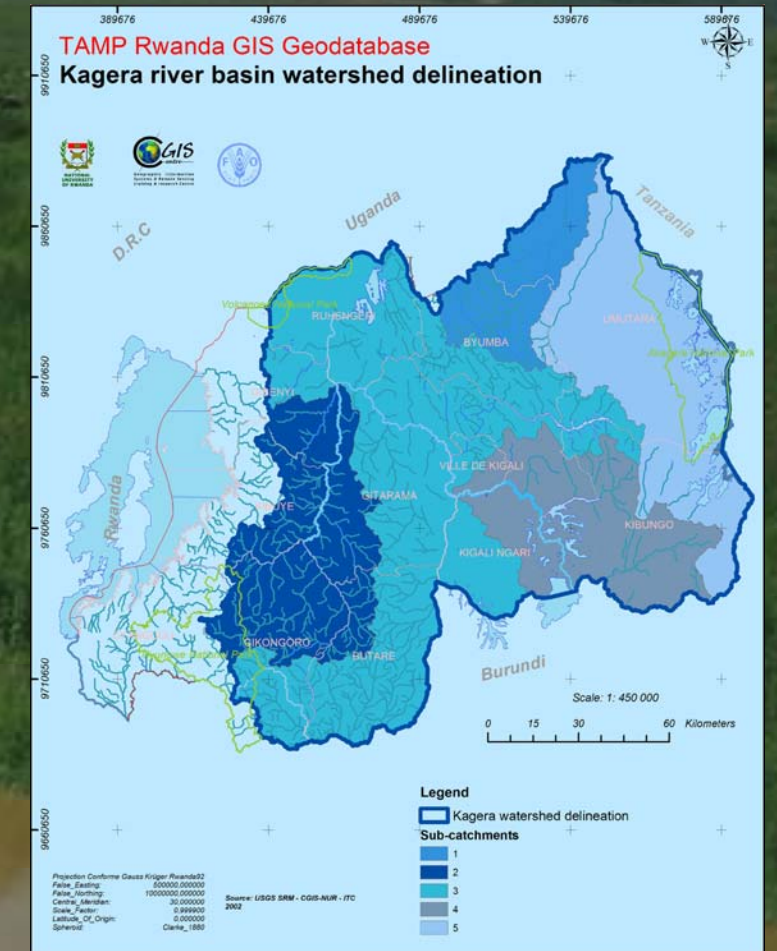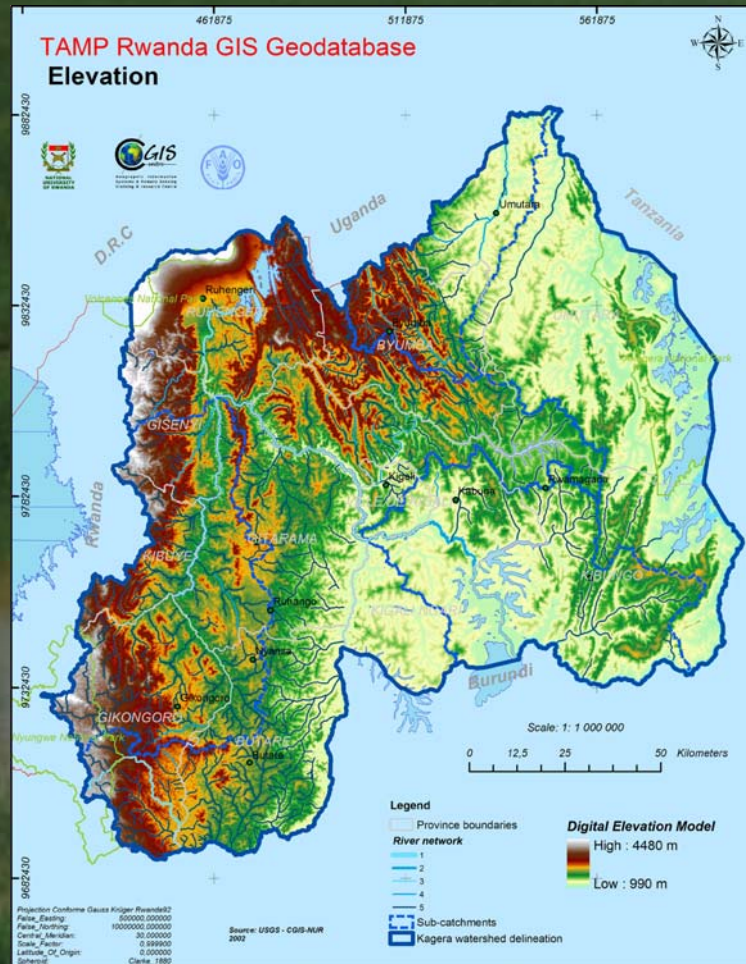# Kagera TAMP Project - FAO

Rwandan GIS database

Baseline maps and spatial trends

Centre for Geographic Information Systems
and Remote Sensing
National University of Rwanda
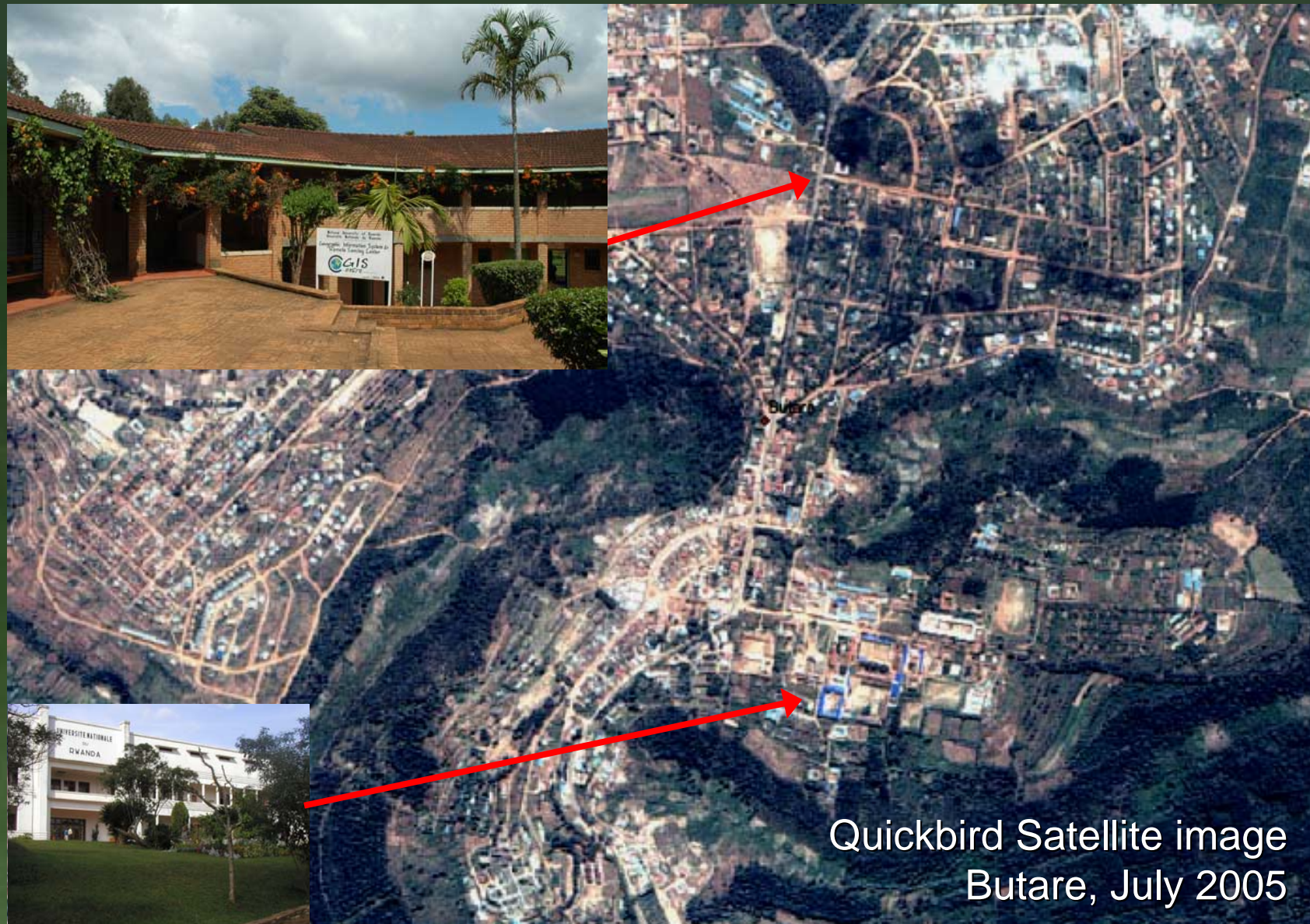
www.cgisnur.org

Outline

- Background and objectives of the GIS-RS component

- Datasets used : TAMP GIS database

- Results
  - Baseline thematic maps
  - Trends (spatial)

- Future administrative boundaries

- Data sharing and access

The CGIS-NUR
An Interfaculty Centre of the National University of Rwanda

Quickbird Satellite image
Butare, July 2005

- Training and Research Centre in the fields of Geographic Information Systems and Remote Sensing, created in 1999;

- Supported by the Government Of Rwanda (GoR) through the Rwanda Development Gateway Group;

- Towards a National Geographic Institute

We are Moving to a Geodata Rich Society
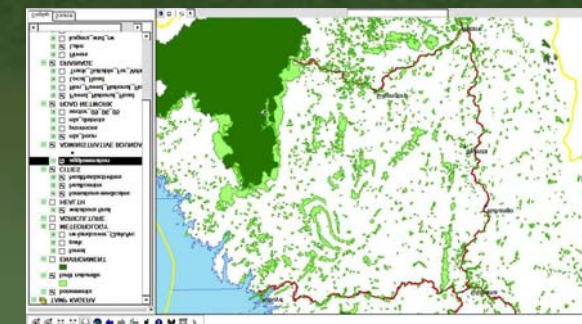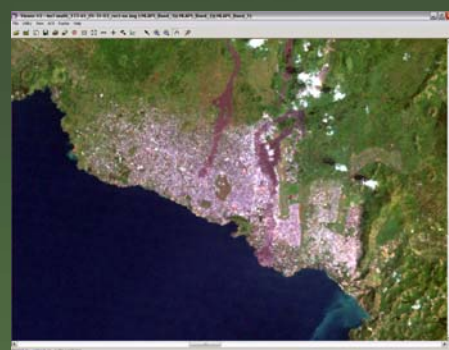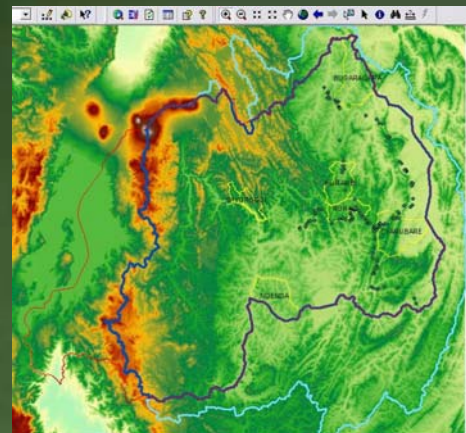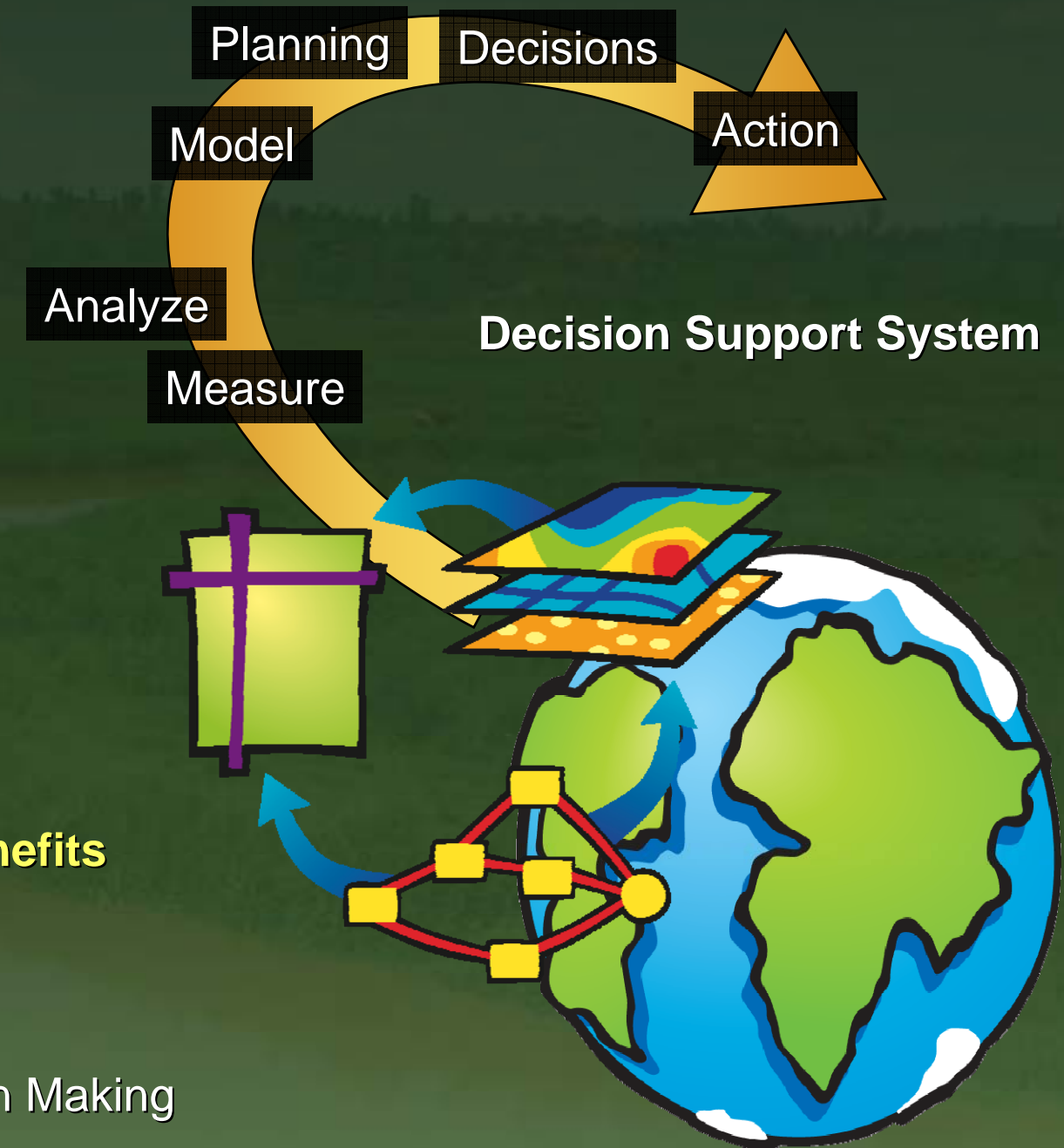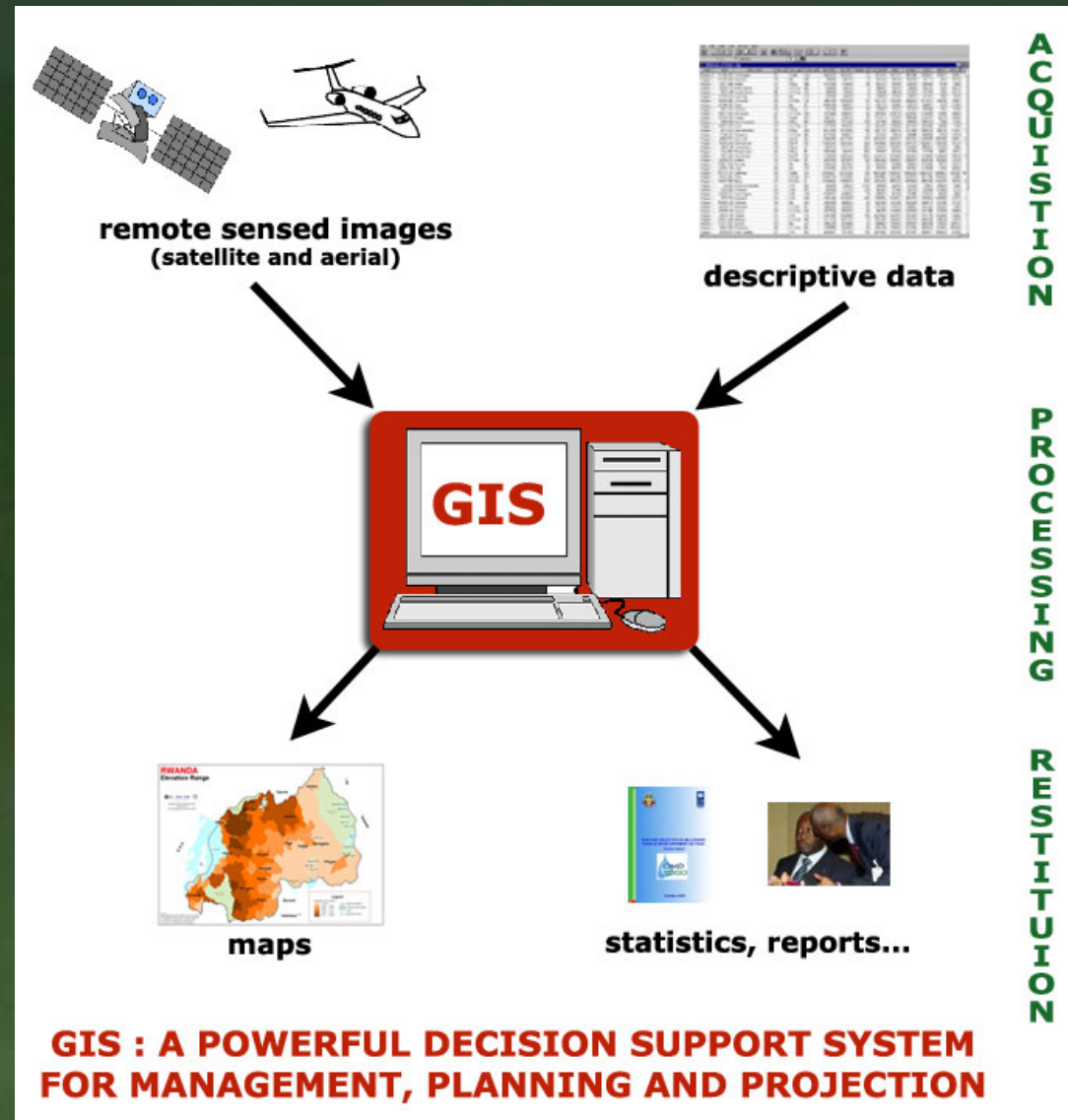## *More "Geospatial" Information*
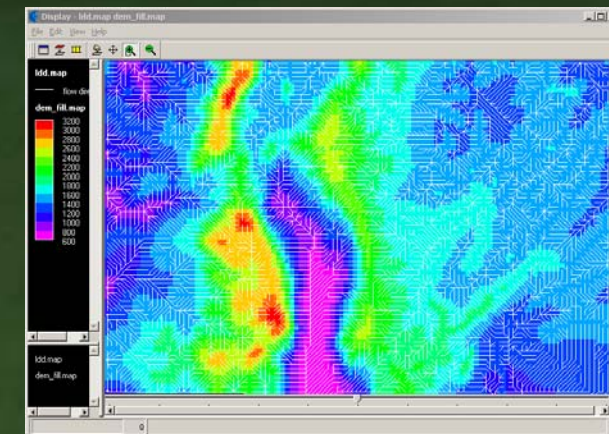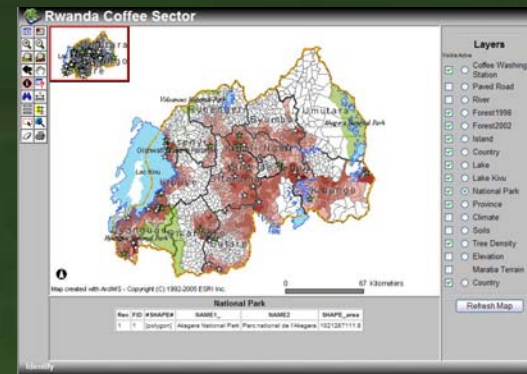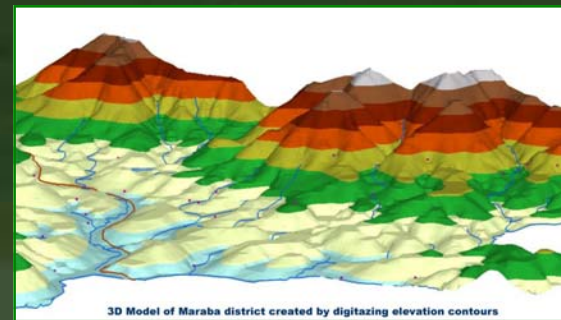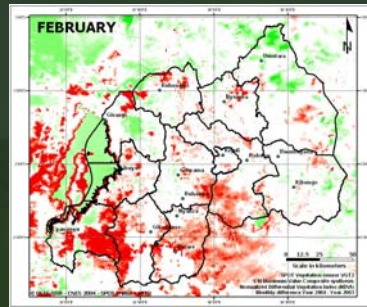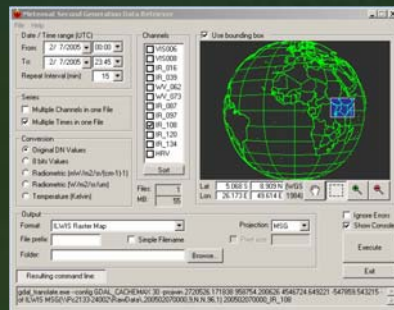
Remote
Sensed
Databases
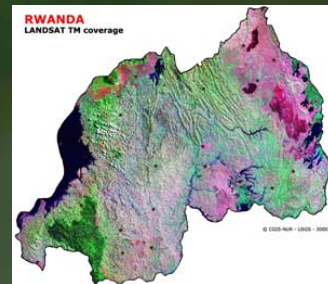
- GPS / Location Data
- Satellite Imagery (100x)
- Geo-Demographic Data
- Real Time Monitoring

