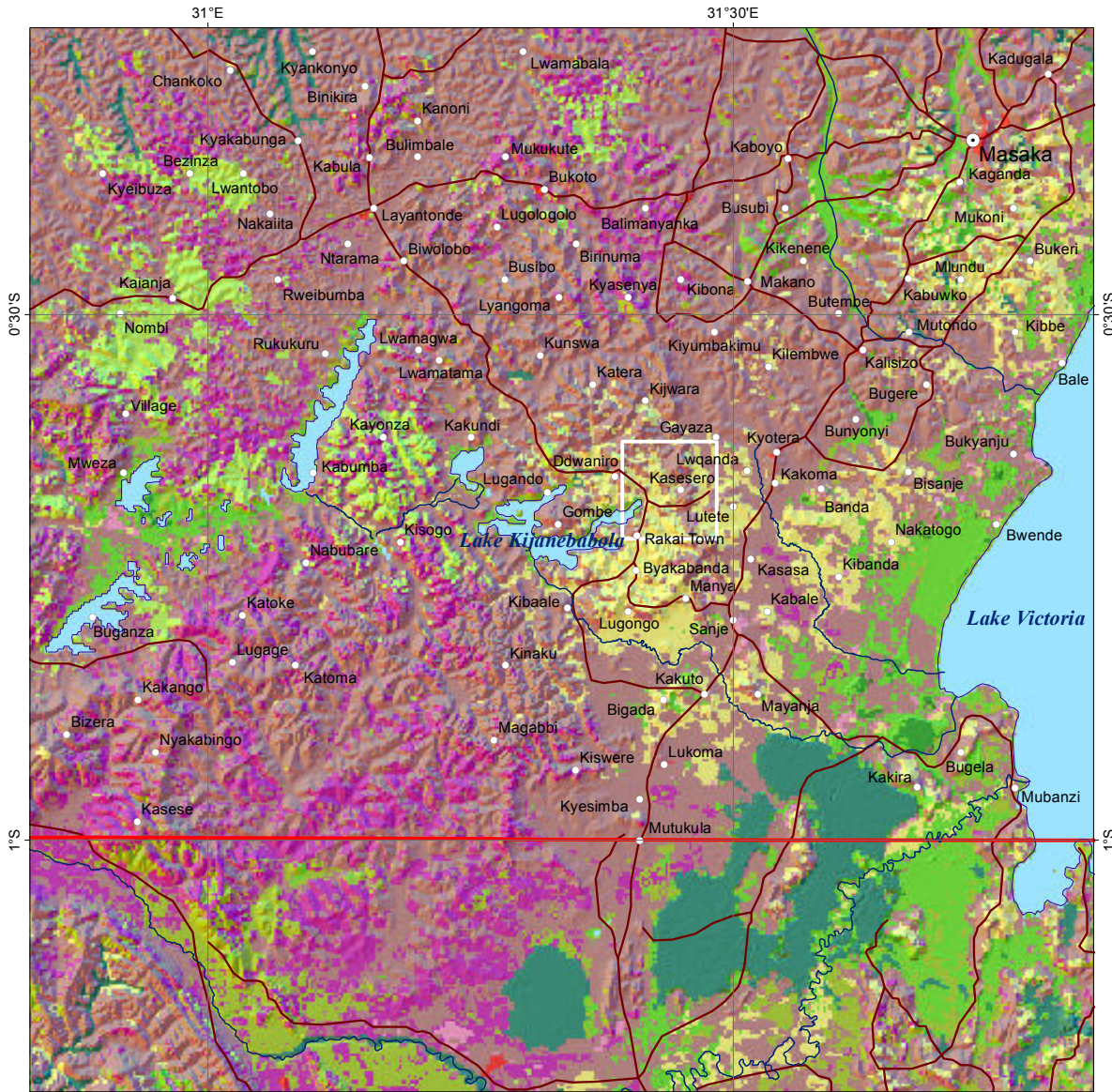
- Mid Altitude Derived Savanna
- Mid Altitude Humid Forest

\* Legend corresponds to left map

Agro-Ecological Zones indicate the division of land areas that have similar characteristics related to land suitability, potential agricultural production and environmental impact.



# Landcover

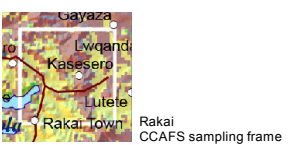


Scale 1:12,500,000  
 0 125 250 500 Kilometers  
 — International boundary  
 □ Corresponds to the map on the left

- Landcover**
- Rainfed croplands
  - Mosaic Croplands/Vegetation
  - Mosaic Vegetation/Croplands
  - Closed broadleaved deciduous forest
  - Open broadleaved deciduous forest
  - Closed to open broadleaved evergreen or semi-deciduous forest
  - Open needleleaved deciduous or evergreen forest
  - Closed to open shrubland
  - Closed to open grassland
  - Urban area
  - Closed to open broadleaved forest regularly flooded (fresh-brackish water)

