



AGRHYMET Regional Centre: A Centre of Excellence at the Service of Development



Training Center

**AGRHYMET
Regional Centre
Niamey, Niger**

**U.S. Geological Survey
Center for Earth Resources
Observation and Science (EROS)
Sioux Falls, South Dakota, USA**

Applications of Coarse to High Resolution Satellite Imagery
for Land Productivity Assessment & Management



Welcome to the AGRHYMET Regional Centre: A Centre of Excellence at
the Service of Development

Issoufou Alfari – AGRHYMET Regional Centre



Bamako , Mali

6 - 17 February, 2006



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Welcome to the AGRHYMET Regional Centre



***A Centre of Excellence at the Service of
Development***

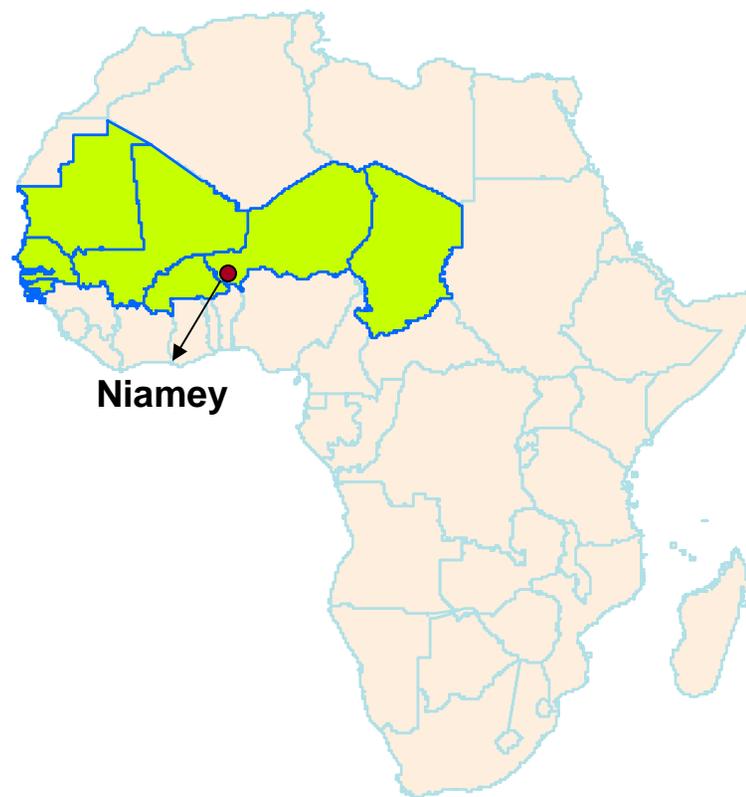
Issoufou Alfari



The AGRHYMET Regional Centre

- Specialized Institute of CILSS based in Niamey, NIGER

Burkina, Cape Verde, Chad, The Gambia, Guinea-Bissau, Mali, Mauritania, Niger, Senegal.



- Creation : **December 1974**
- National Components in each CILSS member country



The AGRHYMET Regional Centre

- **Objectives**

«To promote information and training in agro-ecology in order to contribute to the attainment of food security and increased agricultural production in the CILSS member countries»