Vector Databases

GIS Is Particularly Valuable

As a Tool to Manage and Analyse Spatial Information

Decision Support System

Planning — Decisions — Action — Model — Analyze — Measure

Providing Many Benefits

- Understanding
- Efficiency
- Cost Savings
- Improved Decision Making

Objectives of the GIS and Remote Sensing component
Rwanda

- Contribute to collecting spatial database

- Develop a computerized GIS including:
  - Base-line data
  - Historical data
  - Analysis

- Spatial analysis of recent changes and trends

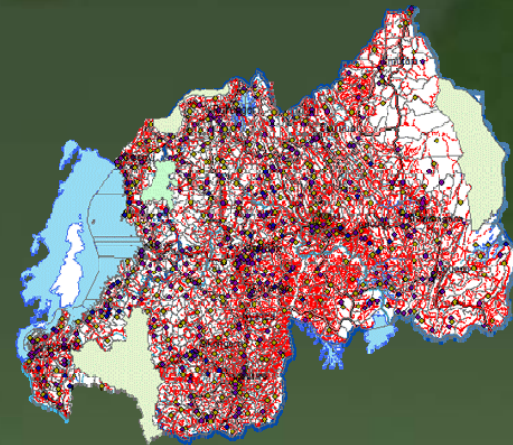# Spatial databases…
Image and vector DB

- **IMAGE DATABASE**
  - satellite image
  - aerial photography
  - scanned maps

- **VECTOR DATABASE**
  - 'foundation' national databases
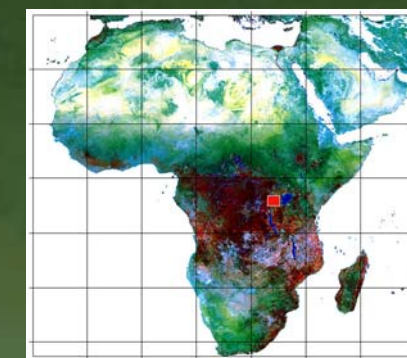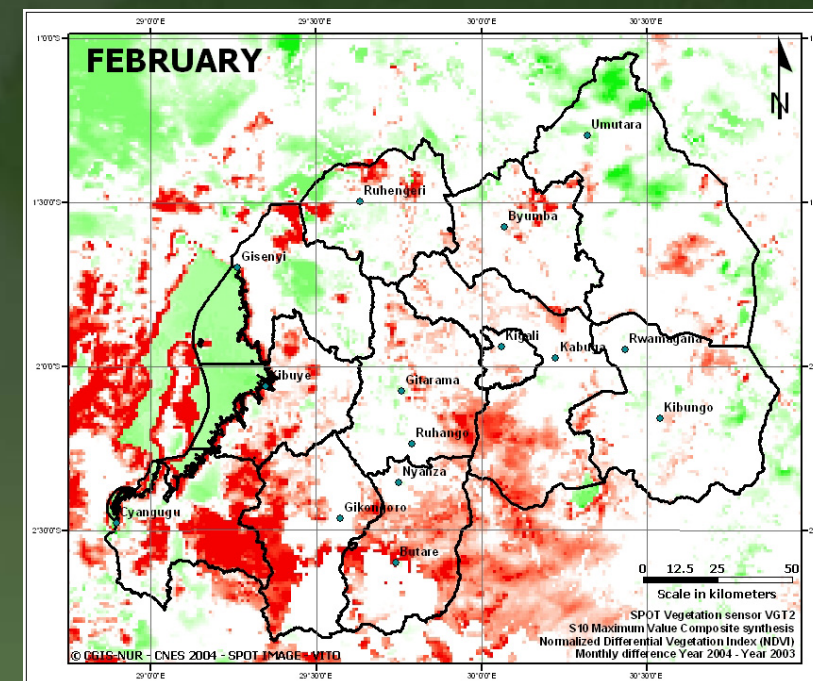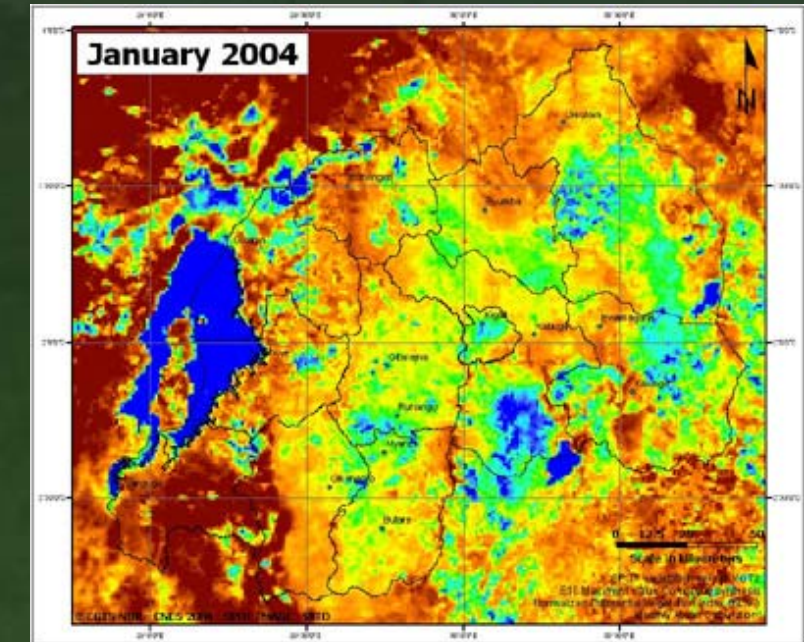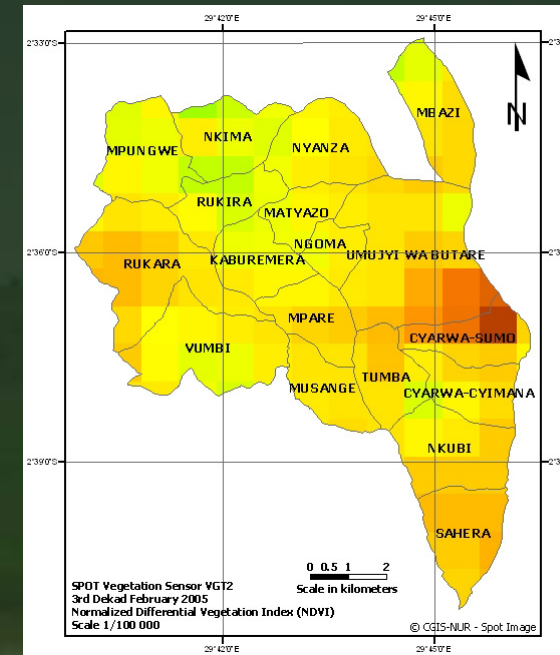 - other spatial databases

Satellite	Pixel size
SPOT VGT	1 kilometer
SPOT HRV	20 m multi. 10 to 5 m panchro.
LANDSAT	30 m multi. 15 m panchro.
ASTER	15 meters
QUICKBIRD	61 centimeters

Satellite databases…
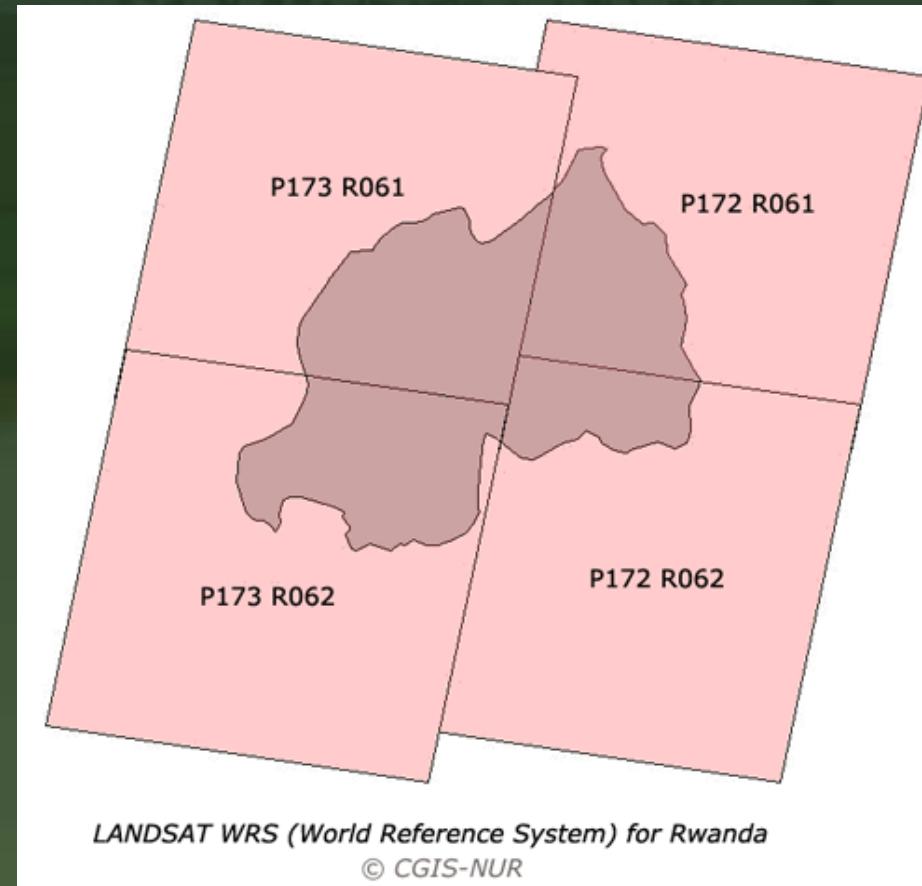## *SPOT Vegetation*

- *Coverage* : **national** (continental)

- Spatial resolution : **1 kilometer**

- *Dates* : **dekads** from 1998 up to now

- *Applications* : **vegetation** monitoring, **food** security and early warning systems etc.
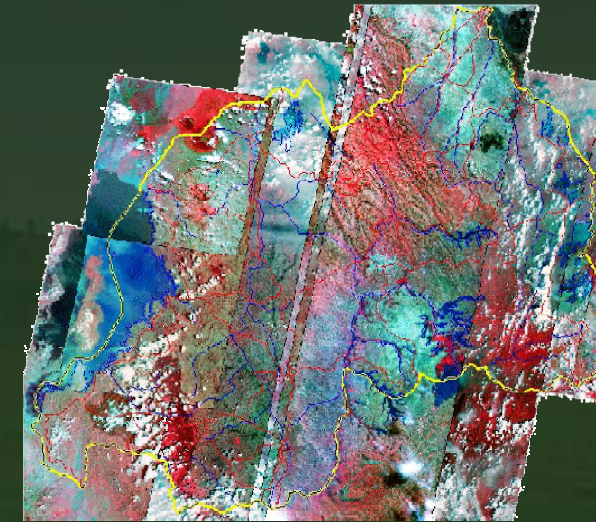
Satellite databases…
Landsat

- *Spatial resolution : **15 to 30 meters***

- *Dates* : **from 70's up to now**

- *Applications* : **land use/land cover**, **forest**, **environment** monitoring, **change** detection

P173 R061   P172 R061

P173 R062   P172 R062

LANDSAT WRS (World Reference System) for Rwanda
© CGIS-NUR

Satellite databases…
Aster

- *Spatial resolution :* **15 meters**

- *Dates* : **from 70's up to now**

- *Applications* : **land use/land cover**, **forest**, **environment** monitoring, **change** detection

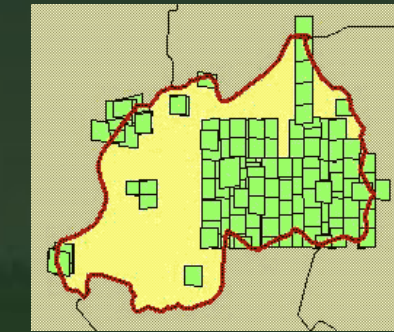Aster coverage 2003
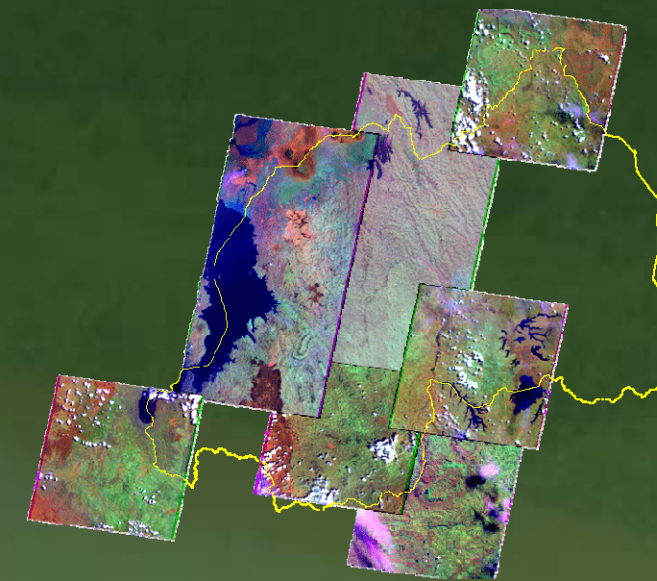
Aster coverage 2004-2005
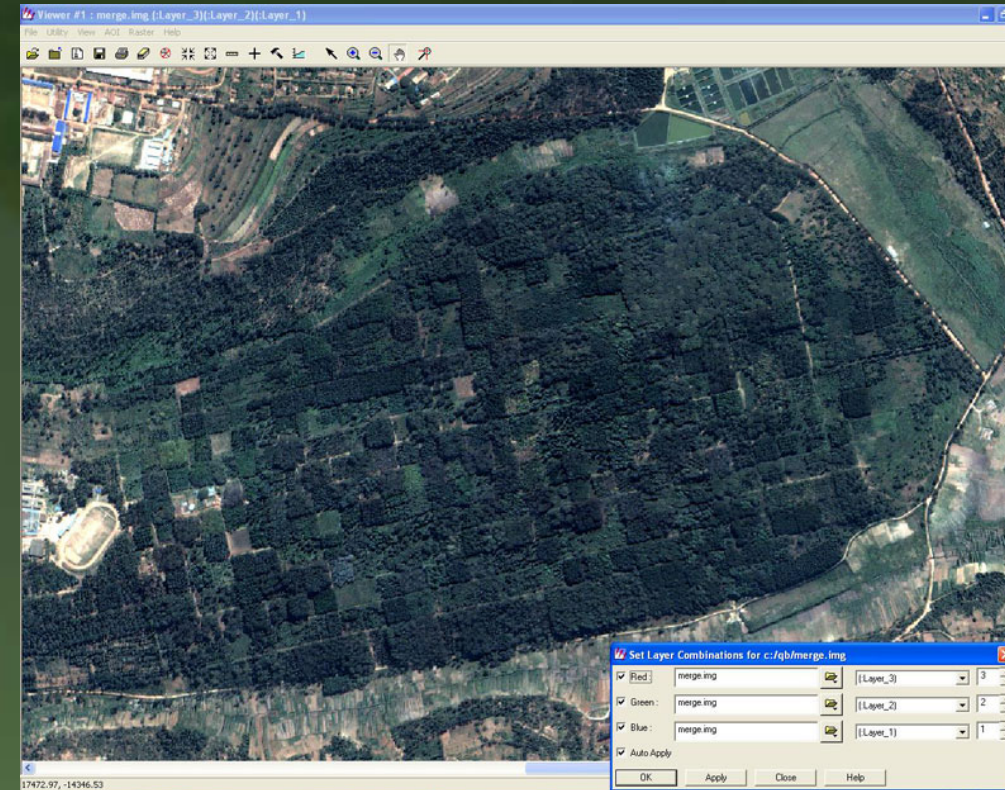
Satellite databases…
Quickbird