○ Town  
 ○ Settlement  
 — International boundary  
 — Road  
 — River

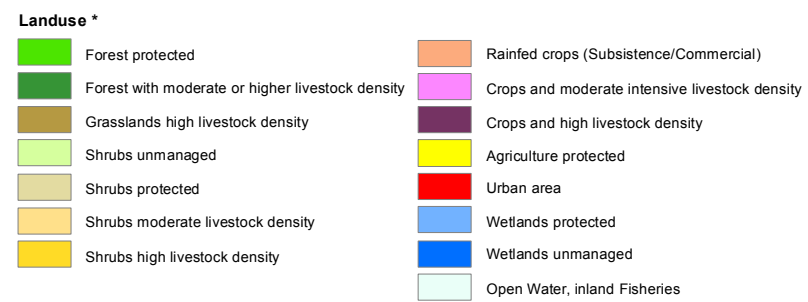
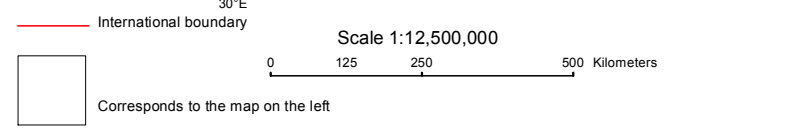
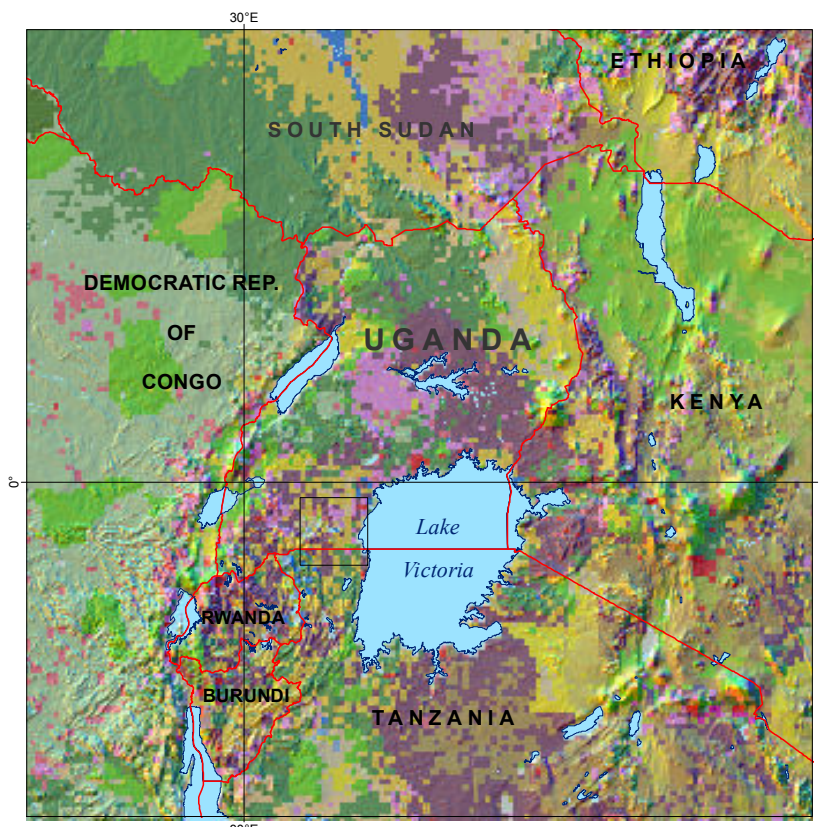
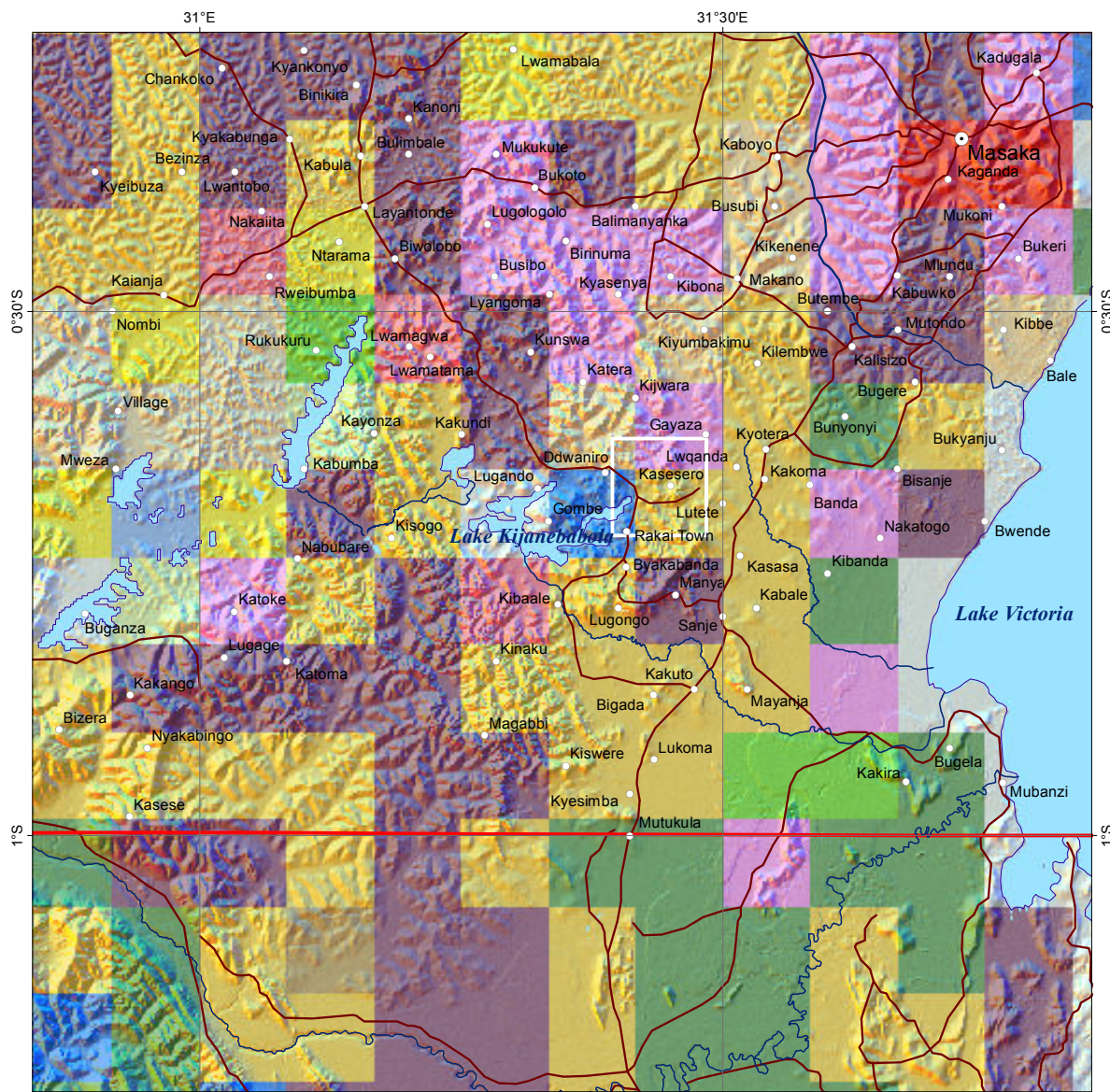
Scale 1:750,000  
 0 7.5 15 30 45 Kilometers  
 1 cm = 7.5 km



Landcover shows the observed (bio)physical cover of the earth's surface, i.e. dominant vegetation, land use and man-made features.