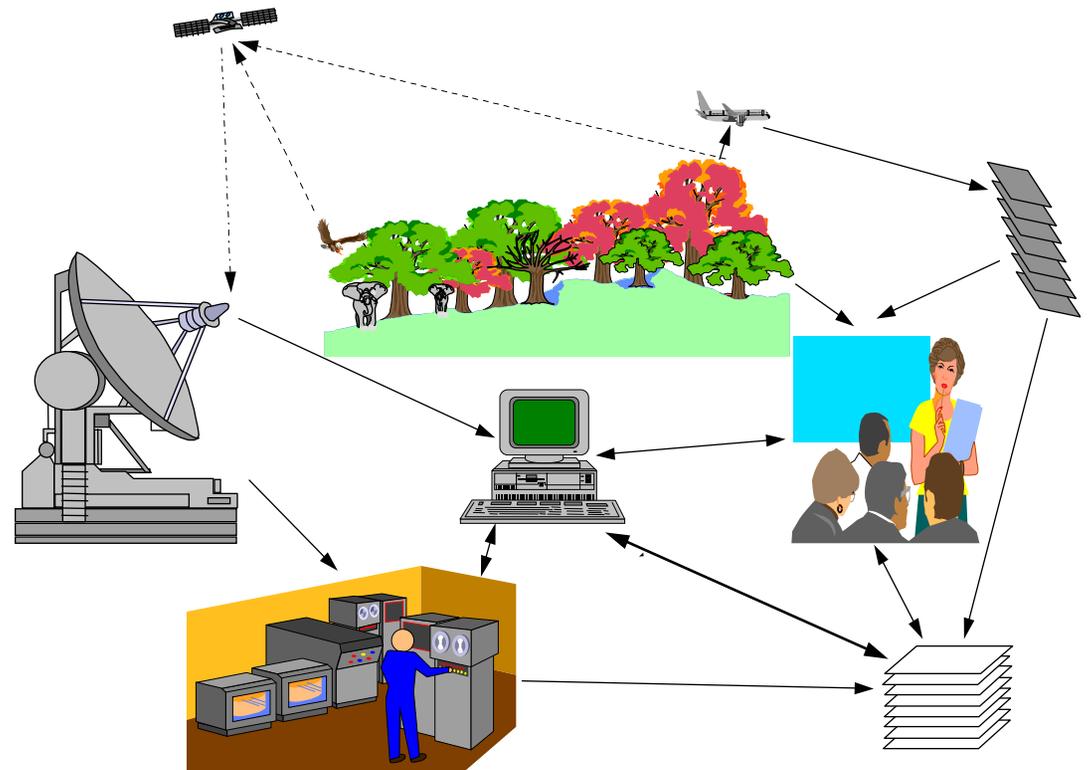
- **Mission**

« To contribute to achieving sustainable food security and rational natural resource and environmental management across the Sahel by building the capacities of national institutions, producing and disseminating information among decision-makers (national authorities, development partners...) and users (institutions, NGOs and producers/farmers)».



To meet these objectives a particular attention was given to the use of remote sensing data to develop products associated with food security and natural resource management

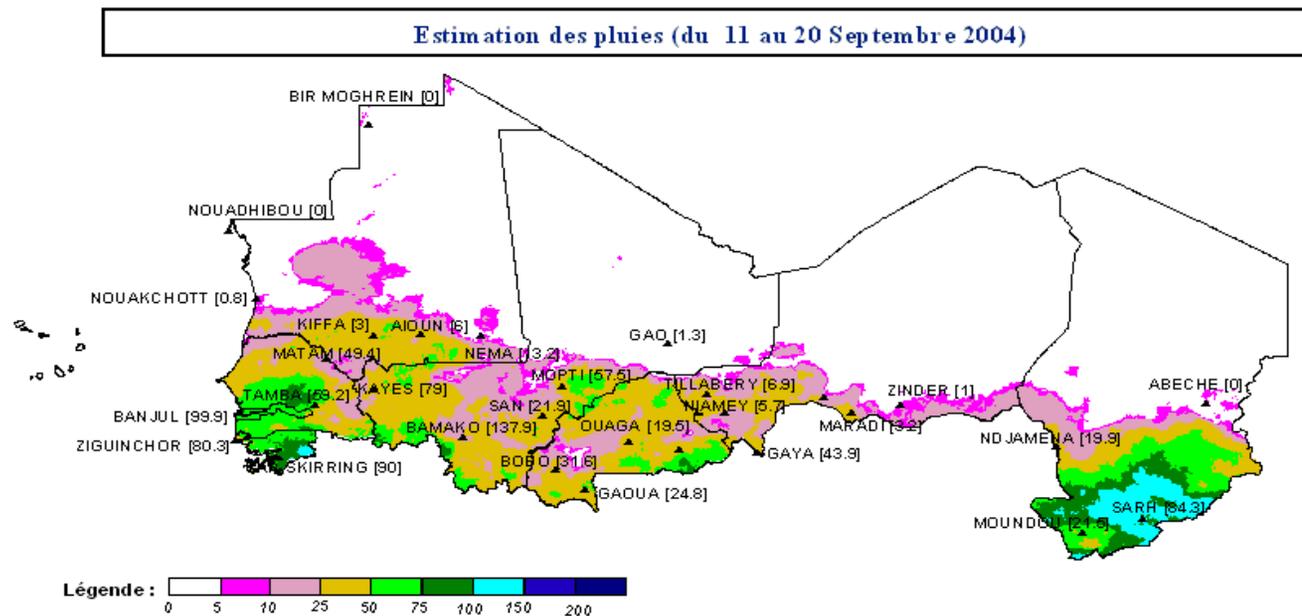
- PDUS (METEOSAT en 1989)
- HRPT en 1990
- Equipments and softwares for image processing (Pcs, Unix Station, Las Adaps, ERDAS/IMAGINE etc..)
- Product elaboration





DATA SET APPLICATIONS

PDUS – METEOSAT: Rainfall estimation





Rainfall estimation is used in many models developed at the Center to monitoring food security