Quickbird archive   Ikonos archive

- *Coverage* : **100 to 200 km²**

- Spatial resolution : **60 centimeters**

- *Dates* : **from 1999 up to now**

- *Applications* : **urban planning, cadastre,** cartography
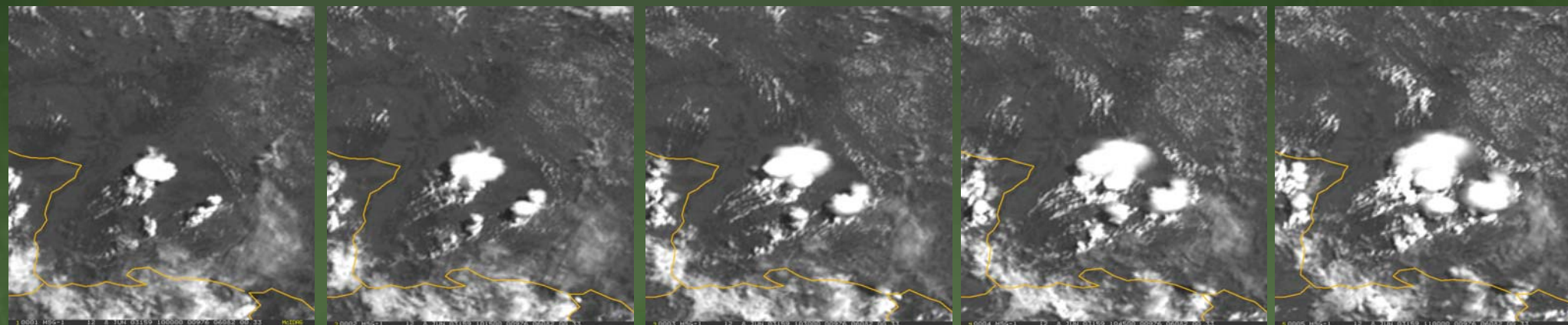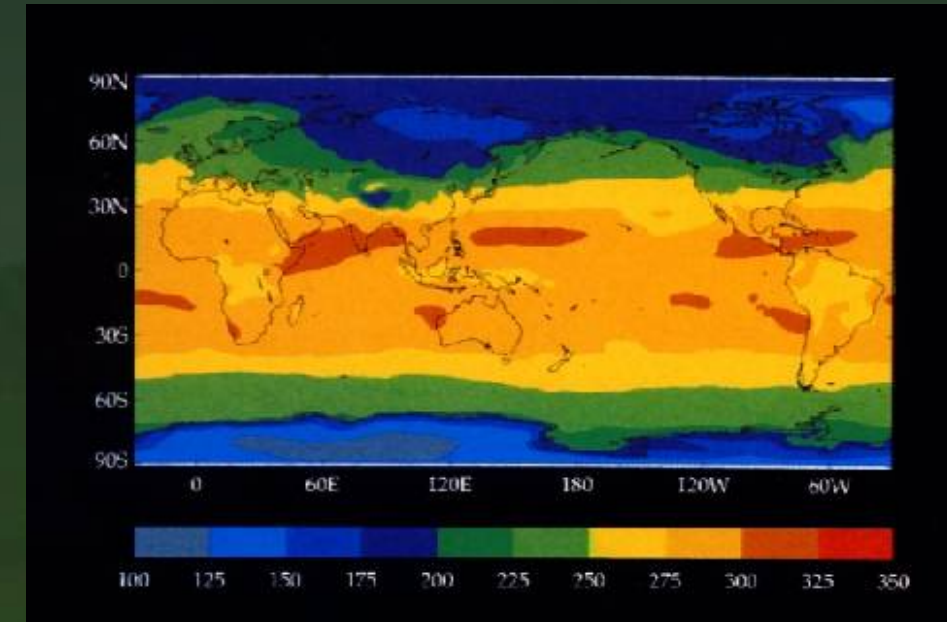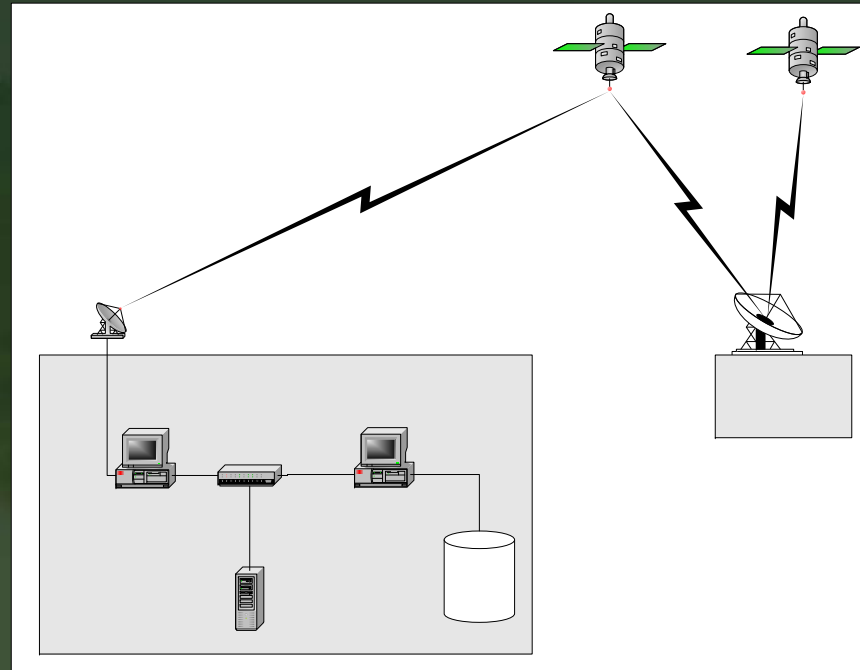

Butare July 2005

Satellite databases...
METEOSAT 2nd generation

- *Coverage* : **national**

- *1 image each 15 mns*

- *12 channels*

- *Applications* : **vegetation, fires** monitoring, **meteorology** etc.

+ meteorological station

+ gauging station

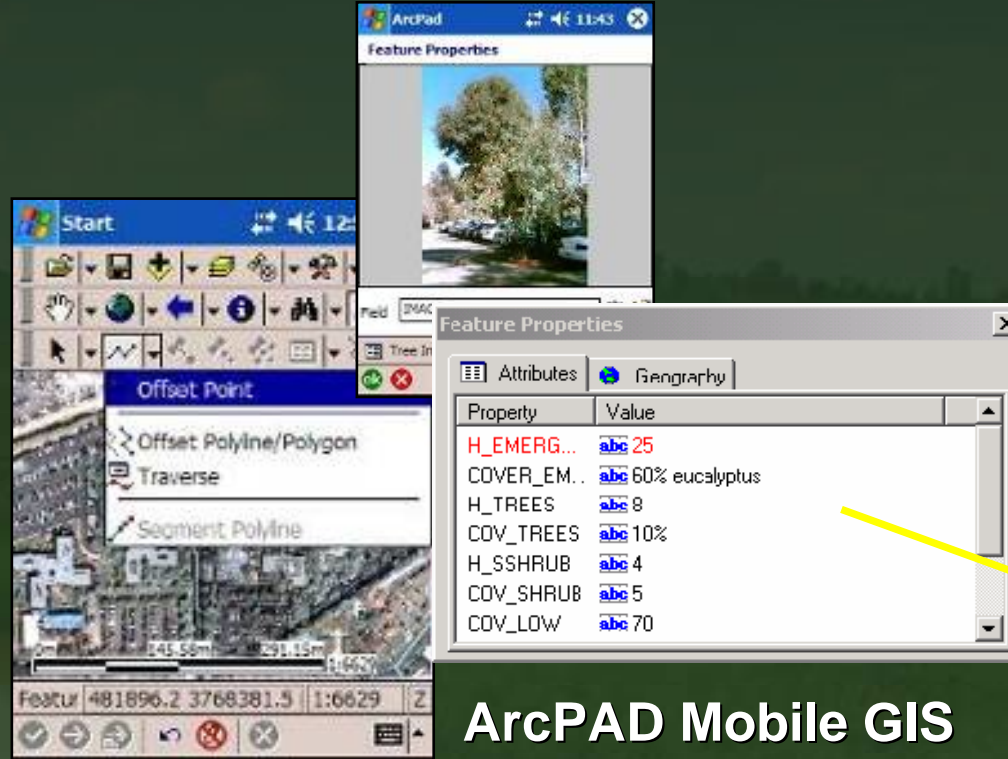# Field data collection
Ground data for image classification

- **Field data collection**
  - Mobile GIS system
  - Direct link to GIS Desktop
  - Accuracy
  - Reliability
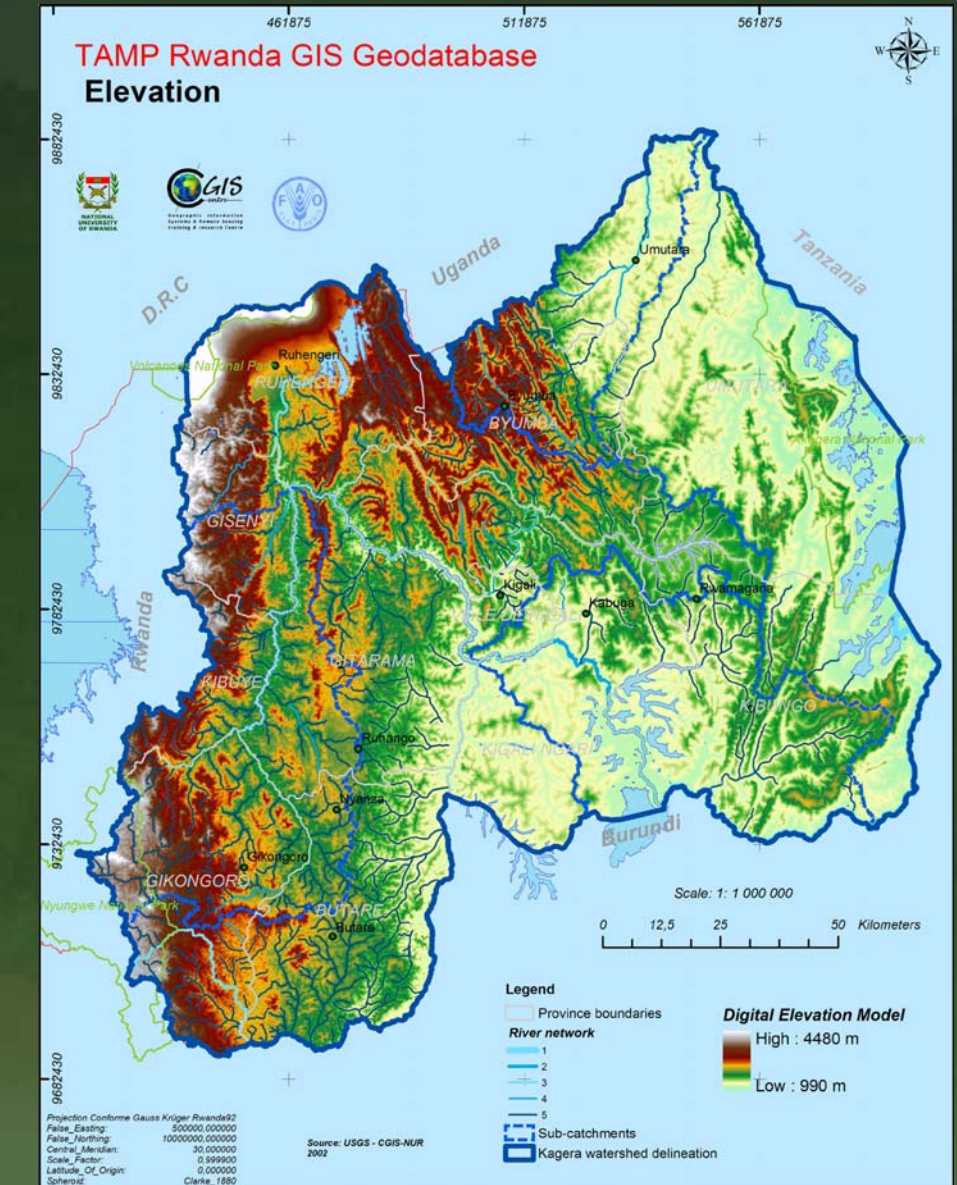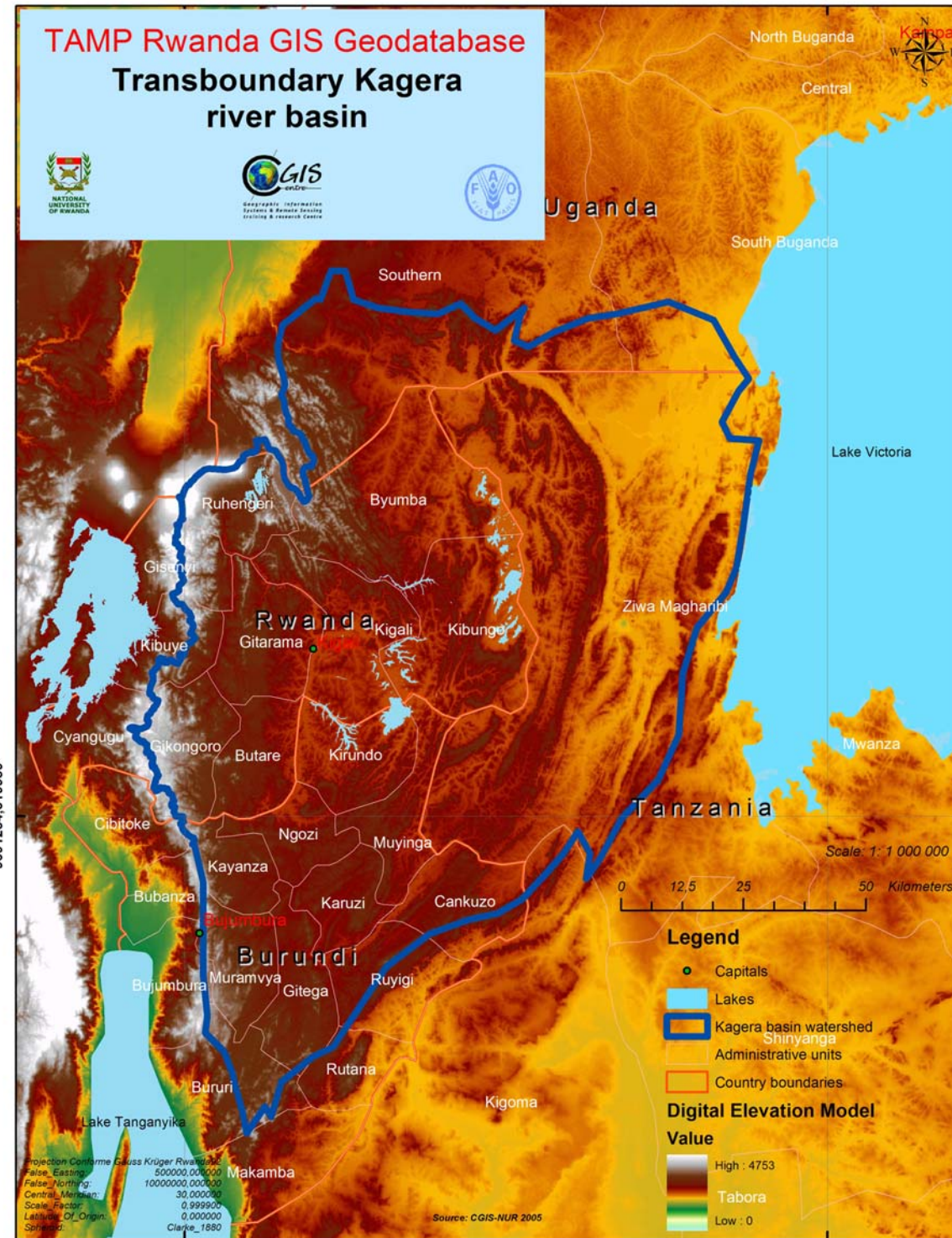
Pocket PC
Coupled GPS
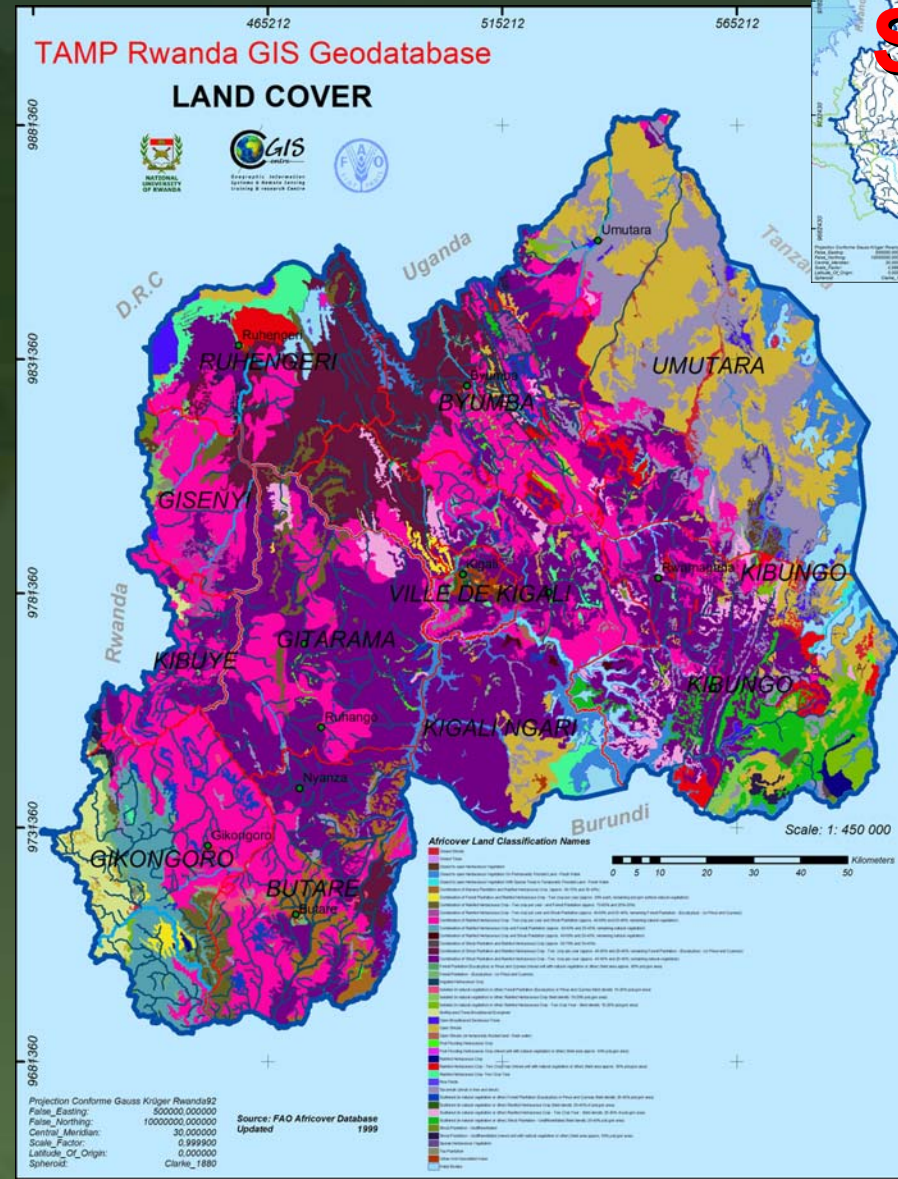
ArcPAD Mobile GIS
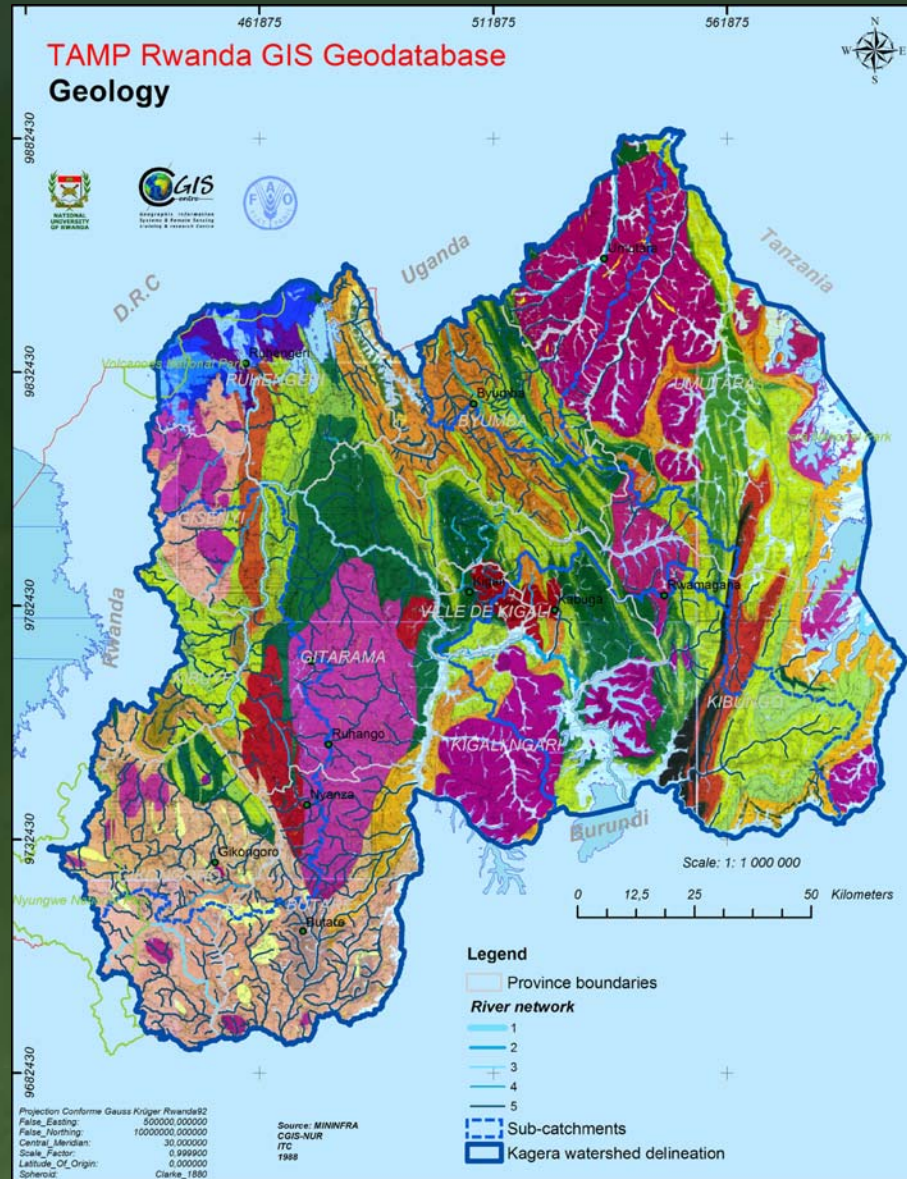
ArcGIS Desktop