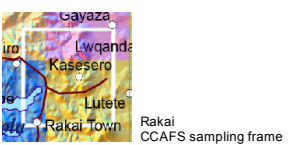
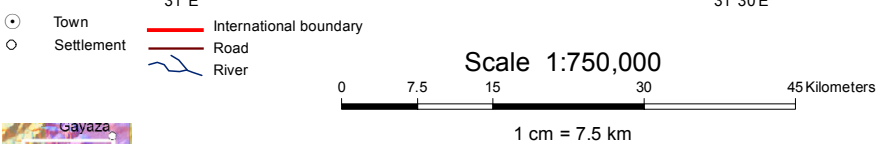
Citation: Arino et al (2009)





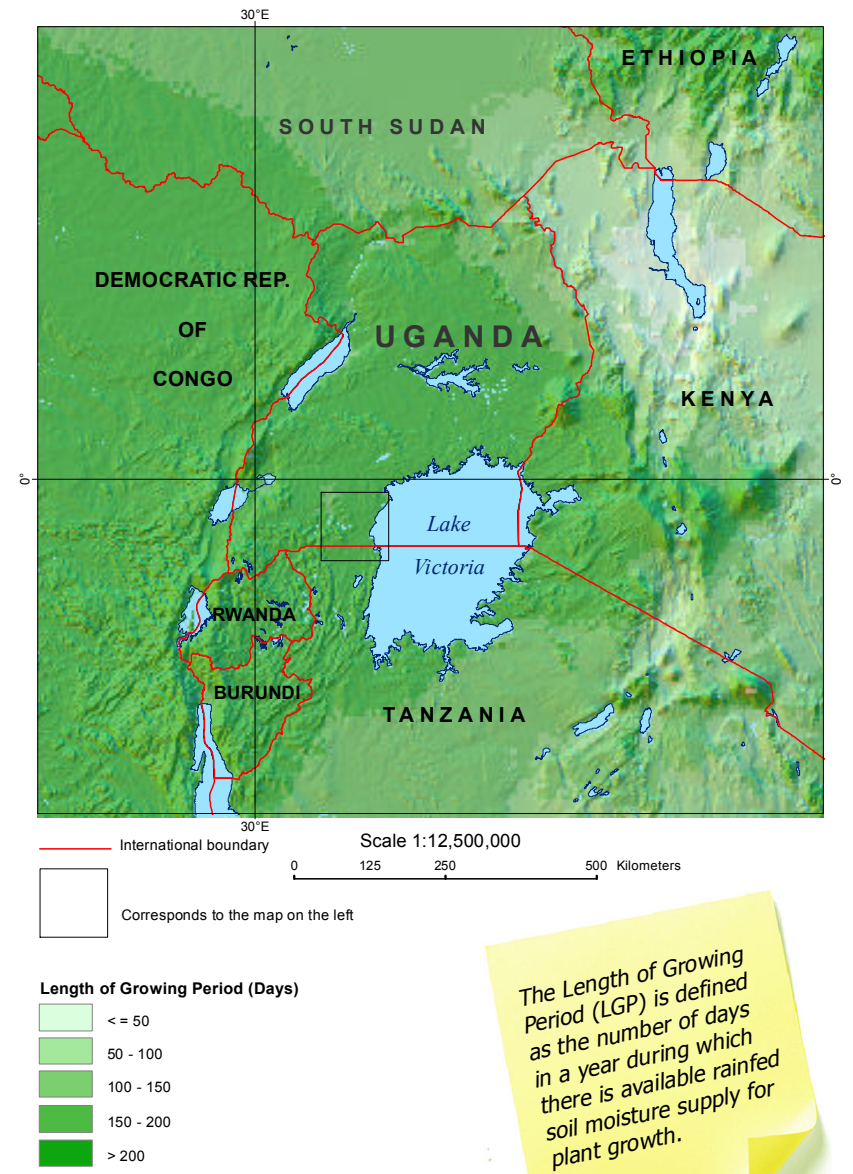
\* Legend corresponds to left map

Landuse is a description of how people utilize the land. It involves the socio-economic activity, i.e. the management and modification of the natural environment into of the natural environment, such as built environment, fields and settlements. At any place, there may be multiple land uses, the dominant one is presented here.





# Length of Growing Period 2000



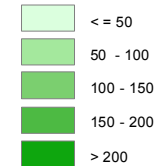
The Length of Growing Period (LGP) is defined as the number of days in a year during which there is available rainfed soil moisture supply for plant growth.