- Start and the length of growing season

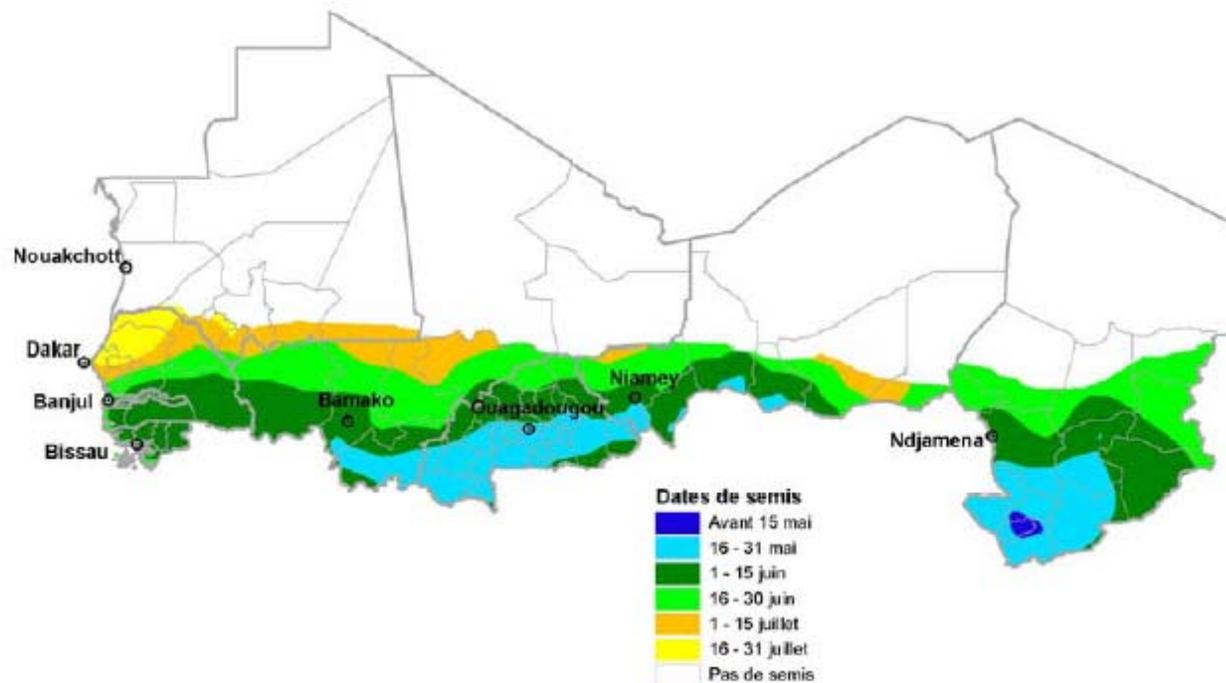


Figure 4.1 : Dates de semis réussis au 31 juillet 2004