- **Field visits**
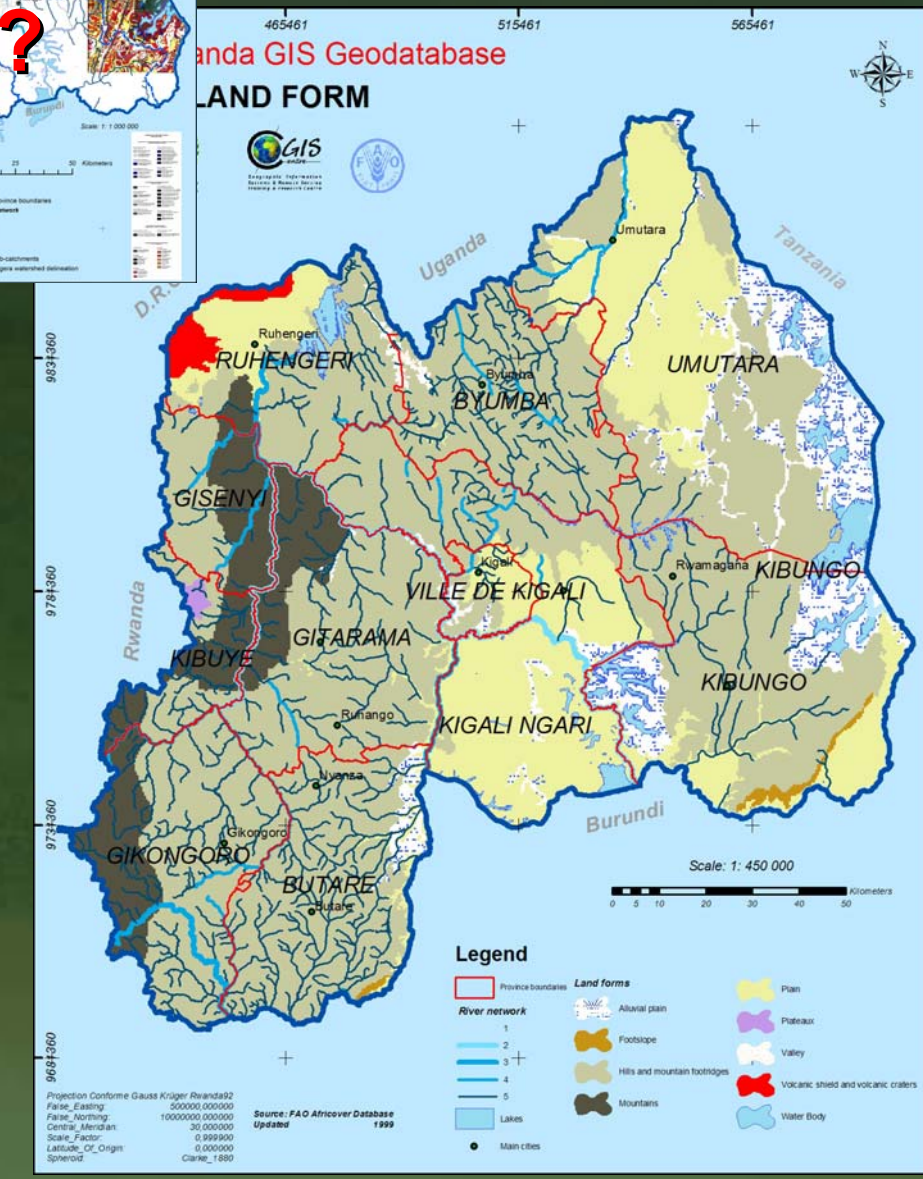
TAMP baseline maps
Kagera river basin

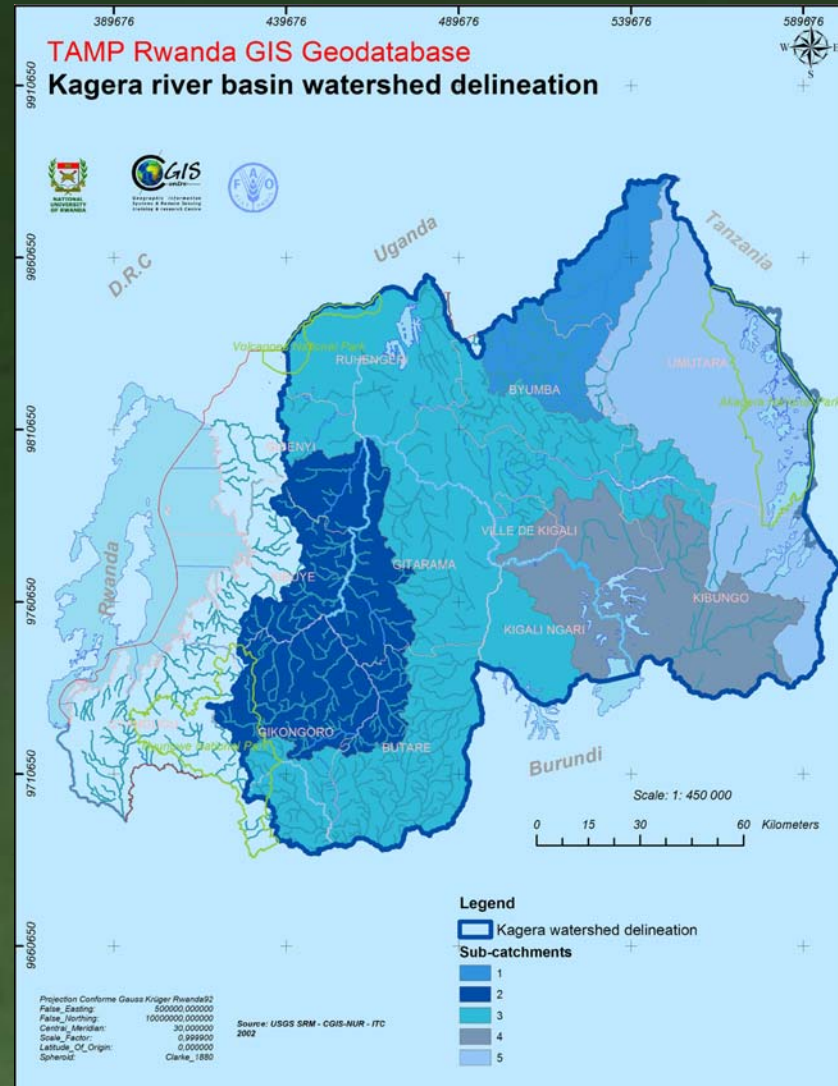# TAMP baseline maps
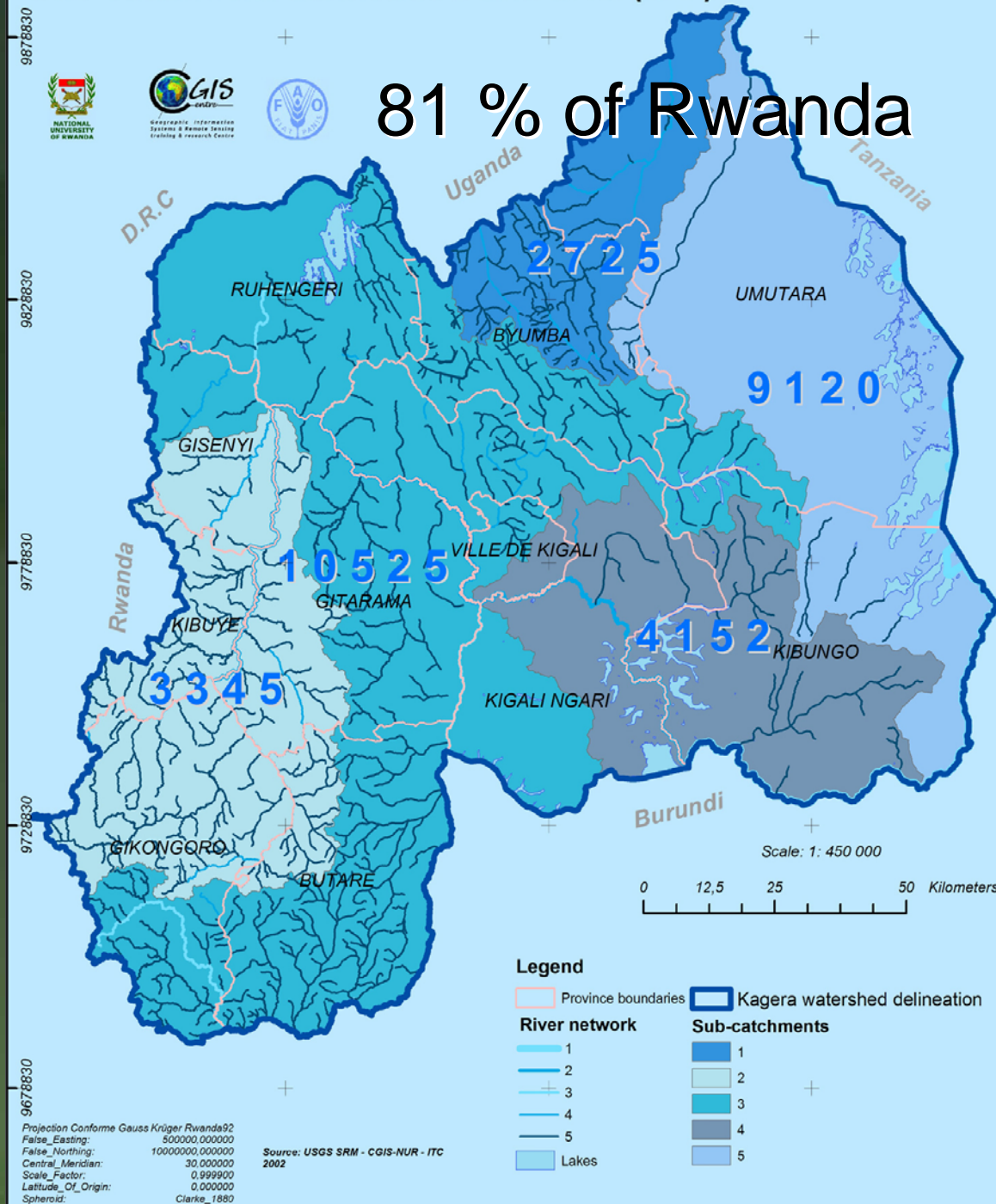
Physical maps