# Length of Growing Period 2030



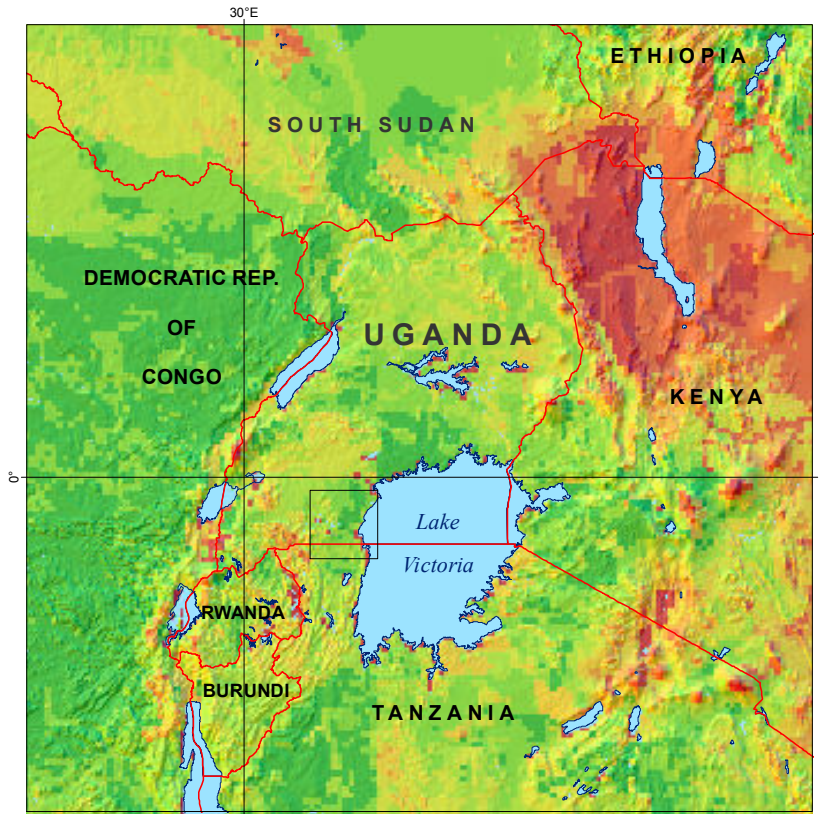
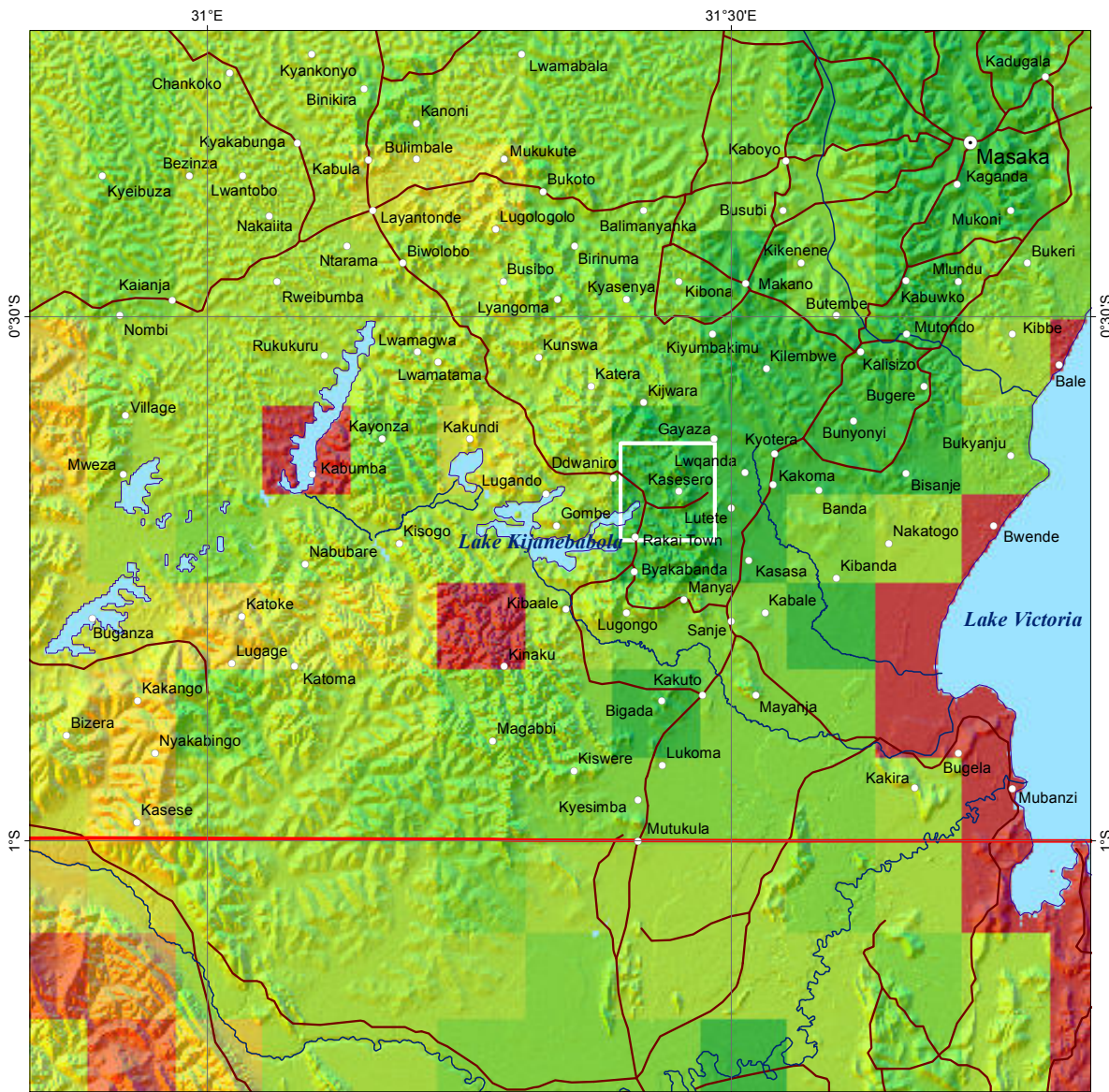
## Length of Growing Period (Days)



The Length of Growing Period in the year 2000. This is the period (in days) during the year when there is available rainfed soil moisture supply for plant growth; here modeled for 2030.



# Crop Suitability



Scale 1:12,500,000  
0 125 250 500 Kilometers

International boundary  
Corresponds to the map on the left

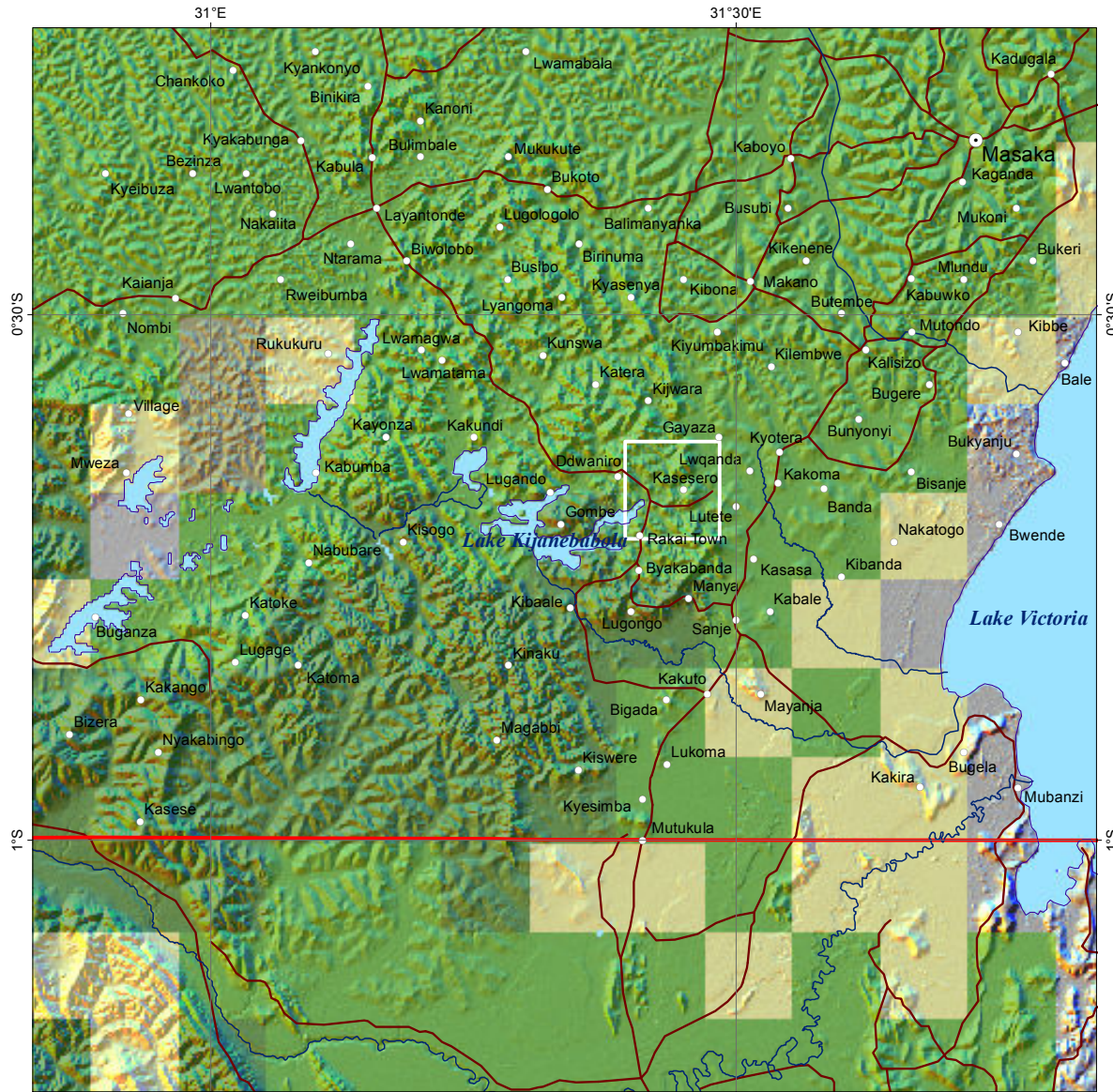
- Crop Suitability**
- Not suitable
  - Very low
  - Low
  - Medium low
  - Medium
  - Medium high
  - High
  - Very high