Comparison of start of season the current year with last year

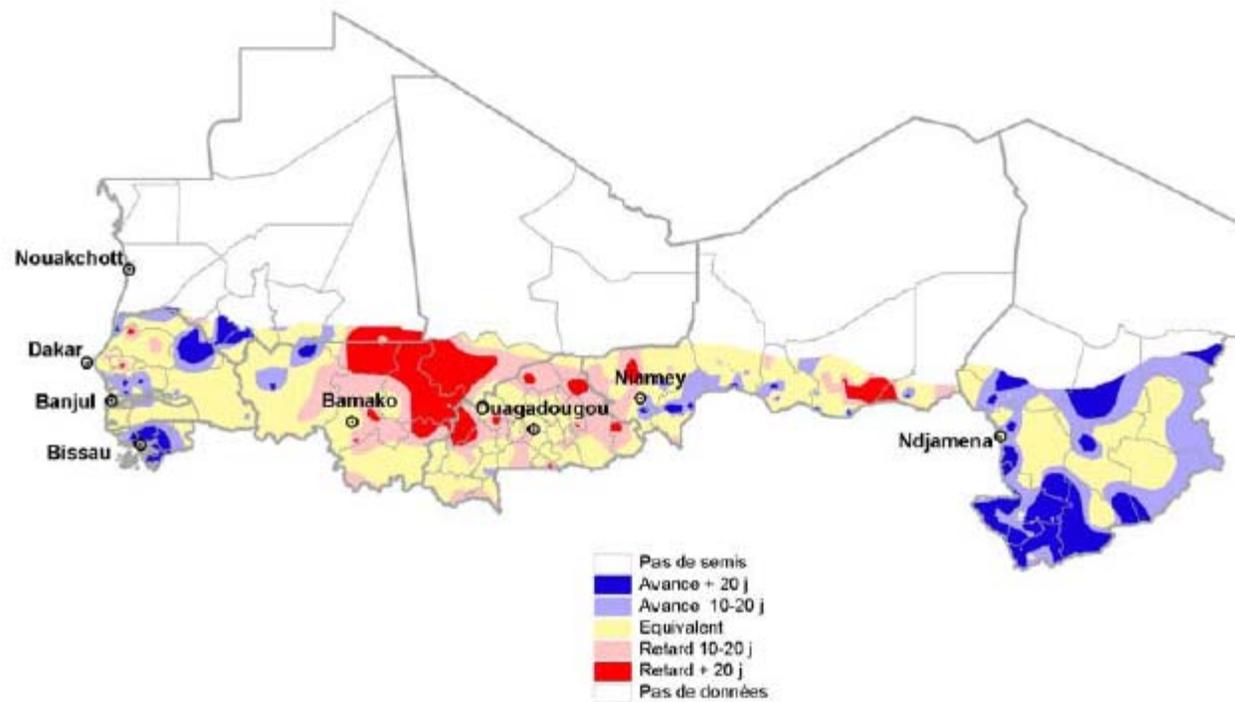
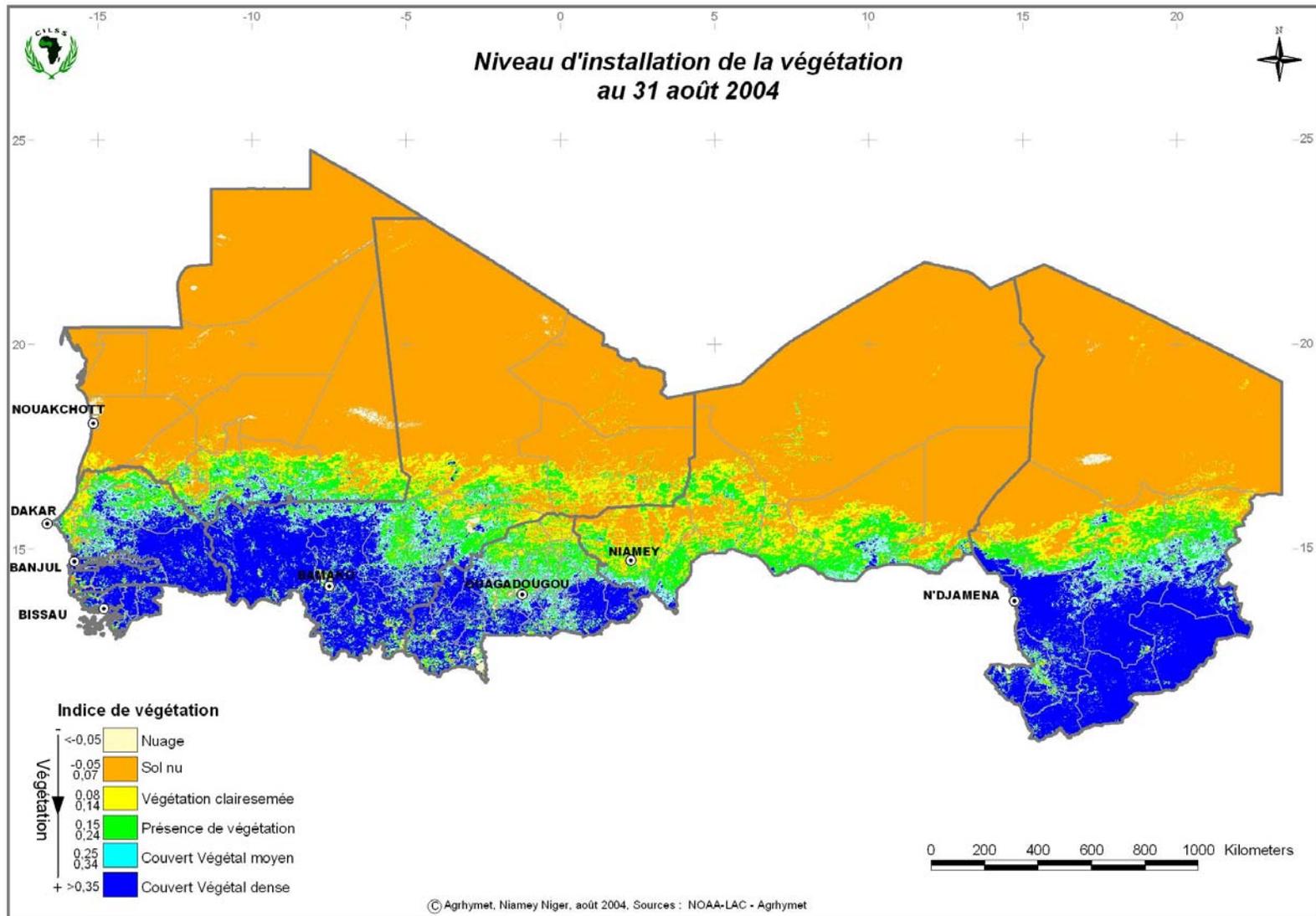