TAMP baseline maps
Hydrology

86 on 106 districts

81 % of Rwanda
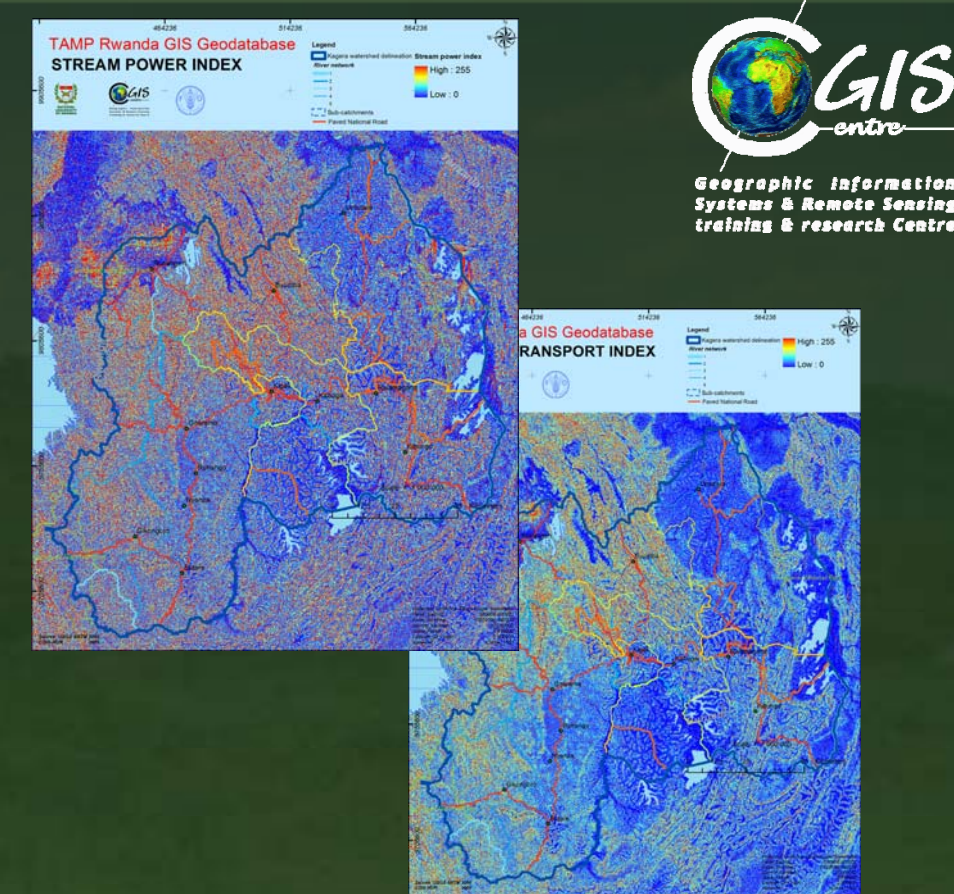
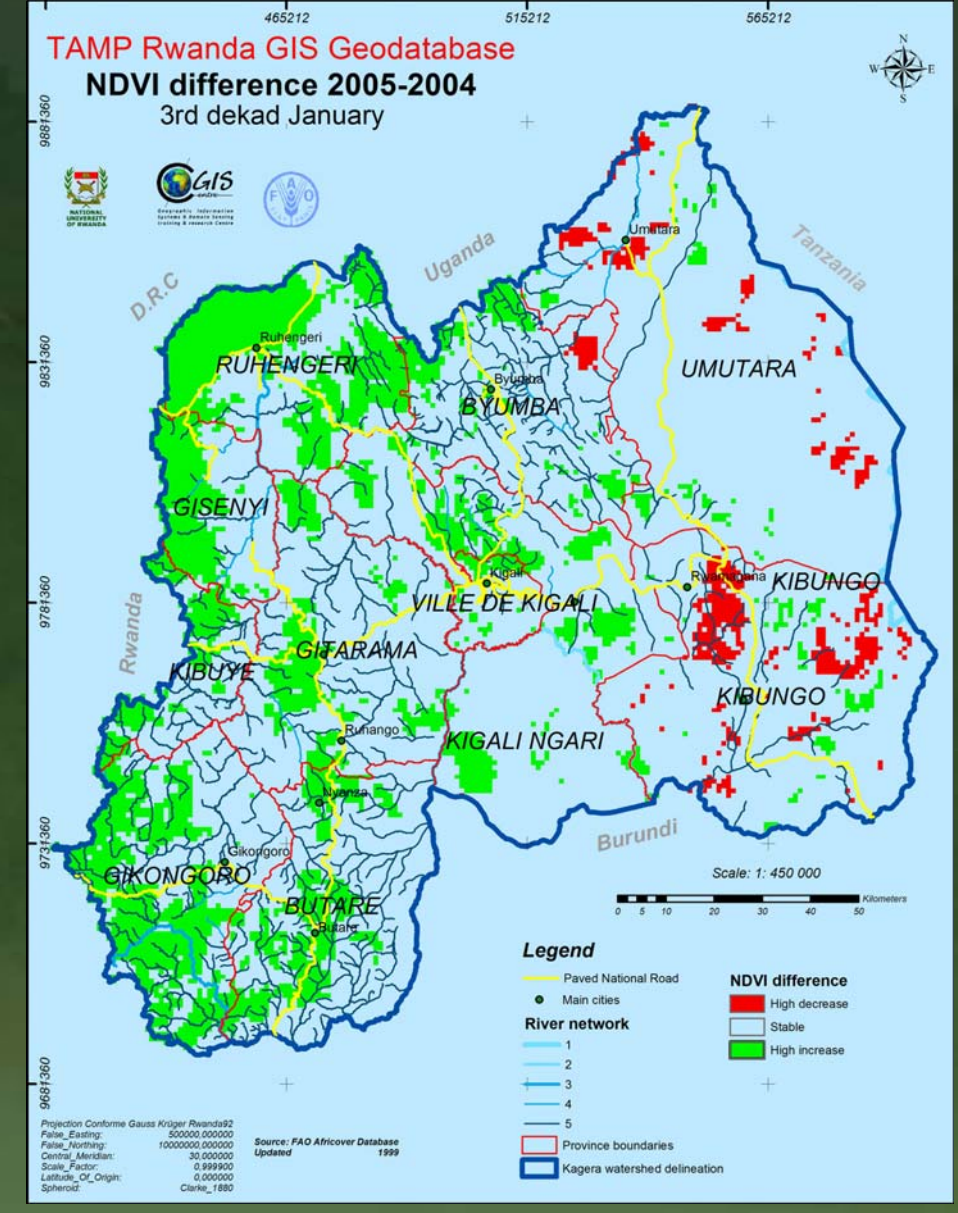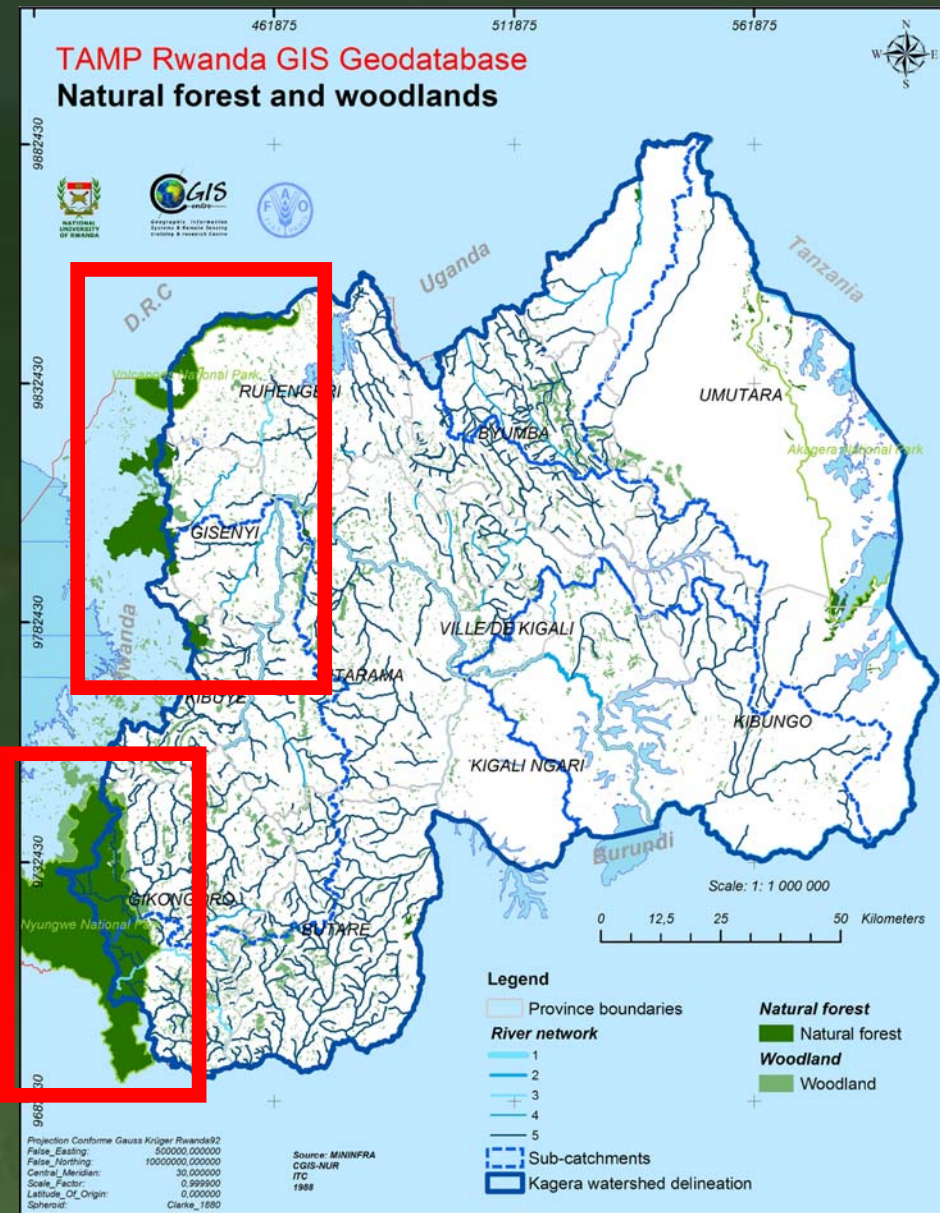| Kagera Basin	Land area sq km	% Land Area
Uganda	5 980	10
Tanzania	20 210	34
Rwanda	**20 800**	**34**
Burundi	*13 060*	*22*
Total	59 800	100

TAMP baseline maps
Climate / Meteorology
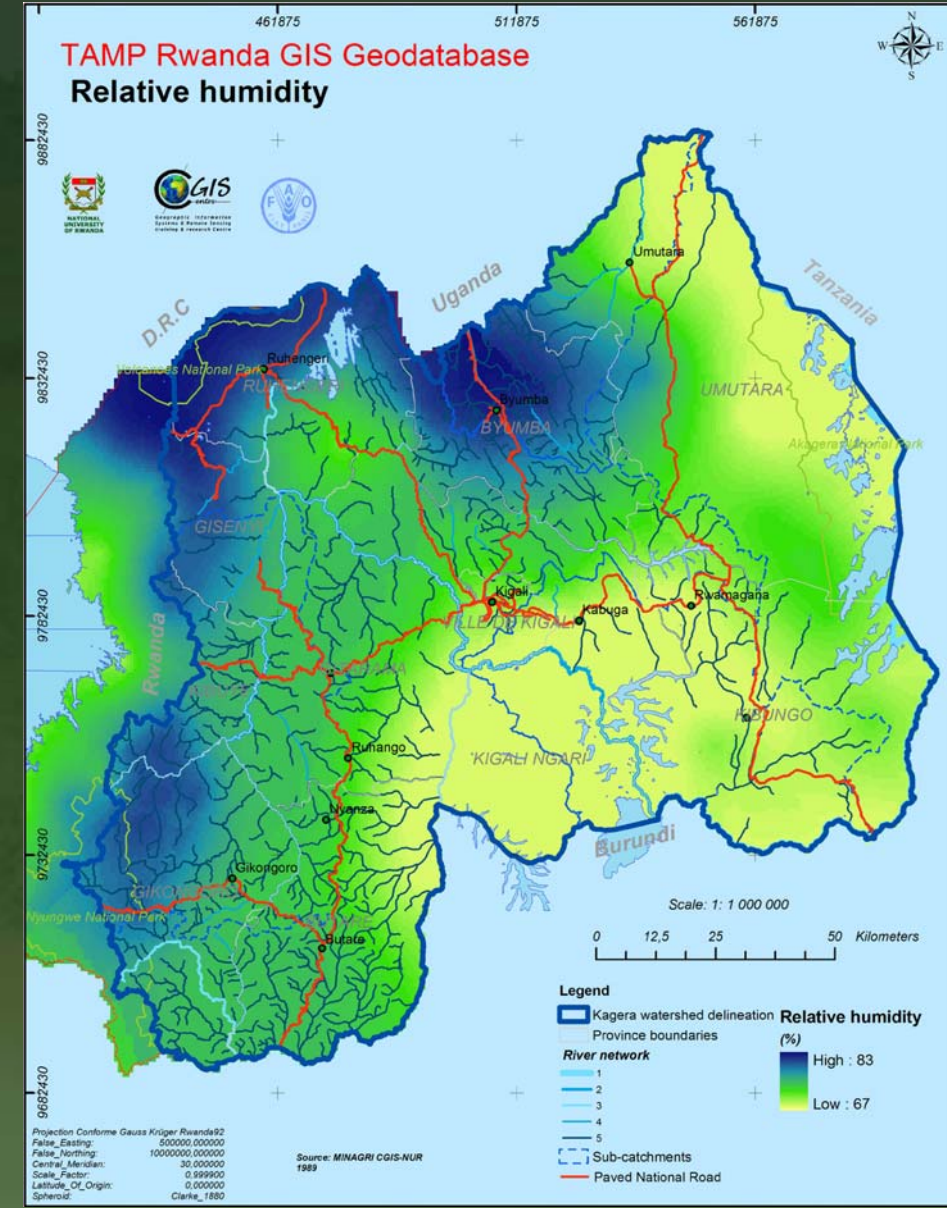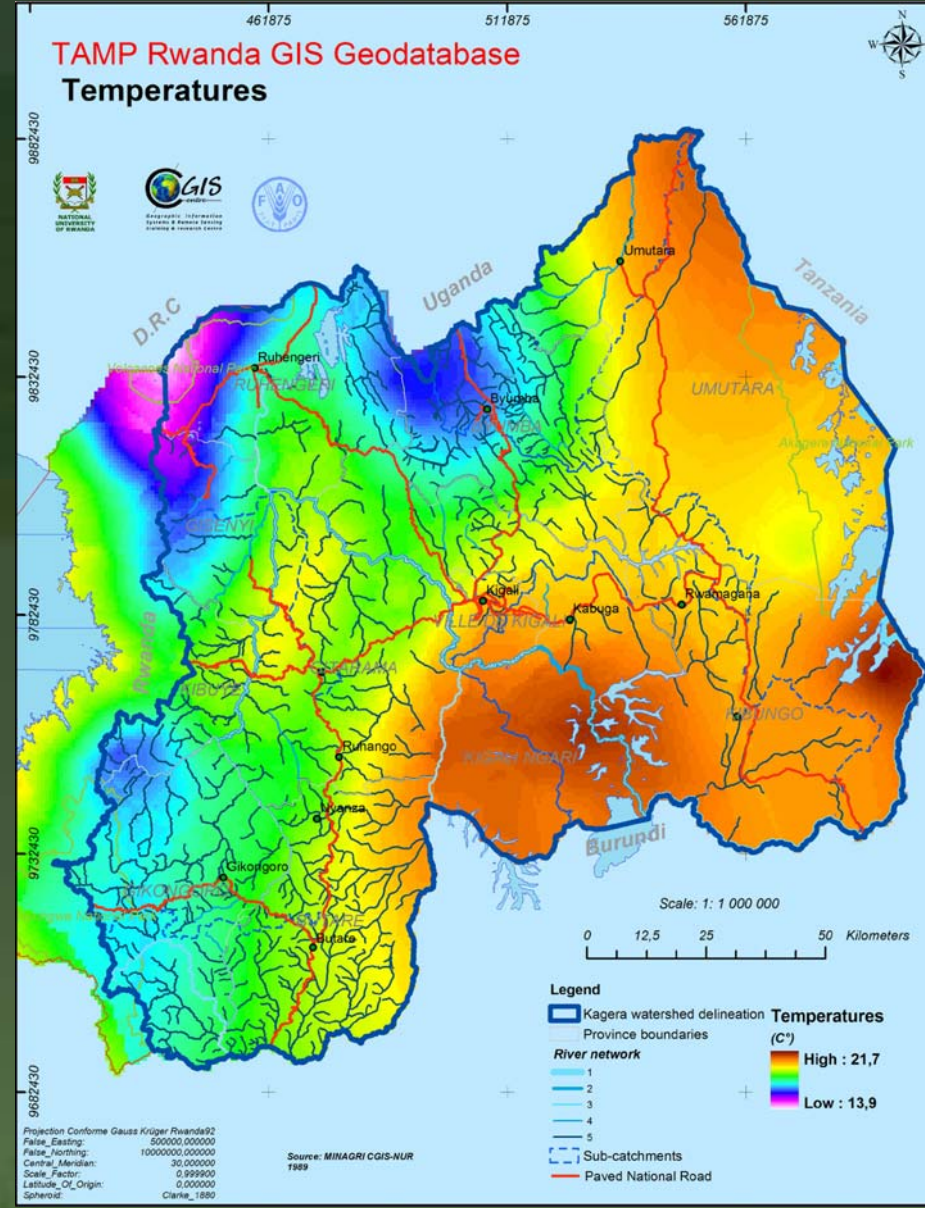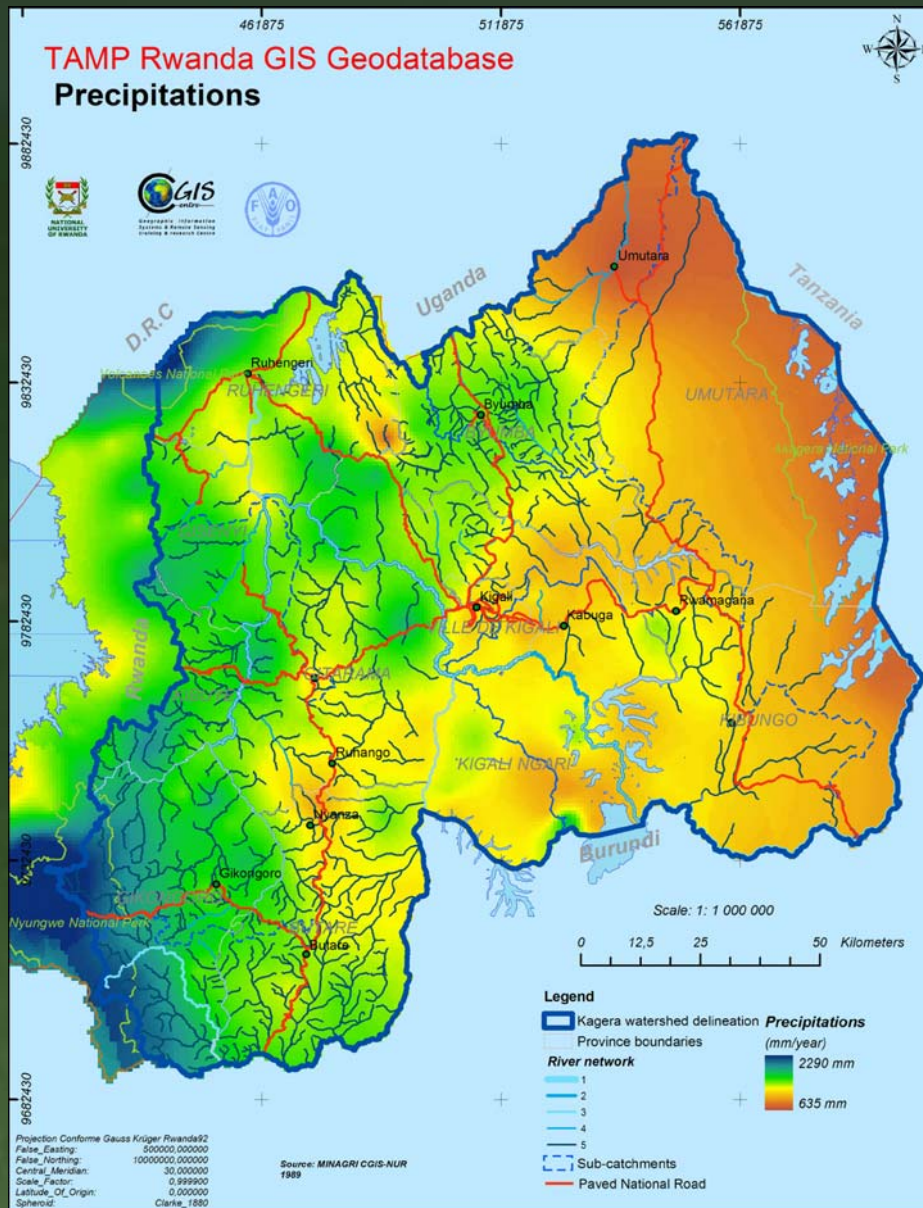
TAMP baseline maps
Natural ressources: vegetation