Crop Suitability refers to the land resource assessment that considers agricultural land use options with relevant agro-ecological condition to estimate expected cropping activities.

Citation: FAO and IIASA (2007)



# Livestock Production Systems



- Town
- Settlement
- International boundary
- Road
- River

Scale 1:750,000



1 cm = 7.5 km



Rakai CCAFS sampling frame



Scale 1:12,500,000



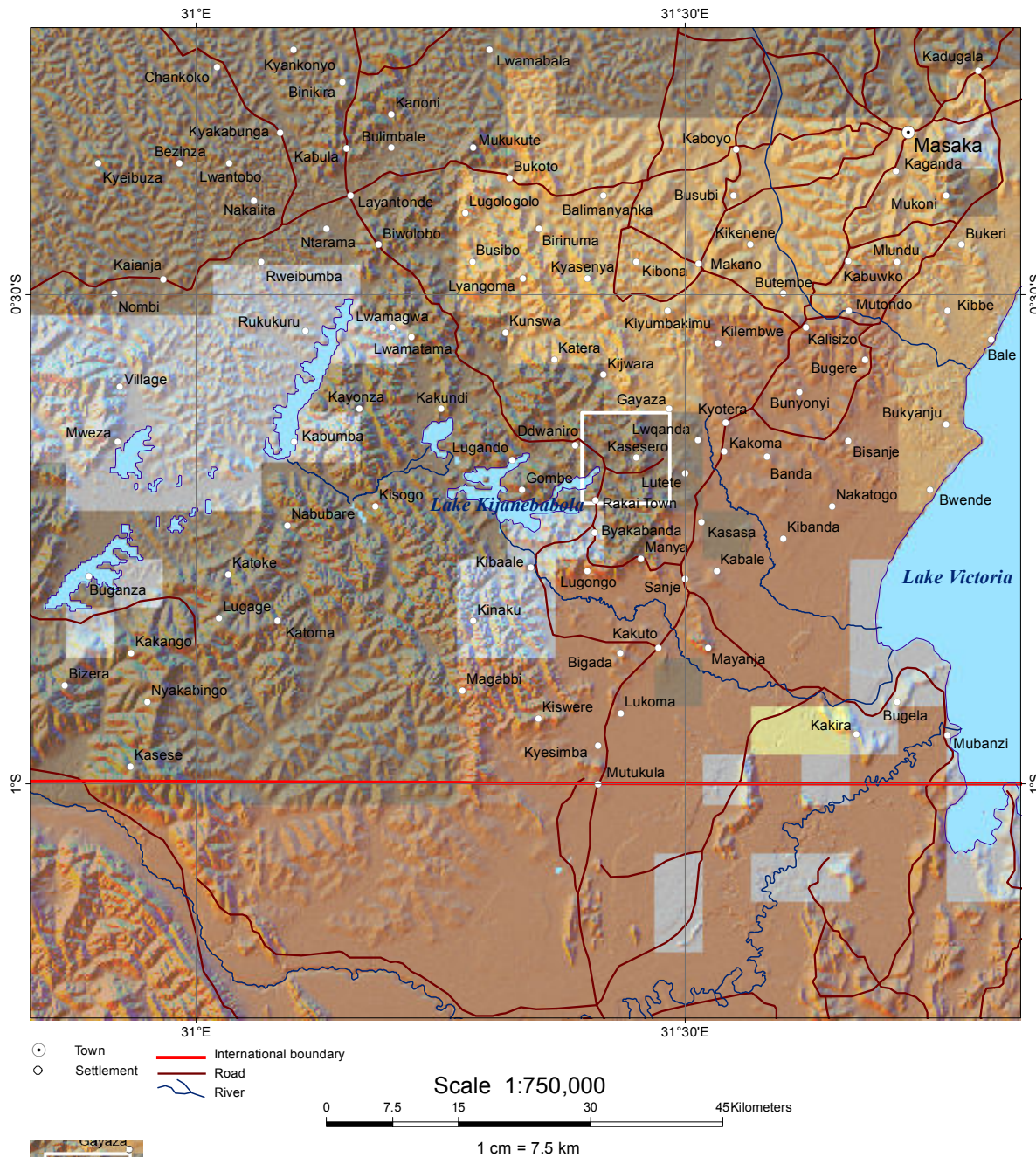
Corresponds to the map on the left

- |  |  |
|--|--|
| <b>Mixed Rainfed</b>   | <b>Livestock only</b>  |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #90EE90; border: 1px solid black;"></span> Arid / Semi-arid     | <span style="display: inline-block; width: 15px; height: 10px; background-color: #FFFF99; border: 1px solid black;"></span> Arid /semi-arid          |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #32CD32; border: 1px solid black;"></span> Humid / sub-humid    | <span style="display: inline-block; width: 15px; height: 10px; background-color: #9ACD32; border: 1px solid black;"></span> Temperate / highland     |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #006400; border: 1px solid black;"></span> Temperate / highland | <span style="display: inline-block; width: 15px; height: 10px; background-color: #654321; border: 1px solid black;"></span> Closed to open shrubland |
| <b>Mixed Irrigated</b>   | <span style="display: inline-block; width: 15px; height: 10px; background-color: #FF0000; border: 1px solid black;"></span> Urban area               |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #ADD8E6; border: 1px solid black;"></span> Arid / semi-arid     | <span style="display: inline-block; width: 15px; height: 10px; background-color: #A9A9A9; border: 1px solid black;"></span> Other                    |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #0000FF; border: 1px solid black;"></span> Humid / sub-humid    |  |
| <span style="display: inline-block; width: 15px; height: 10px; background-color: #00008B; border: 1px solid black;"></span> Temperate / highland |  |