Figure 4.3 : Comparaison entre les dates de semis au 31 juillet 2004 et celles de l'année 2003



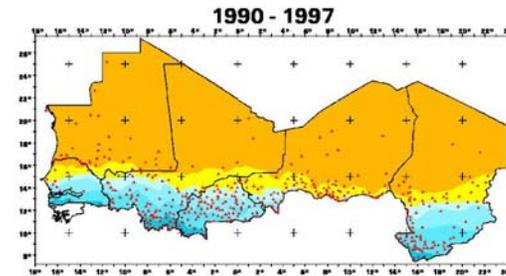
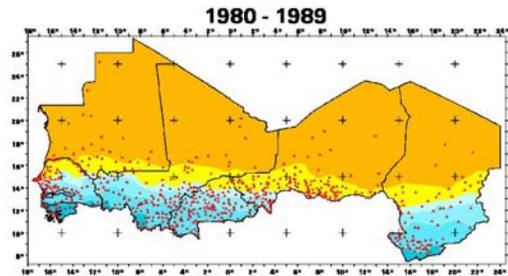
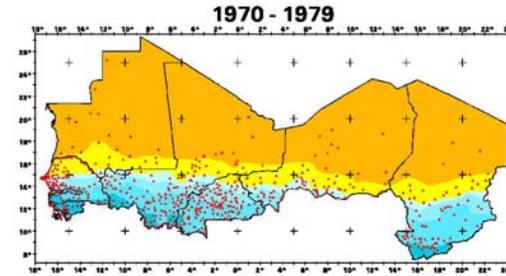
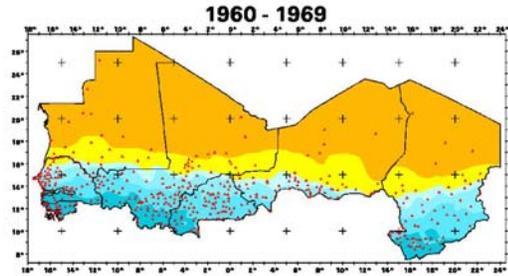
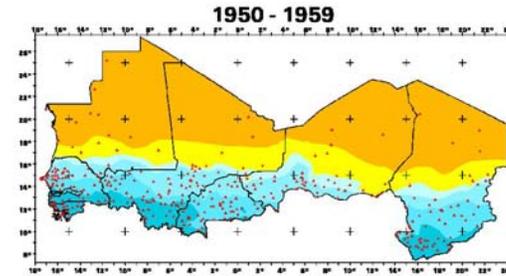
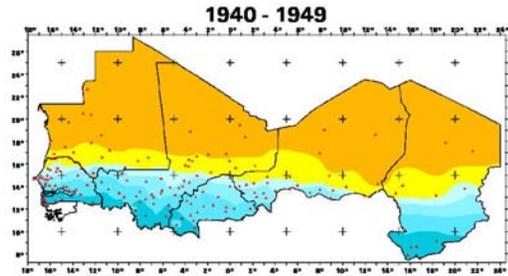
- NOAA – AVHRR Vegetation Greenness Map

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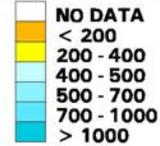




AVERAGE ANNUAL RAINFALL BY DECADE IN WEST AFRICA



Accumulations (mm)



Rainfall station location

Data Provided By:
 AGRHYMET Center
 Niamey Niger
 Famine Early Warning System
 Rainfall Database
 Produced By:
 US Geological Survey
 EROS Data Center (1998)



More maps are produced with NOAA – AVHRR data for

- **Bush fire monitoring**
- **Biomass estimation**
- **Crop yields estimation**
- **Lakes monitoring**
- **Sea surface Temperature**