TAMP baseline maps
Population growth : historical data
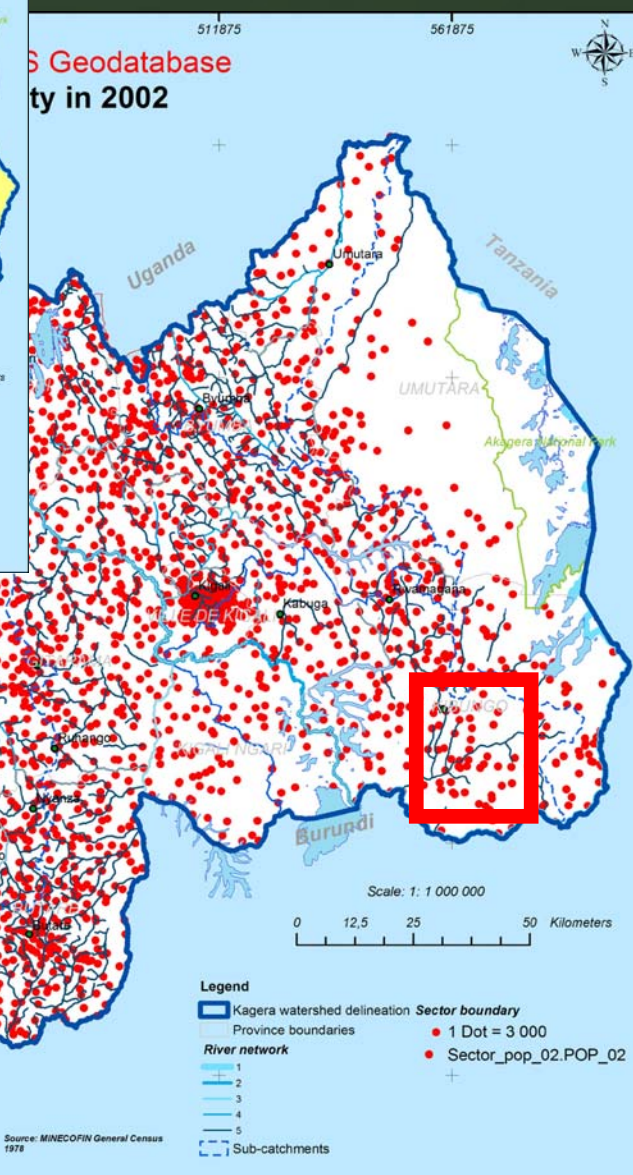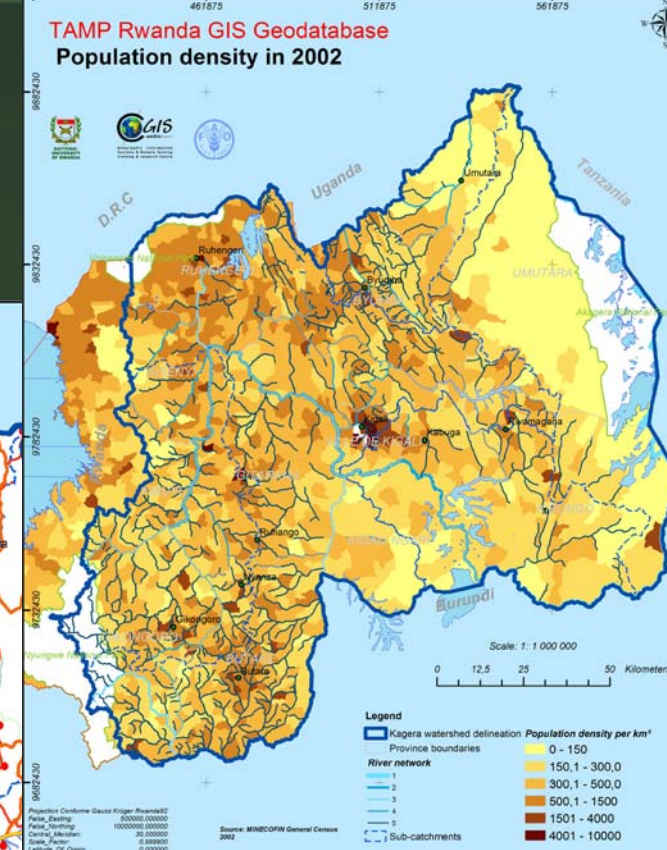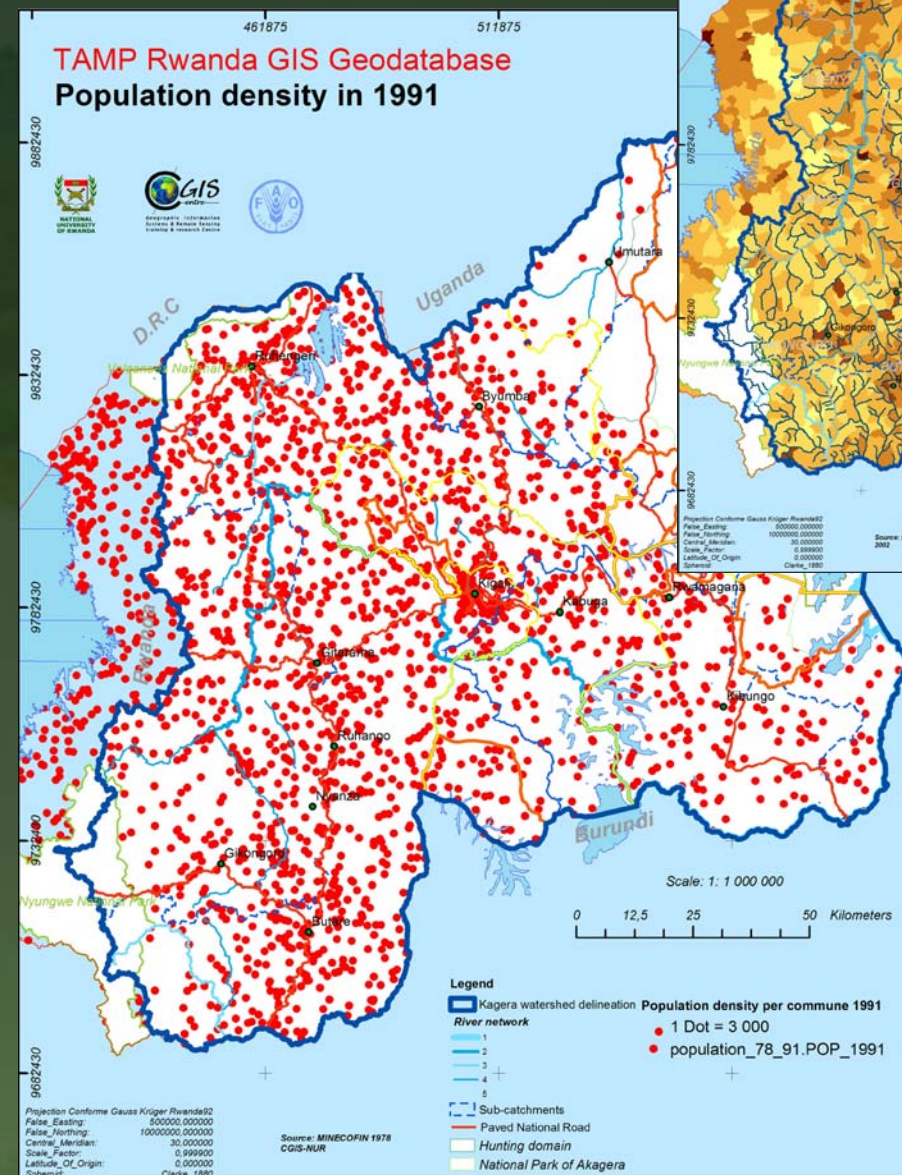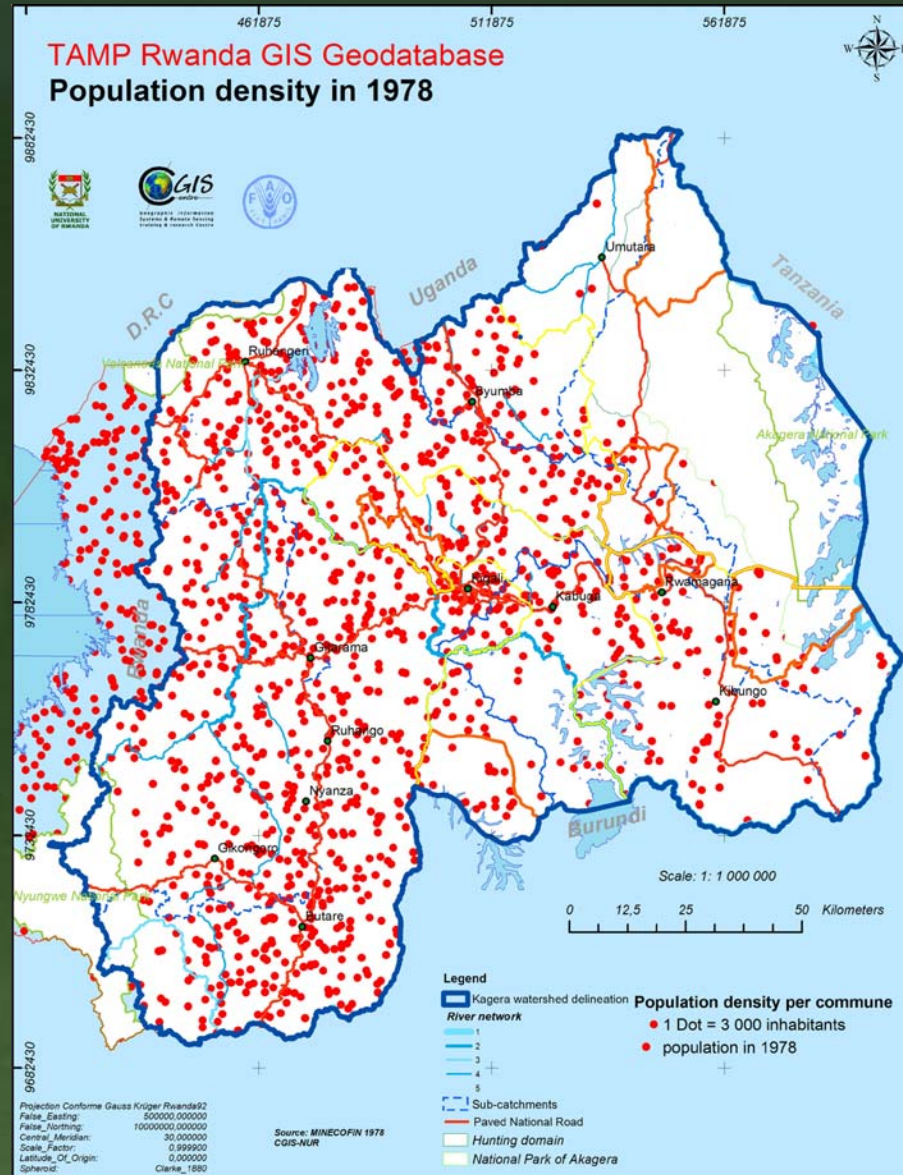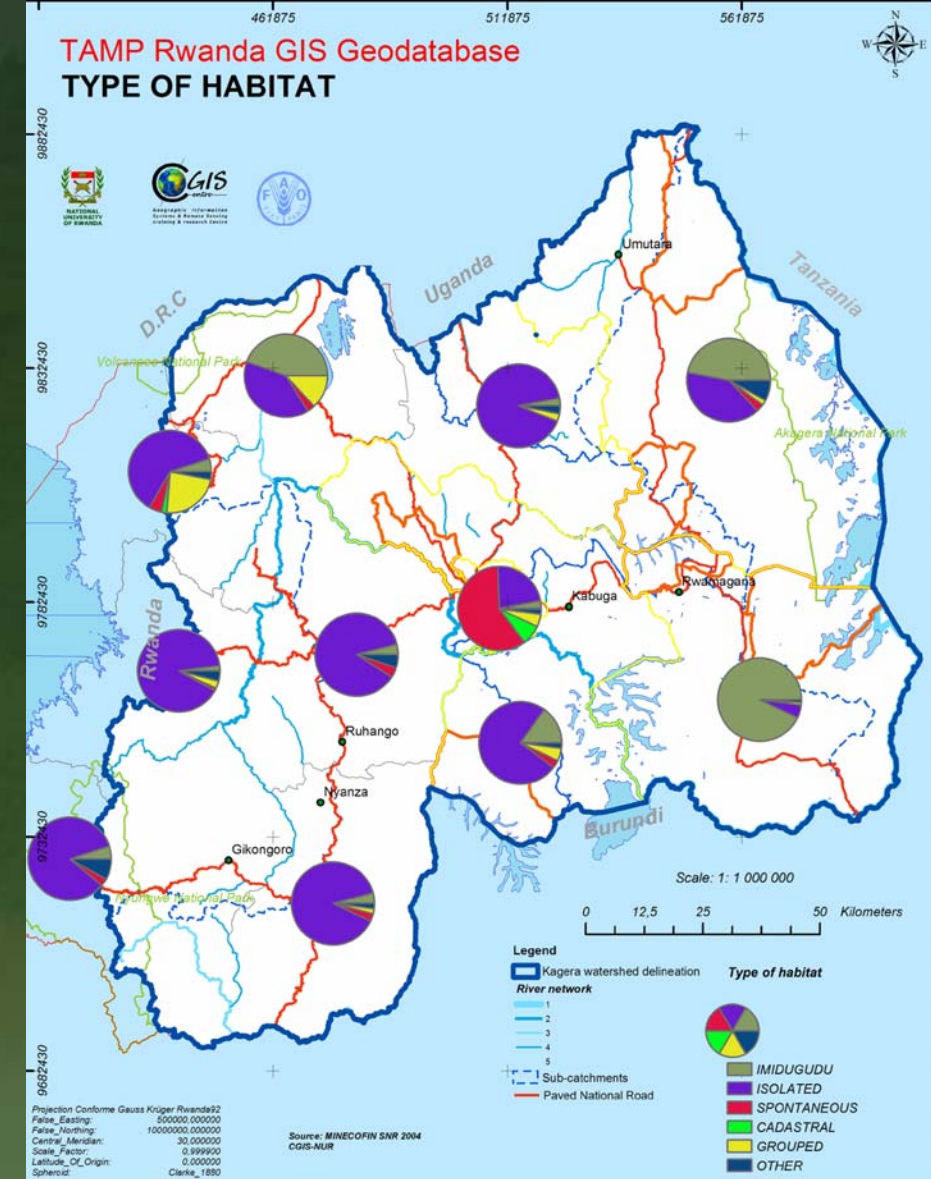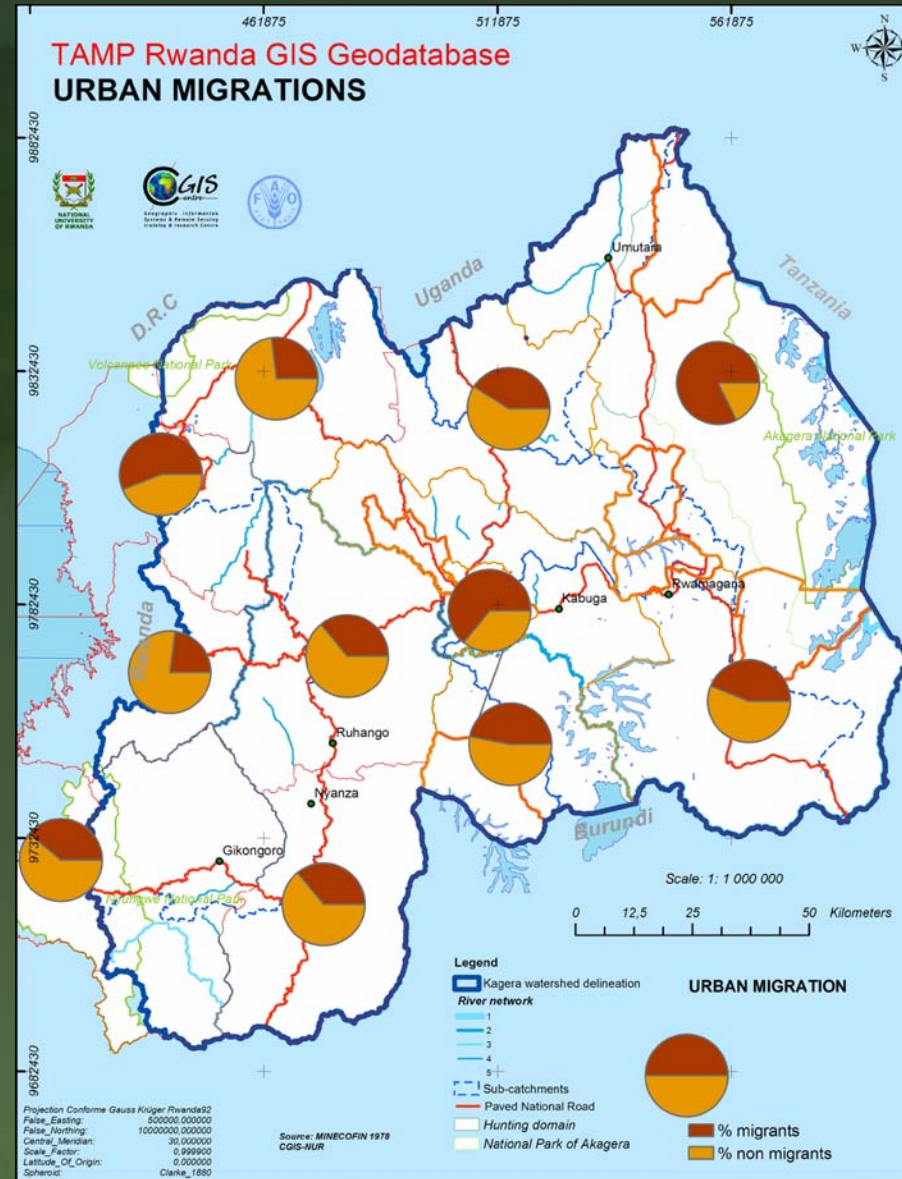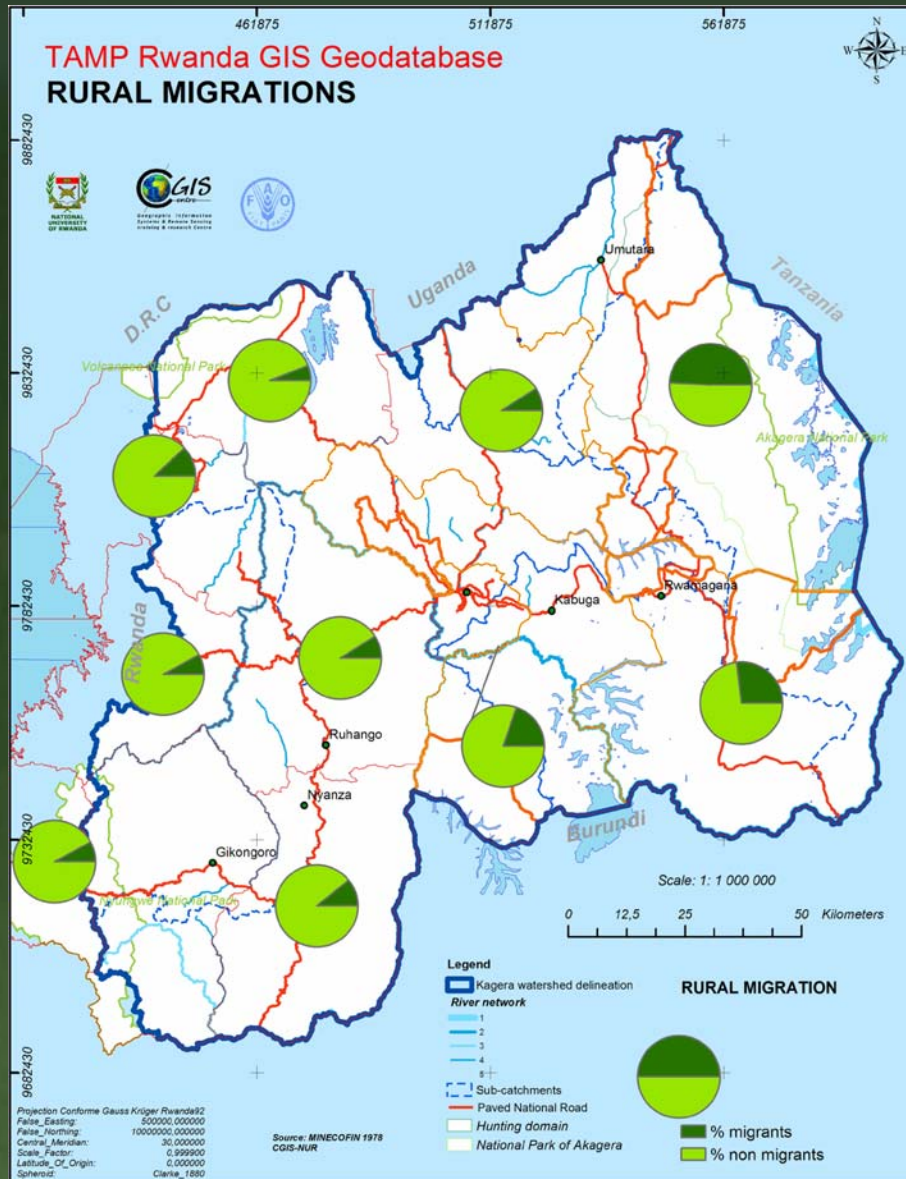
TAMP baseline maps
Migrations and type of habitat