Livestock Production Systems as part of agricultural systems take agro-climatic conditions into account and are classified in terms of feed and livestock resources; livestock commodities produced; production technology; product use and livestock functions; area covered; geographic locations; and human populations supported.

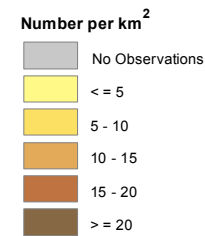


# Livestock Density



— International boundary  
 0 125 250 500 Kilometers

□ Corresponds to the map on the left



Livestock Density is measured in numbers of livestock, including cattle, goats and sheep, per km<sup>2</sup>



# Livelihood Zones

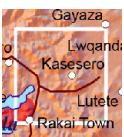


- Town
- Settlement
- International boundary
- Road
- River

Scale 1:750,000



1 cm = 7.5 km



Rakai CCAFS sampling frame



Scale 1:12,500,000

0 125 250 500 Kilometers

Corresponds to the map on the left

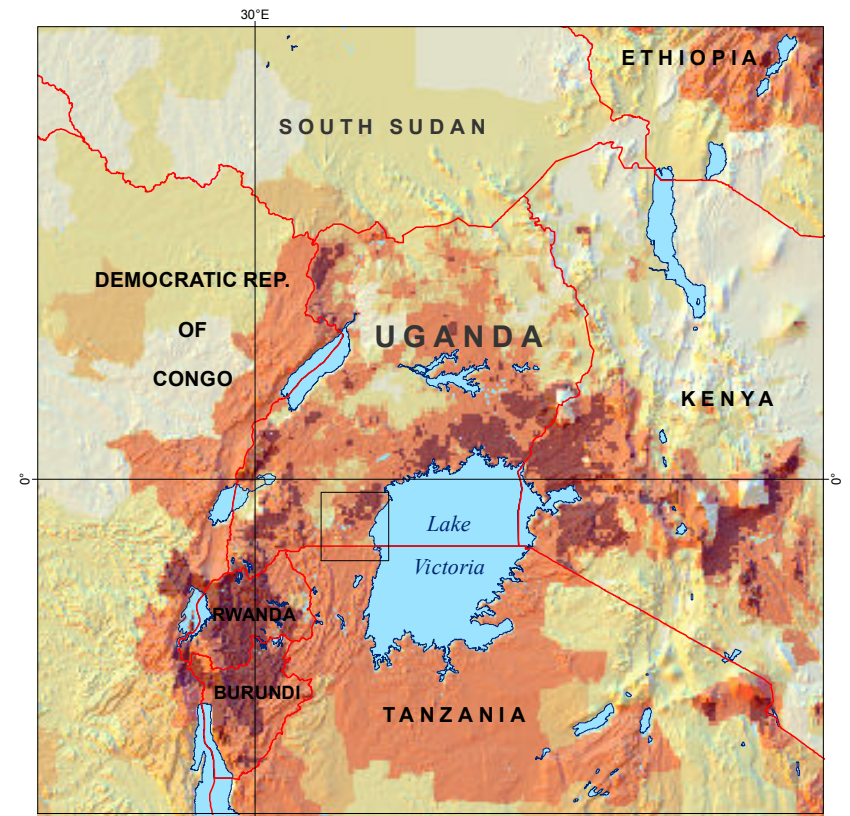
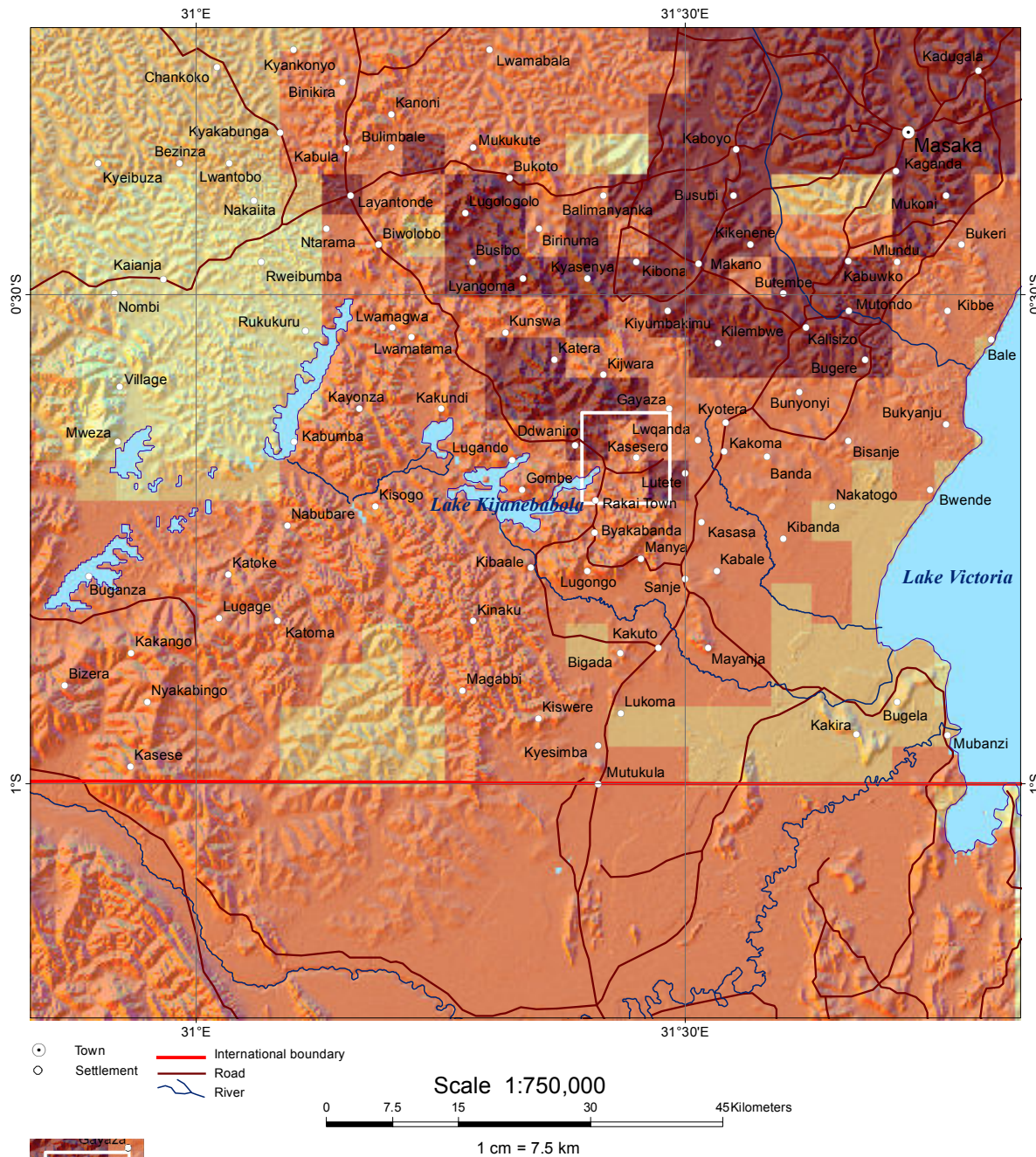
- Livelihood Zones \***
- Albertne Escarpment Cotton Cassava Zone
  - Central and Southern Cattle Cassava Maize Zone
  - Lakeshore and Riverbank Fishing Zone
  - Urban Area
  - Midwest Central and Lake Victoria Crescent Robusta Coffe Banana Maize and Cattle Zone