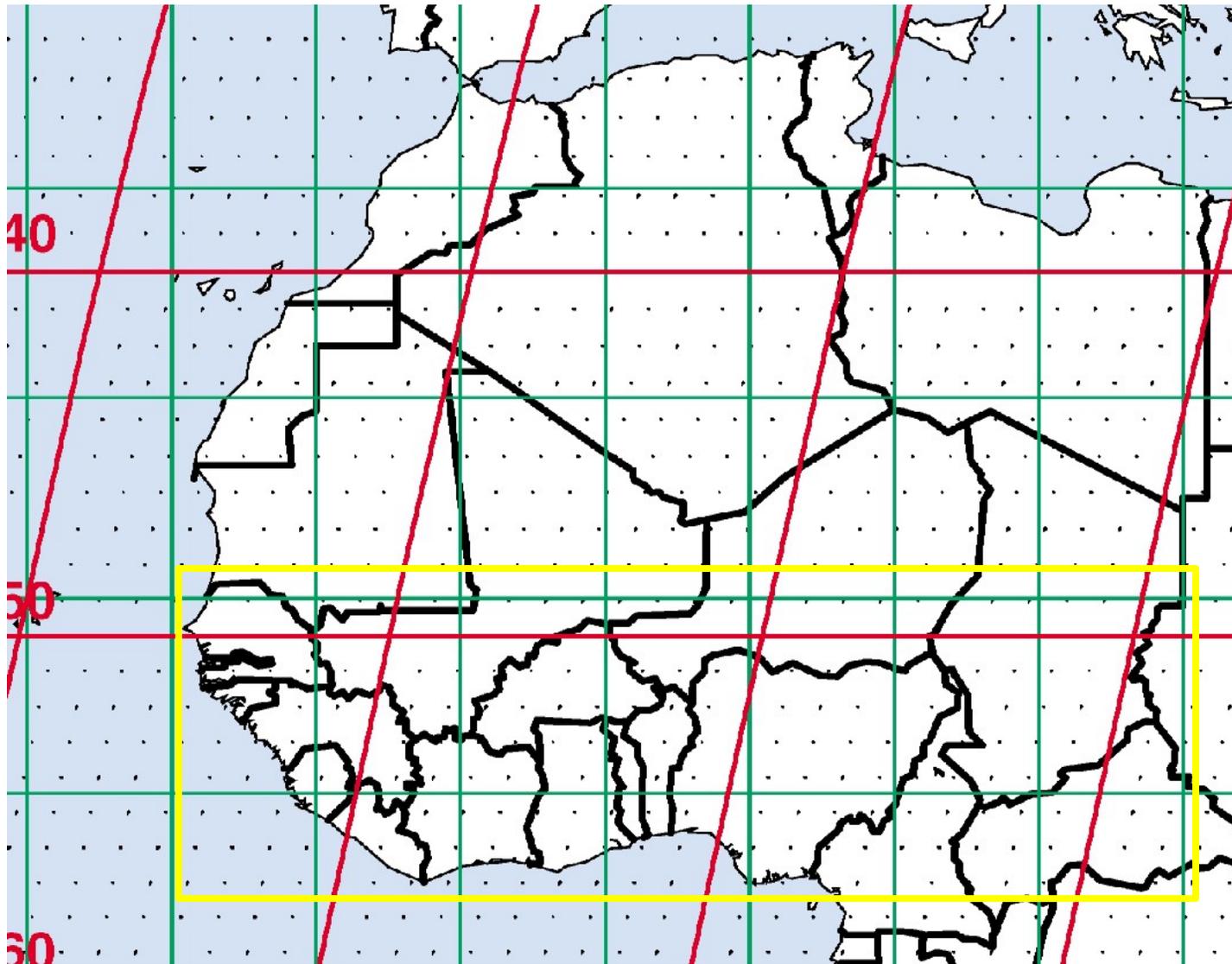
Archive :

- **Daily raw data are available from 1990 to 2004**
- **Decadal vegetation index from 1990 to 2004**

These data covered all west african countries



Landsat satellite images were acquired from USGS
for 1972, 1986 and 2000.





Dissemination :

Landsat data for 1972, 1986 and 2000 are distributed to these following countries :

CILSS countries :

Niger :

- Geographical Institute (IGN)
- Unité Technique d'Appui (UTA)

Burkina faso :

- PNGIM,
- Institut Géographique du Burkina (IGB)

Chad : Laboratoire de Farcha (Ndjamena)

Gambia : National Environmental Agency (NEA)

Mali : Laboratoire de l'EIR, Bamako (1986, 2000)

Mauritania : CNARDA

Sénégal : CSE and **Guinée Bissau**

Projects and univeristy : for specific images



Non-CILSS countries :

Benin : - Centre national de Télédétection (CENATEL)

- La Direction des Forêts et Ressources naturelles

Ghana : -Remote Sensing and GIS Lab. Dept. of Geography
University of Ghana, Accra

- Environmental Protection Agency, Accra

Guinée Conakry : - Direction Nationale de la Météorologie
- Service national des Sols (SENASOL)

Nigeria : - RECTASS, ILE IFE

- National Center for Remote Sensing , Jos

Togo : - Direction Nationale de la Météorologie

- Institut Togolais de Recherche Agronomique

Côte d'Ivoire : Centre National de Télédétection et d'information géographique (CNTIG) (1986 and 2000)