TAMP baseline maps
Livestock

BOVIN2001	BOVIN2002	BOVIN2003	BOVIN2004
10668	0	0	0
88038	89359	100980	102495
53091	62294	63331	64281
42768	38147	55730	56566
35760	42331	50838	51601
229682	226710	296800	301252
0	0	0	0
0	0	0	0
0	0	0	0
48753	50701	49168	49906
35357	48161	48893	49626
26511	23362	27883	28301
36362	36907	51989	52766
140296	142400	173400	176001
59440	55078	72688	73778

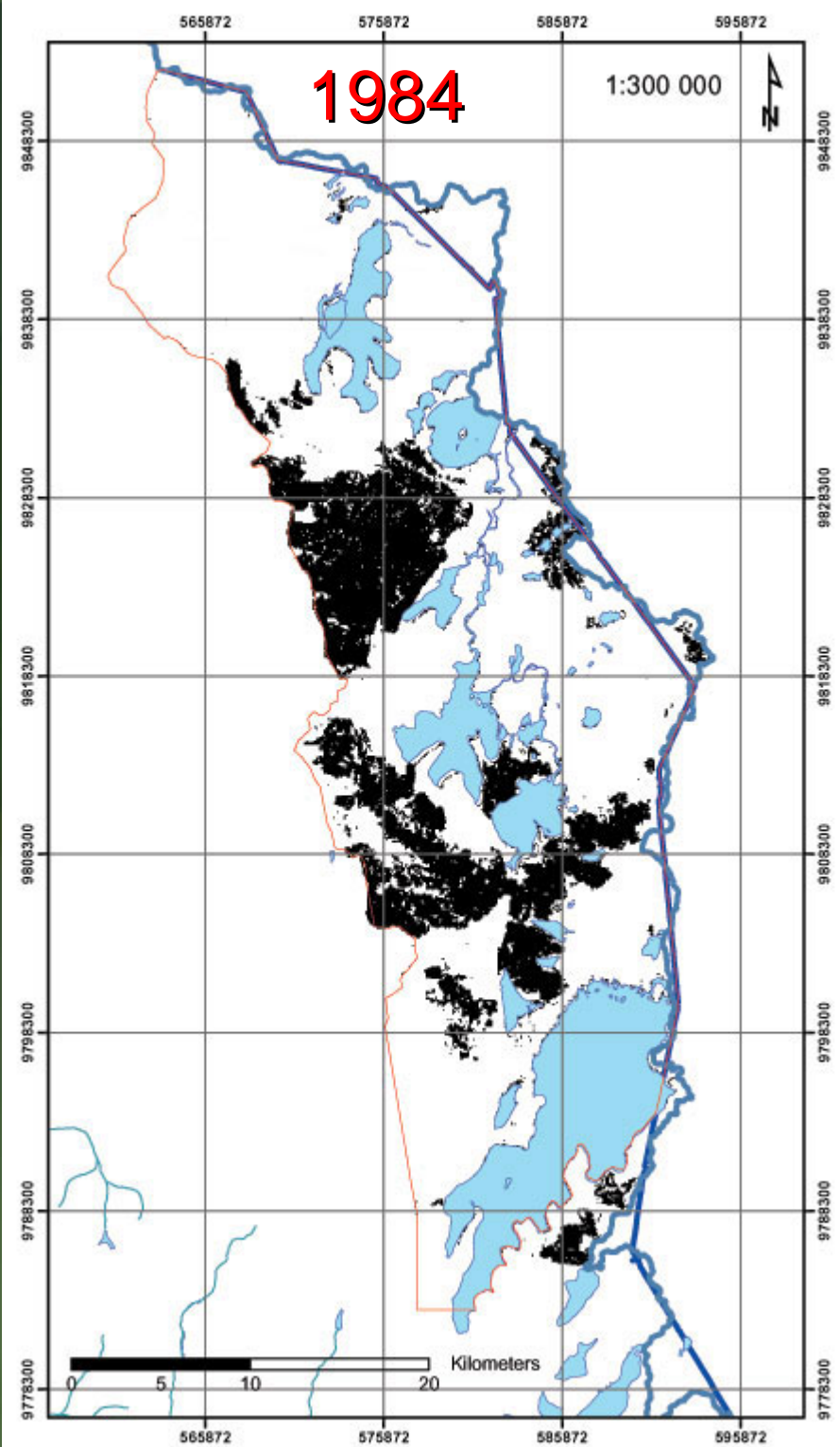| C_EPTEL_20	OVINS_03	CAPRIN_03	PORCIN_03	LAPIN_03	VOLAILLE_0
0	0	0	0	0	0
538093	32559	100980	14834	36176	252564
500005	13047	144334	34155	31968	213170
350211	61682	73985	20266	45827	92721
1008419	85066	65065	8399	43588	755463
559136	2187	86861	1246	5974	166068
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
276348	46369	71298	32418	32418	44677
409874	30035	42529	9328	40066	239023
290171	20127	73292	17041	11425	140403
428355	45666	71268	14428	150044	94960
924267	30618	138378	47936	224164	309771
375393	4410	100363	11867	12761	173304
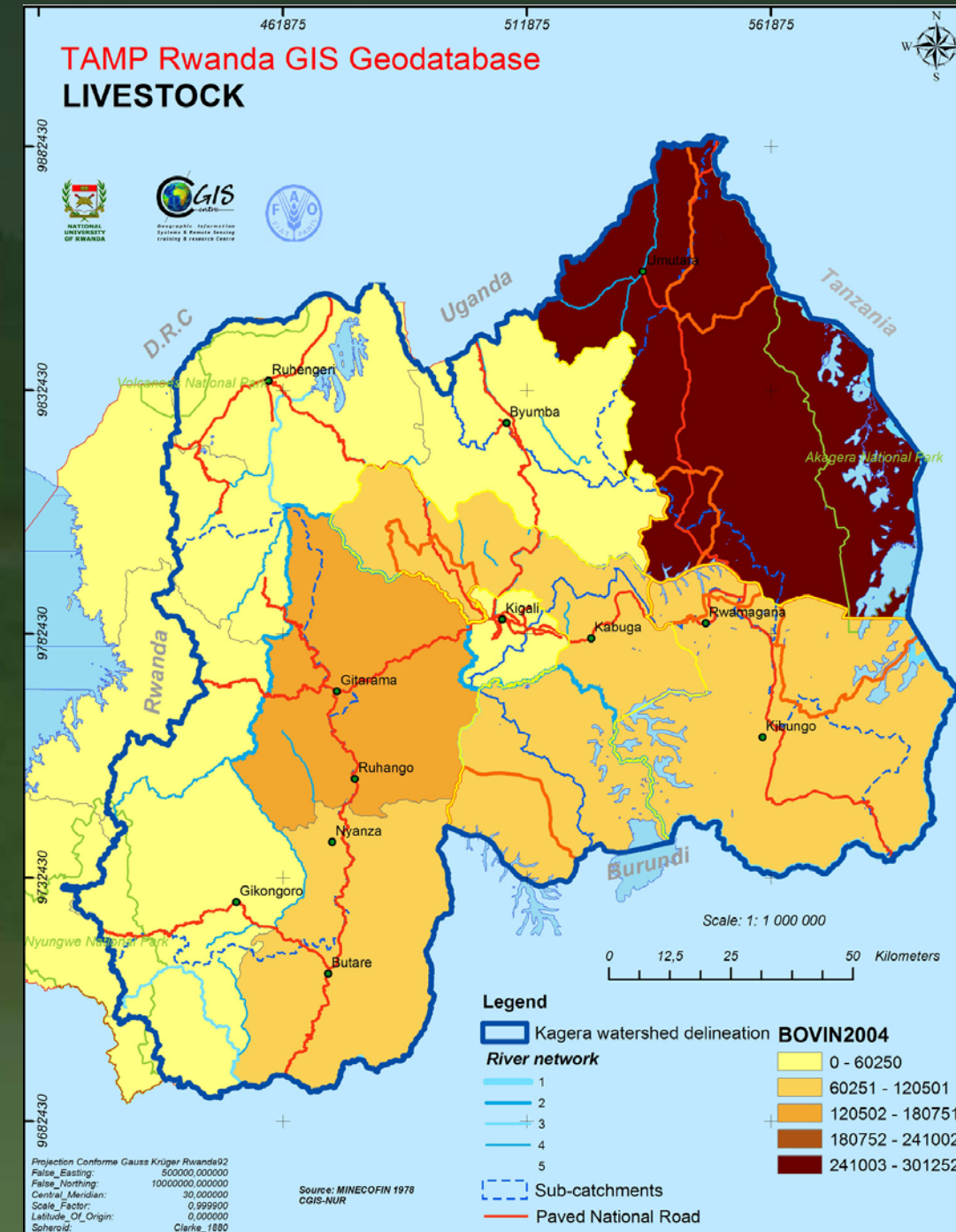
TAMP Spatial Trends
3 main threats

- Fires

- Deforestation

- Degradation of wetlands

Savanna fires

Degradation of wetlands

Deforestation

TAMP Trends
Fires
Akagera Park

1984   1:300 000

1990   1:300 000

1999   1:300 000
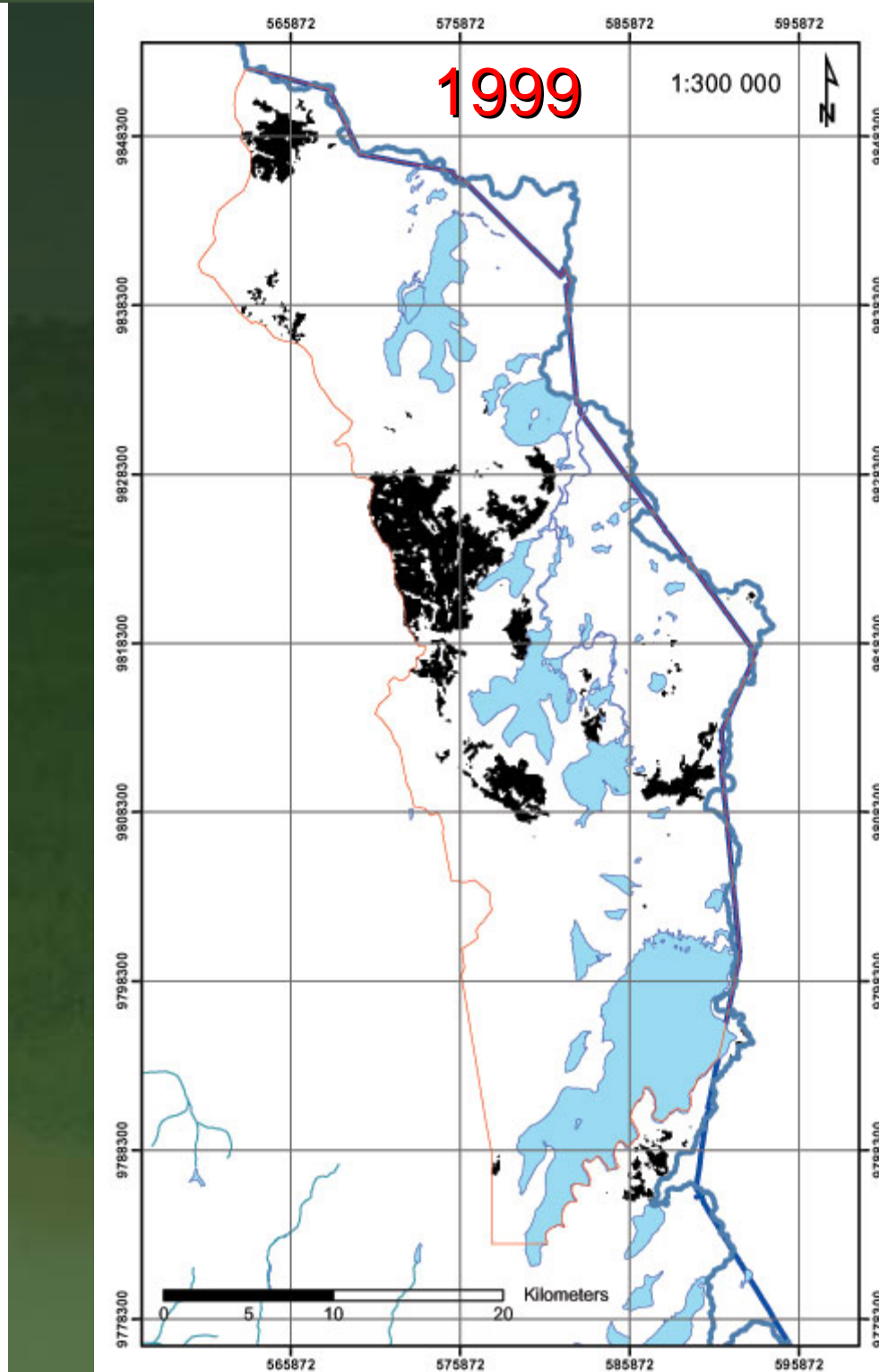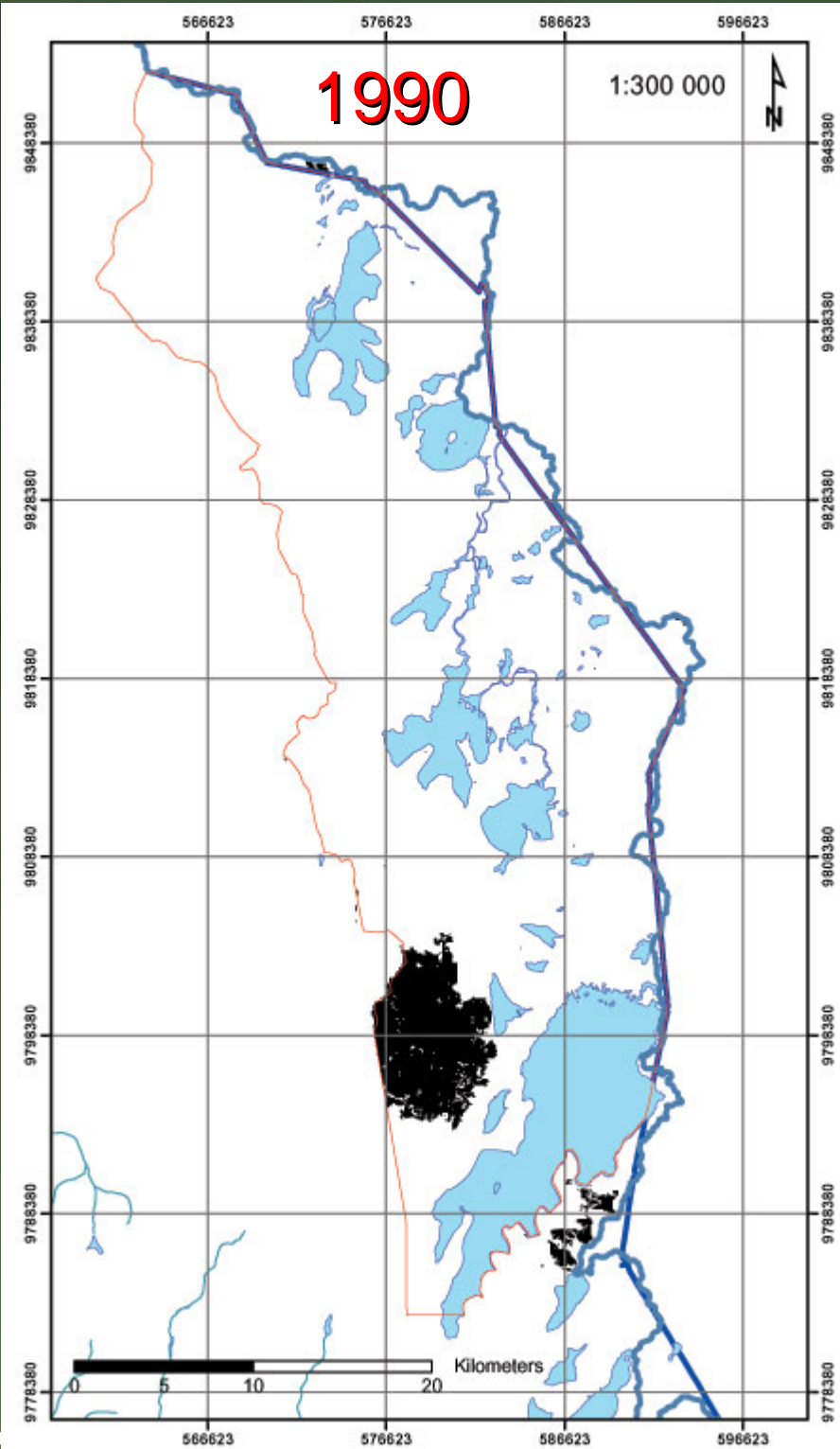
TAMP Trends
Deforestation
District of Nyarubuye