\* Legend corresponds to left map

Livelihoods are complex and shaped by a variety of factors. These livelihood zone maps delineate geographic areas within which people broadly share the same livelihood patterns including access to food, income, and markets.



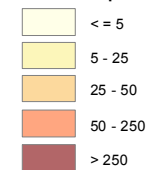
# Human Population Density



— International boundary  
 0 125 250 500 Kilometers

□ Corresponds to the map on the left

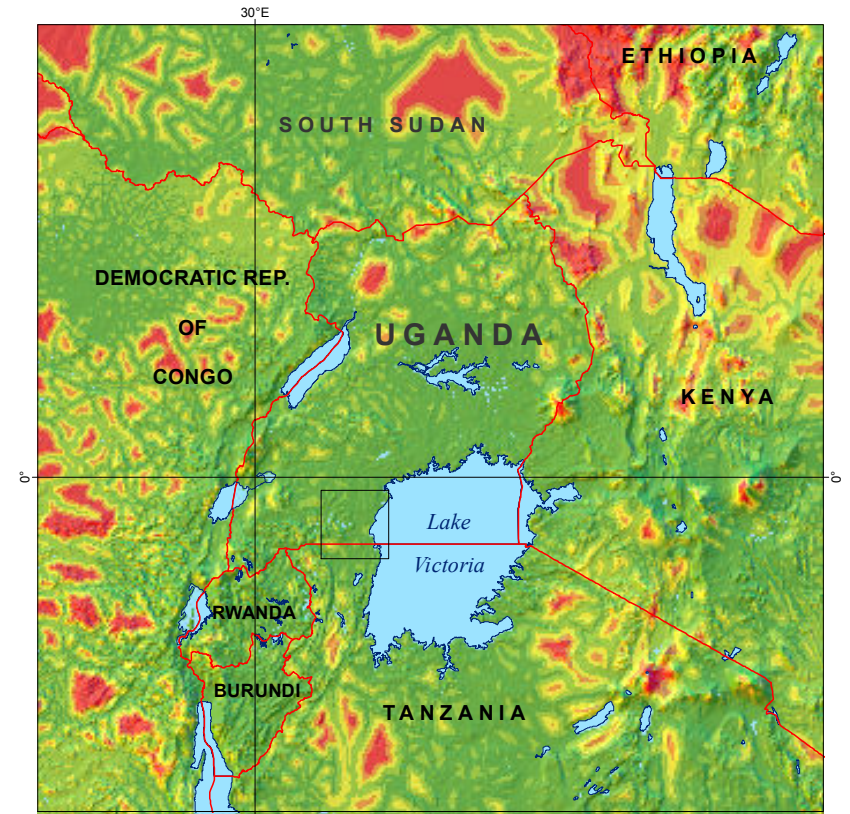
### Number of persons per km<sup>2</sup>



Human Population Density is the gridded number of persons per km<sup>2</sup> in 2005.



# Market Access

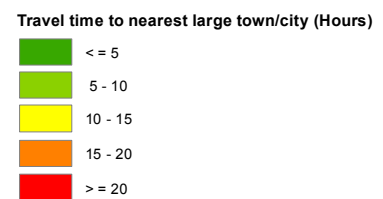


— International boundary  
 — Road  
 — River

Scale 1:12,500,000

0 125 250 500 Kilometers

Corresponds to the map on the left



Travel time is a measure of accessibility determined in the time (hours) taken to the nearest urban centre, town or city of a population of 50,000 people or more (taking different means of transportation into account)

Citation: Nelson (2008)



# Poverty



- Town
- Settlement
- International boundary
- Road
- River

Scale 1:750,000



1 cm = 7.5 km

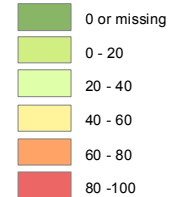


Rakai CCAFS sampling frame



- International boundary
- Scale 1:12,500,000
- 0 125 250 500 Kilometers
- Corresponds to the map on the left