Many applications are being conducted at the Center

**Assessment of Land Use / Land Cover
Changes West Africa**

Burkina Case Study: Mare aux Hippopotames

A Collaborative Program

with

USGS EROS Data Center

AGRHYMET Regional Center in Niamey, Niger

Institut du Sahel in Bamako Mali

With funding from the

U.S. Agency for International Development



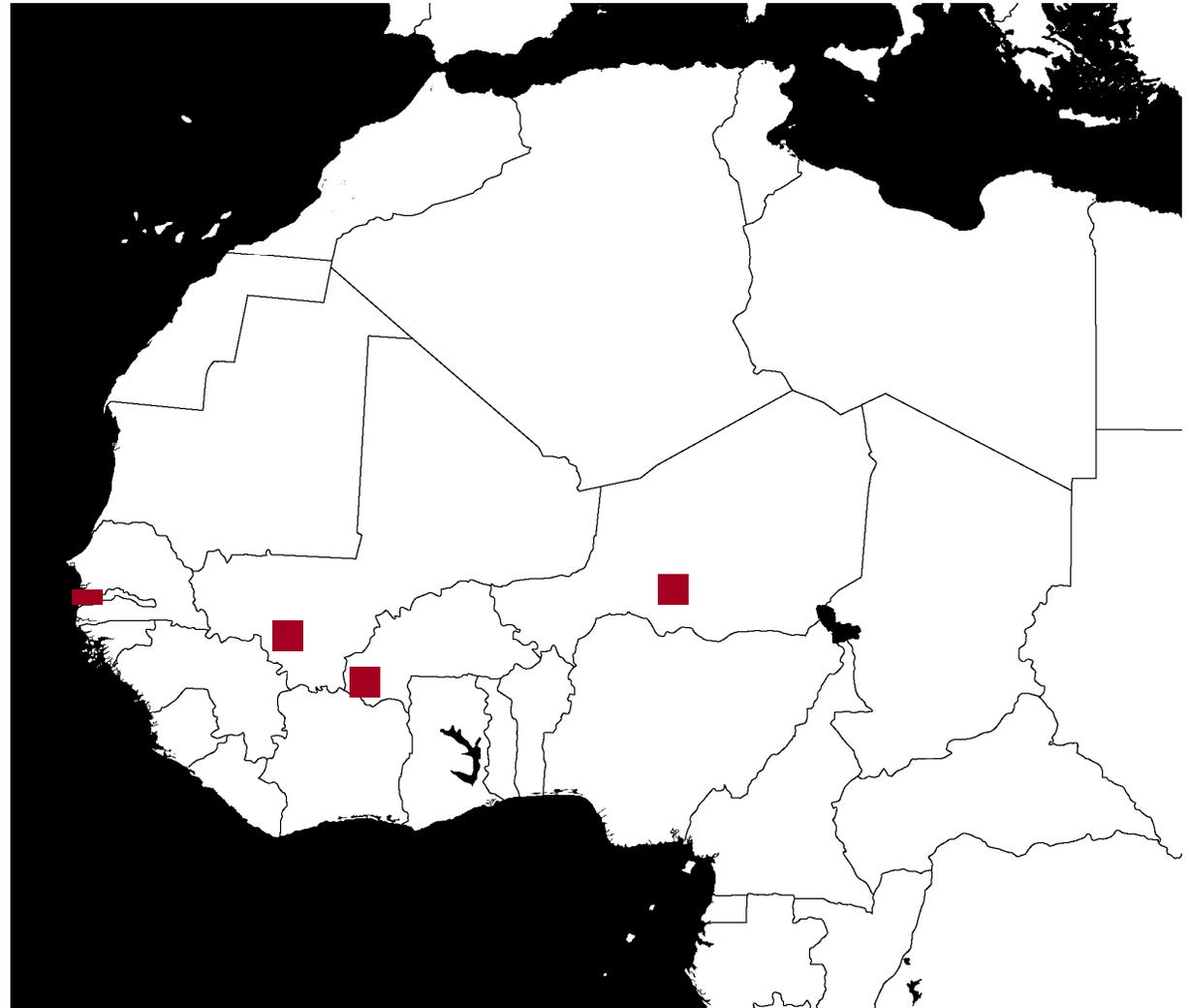
Major concerns during the past 40 years :

- ✓ decrease in rainfall since 1880's
- ✓ decline in vegetation cover and biodiversity
- ✓ decline in fauna
- ✓ natural resources are degrading
- ✓ expansion of cultivated area
- ✓ land cover changes driven mainly by human factors
- ✓ degraded soils have high potential for carbon sequestration
- ✓ high population growth, 2.7% per year, doubling every 25 years
- ✓ farming has gradually become market oriented
- ✓ Etc....