1984

1999

TAMP Trends
Water hyacinth
Districts of Gabiro and Ngenda
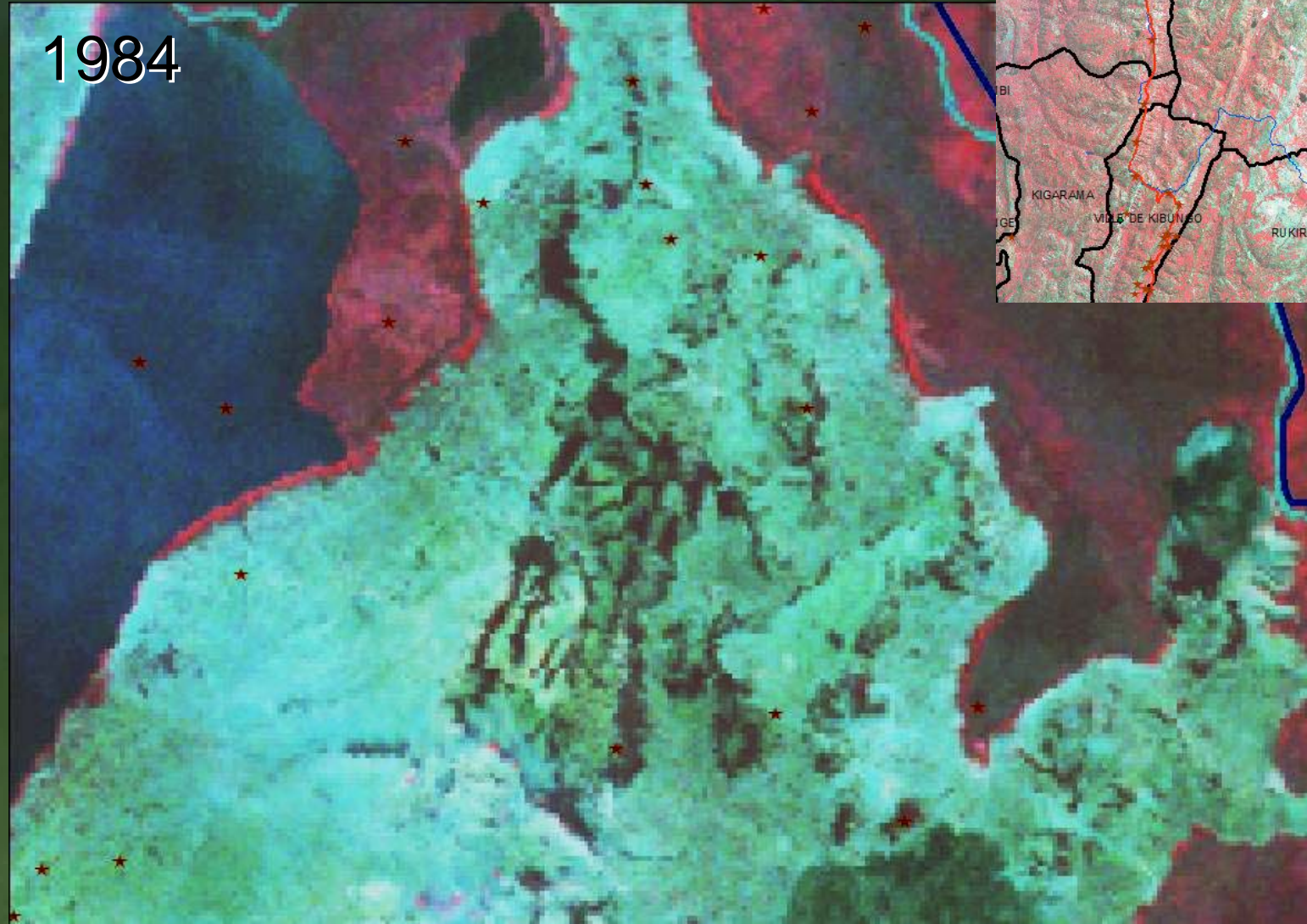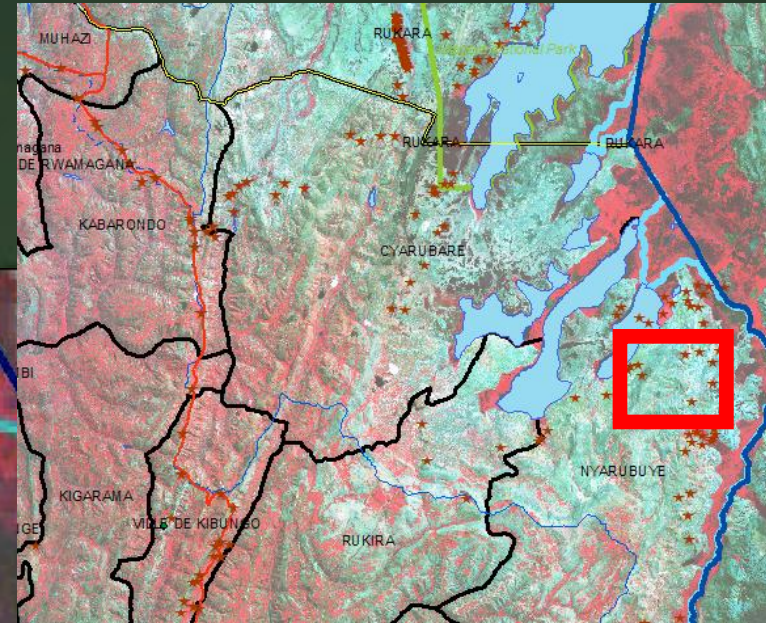
Degradation of wetlands
District of Ngenda

ASTER
Spring 2000

ASTER
Spring 2005

Wetland (blue)

Crops : maize (red-brown)

Scale: 1: 15 000

Projection Conforme Gauss Krüger Rwanda92
False_Easting: 500000,000000
False_Northing: 10000000,000000
Central_Meridian: 30,000000
Scale_Factor: 0,999900
Latitude_Of_Origin: 0,000000
Spheroid: Clarke_1880

Papyrus

Maize
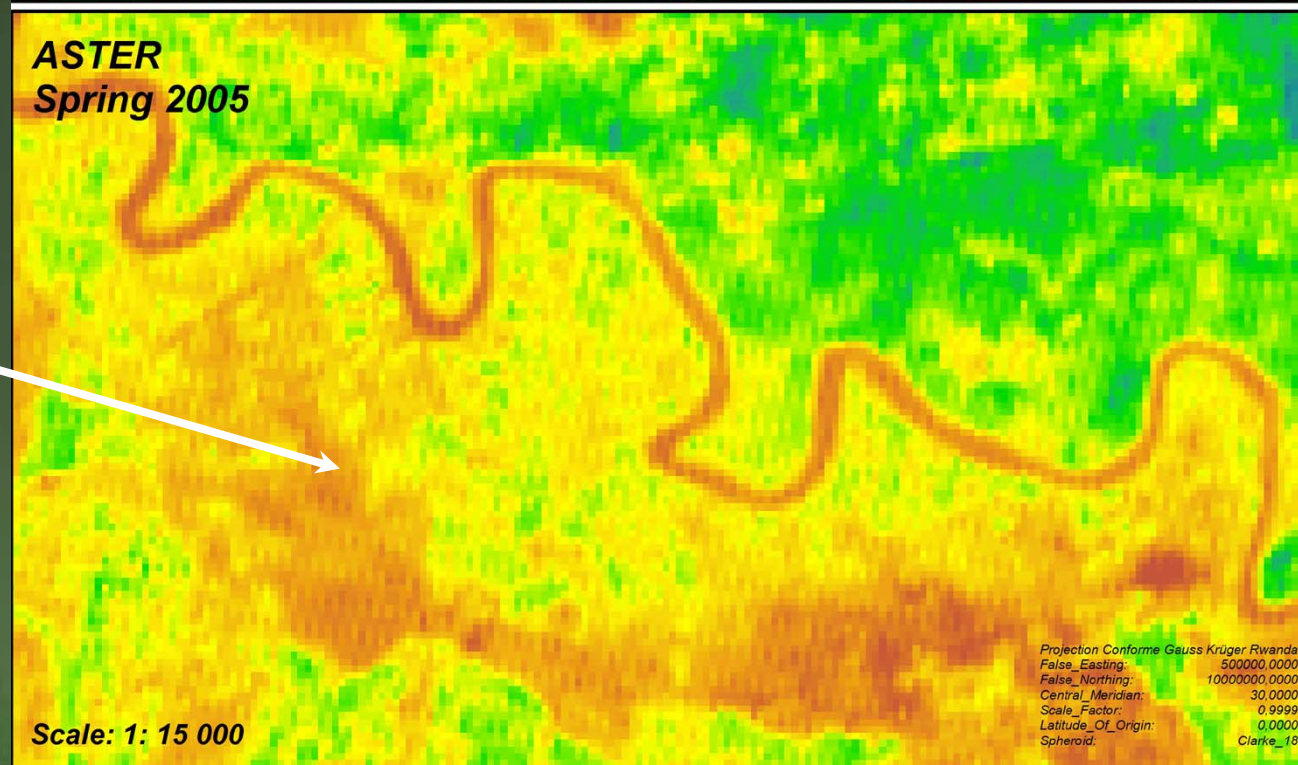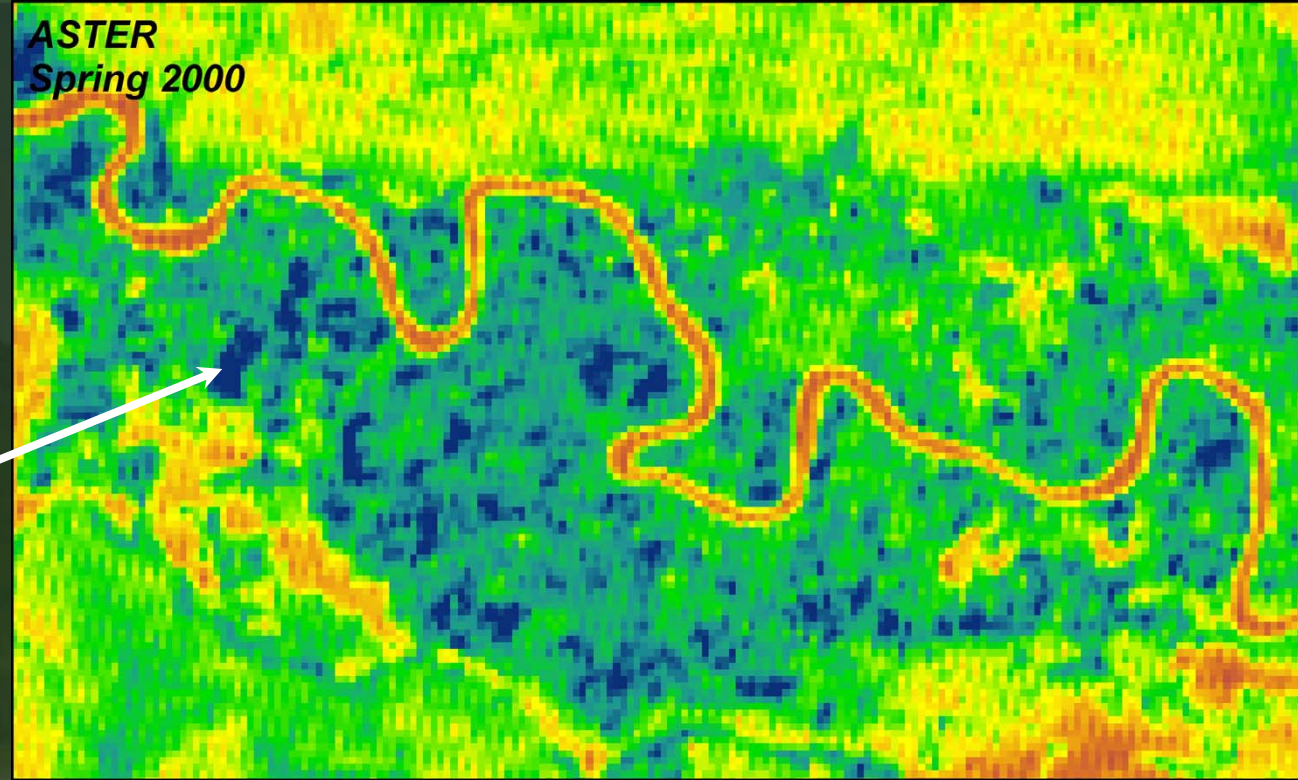
Hot spots for protection
Example of Makera forest

Specific species of interest

Gallery forest

NYARUBUYE

New administrative boundaries

January 2006 : 5 regions

Districts of East region

New administrative limits – Rwanda - 2006
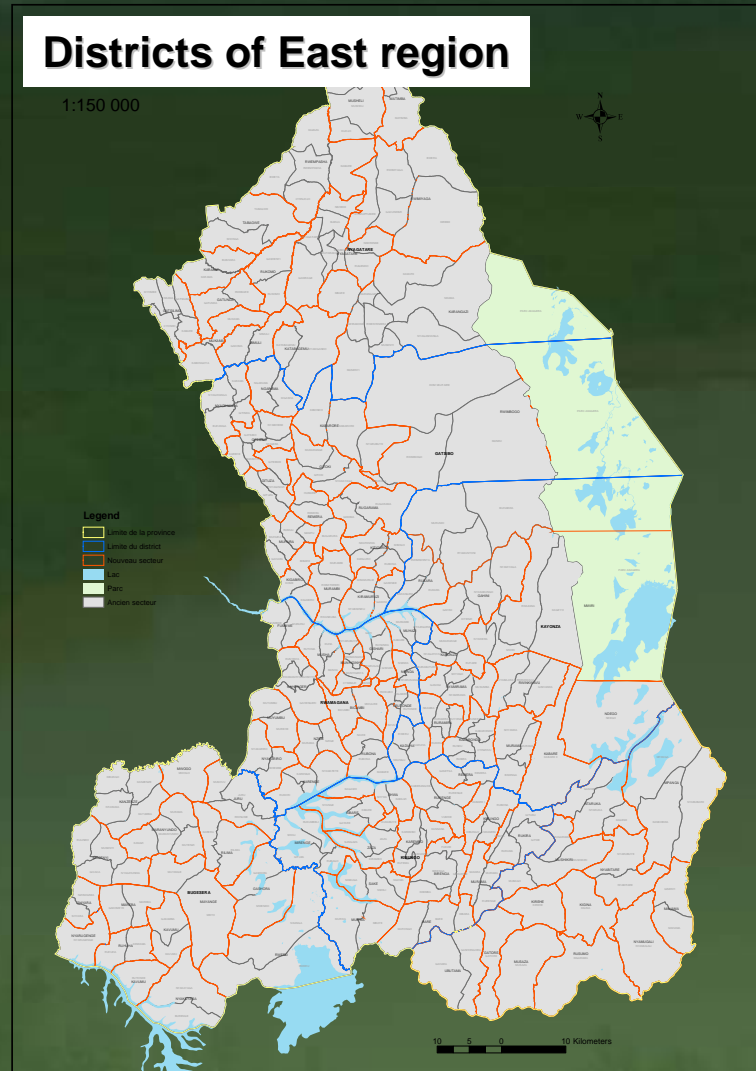
Spatial data sharing and access
Webmapping service

Acquisition

Distribution

Web Browser

NUR WebMapping Server
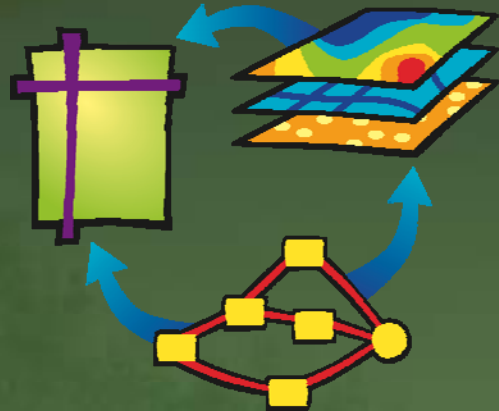
Map Catalog

DataWarehouse
Spatial Databases
Analyis-Applications

End User

CGIS Centre
Geographic Information Systems & Remote Sensing training & research Centre
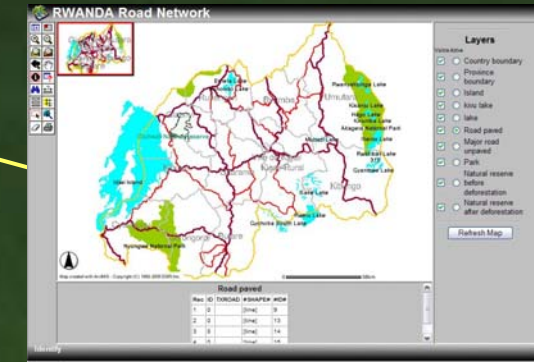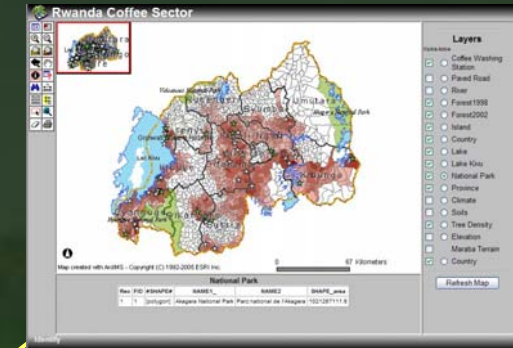
TAMP Webmapping Products
Soon available online

www.cgisnur.org