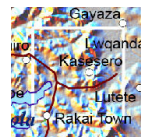
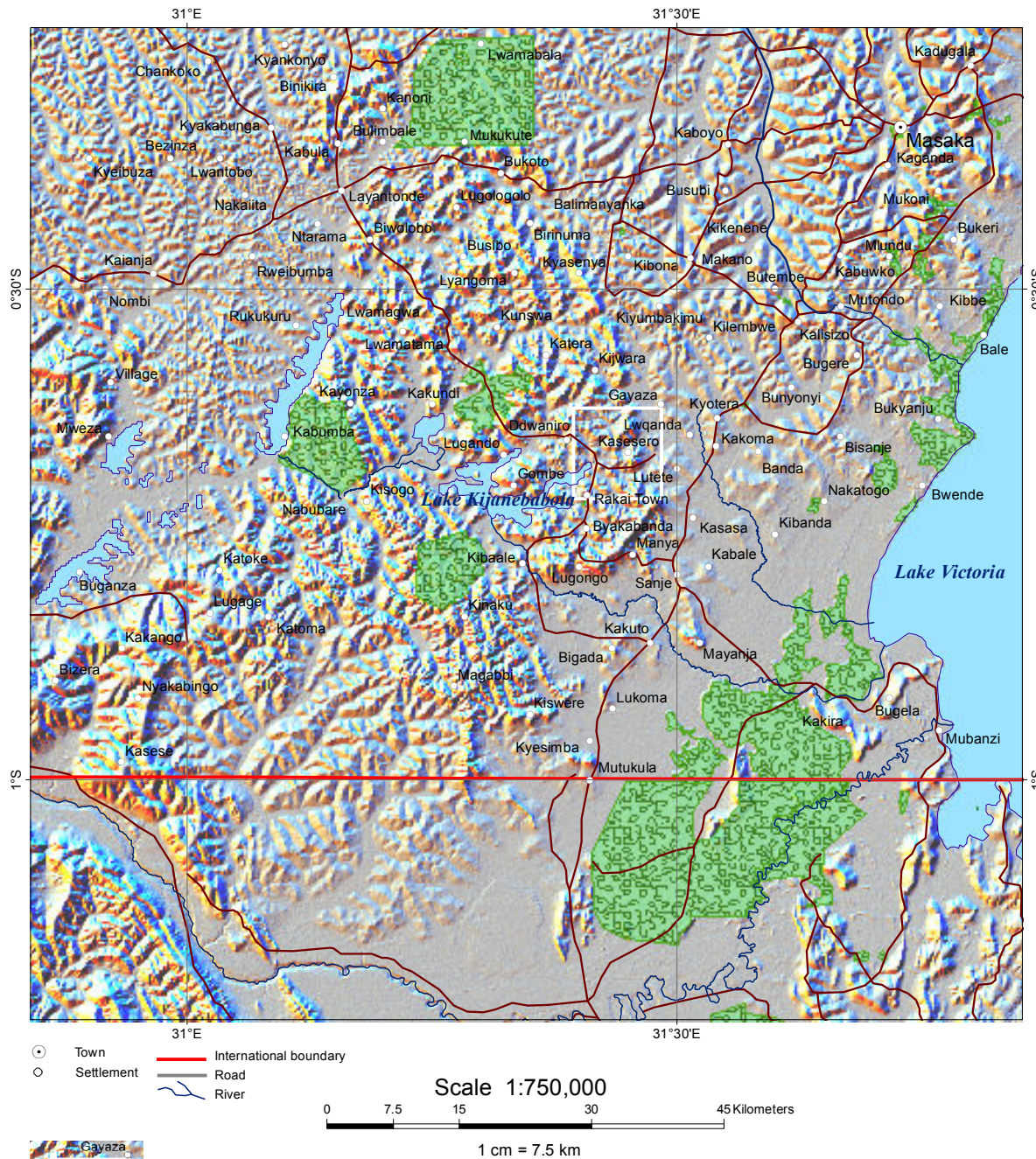
### Percentage of People living on less than 2 US\$ per day



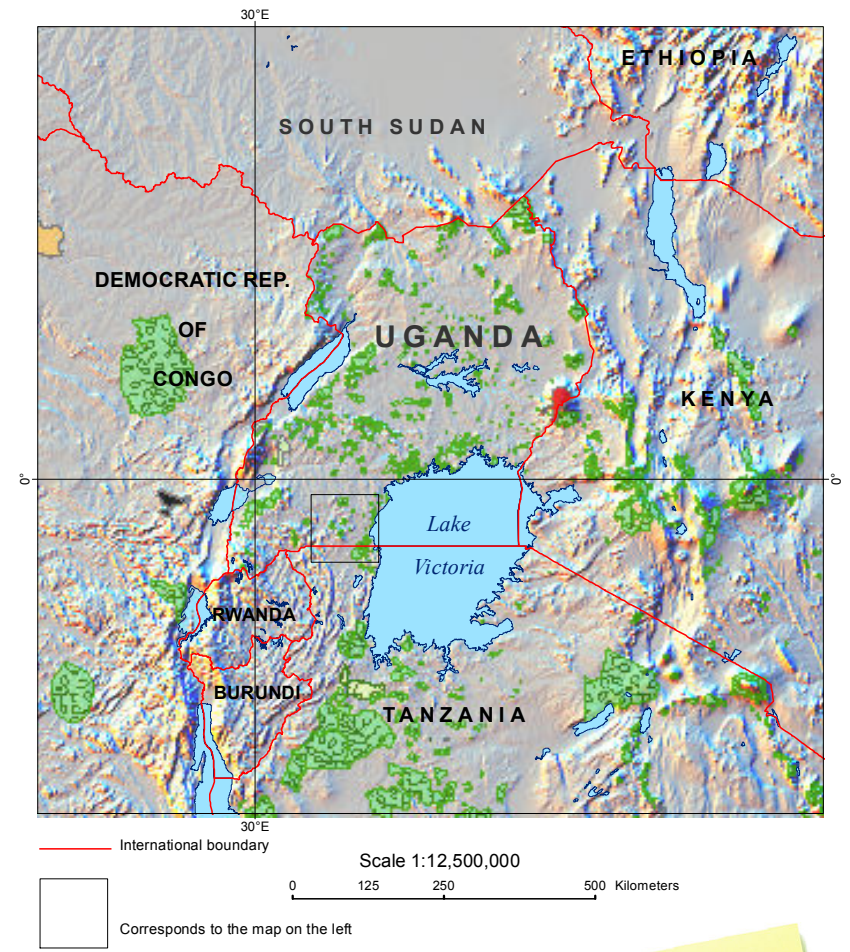
CIESIN constructed global data sets of poverty that are based on estimates of subnational infant mortality and child malnutrition data, recognizing that both are proxies for poverty and welfare rather than direct measures.



# Conservation Areas



Rakai CCAFS sampling frame



## Conservation Areas

- State Forest Reserve
- Forest Reserve
- Nature Reserve
- Hunting Zone
- Gorilla Reserve

Conservation Areas represent protected areas that, according to IUCN, are clearly defined geographic spaces, recognized, dedicated and managed through legal or other effective means, to achieve long-term conservation of nature with associated ecosystem services and cultural value.



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### Regional Map

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