Phase 1: Case Studies of Land Use and Land Cover Change

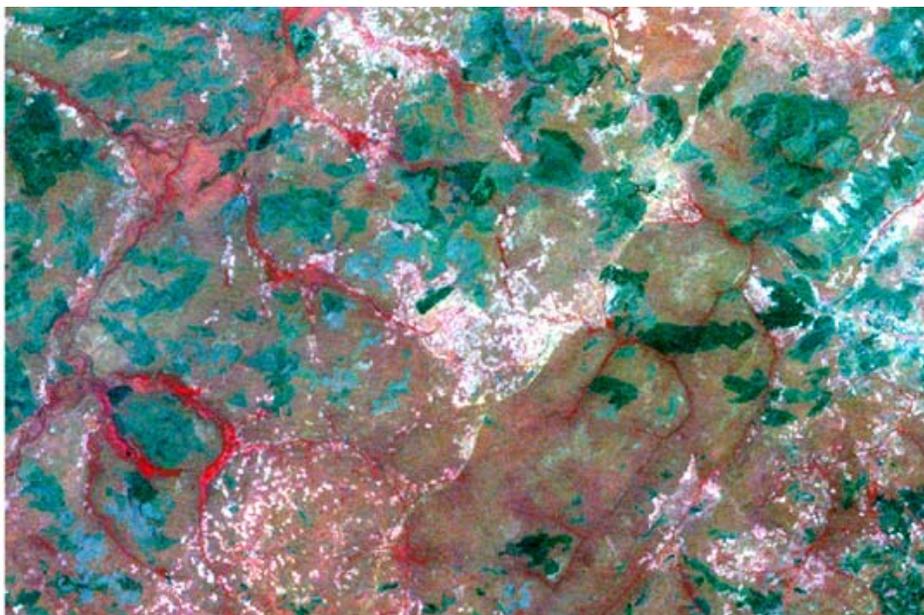
1. Western Gambia
2. Kolokani, Mali
3. Mare aux Hippopotames, Burkina
4. Mahayi, Niger





Burkina Faso: Mare aux Hippopotames

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Landsat data

1973



1999



Satellite Level:

Historical Imagery from the Corona and Argon Satellite Programs

Corona System Overview:

Period of Operation: 1959-1972

Number Missions: 95 successful;
121 total

Orbit: Near-polar

Altitude: 150 to 203 km

Sensor Type: Photographic
camera,
24" focal length

Film Type: Kodak
panchromatic film

Nominal Photo Scale: 1:305,000

Spectral Region: Visible

Scan Angle: 70 degrees

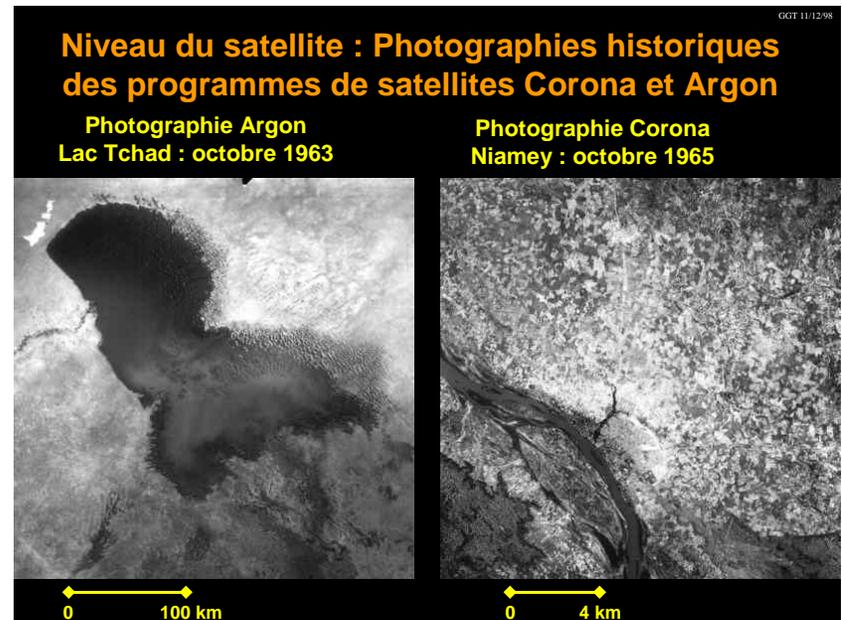
Ground Coverage: 19.6 by 266 km

Ground Resolution: 1.5 to 8 meters

Corona image



Ouagadougou
Janvier 1968
(Corona)



Niveau du satellite : Photographies historiques des programmes de satellites Corona et Argon

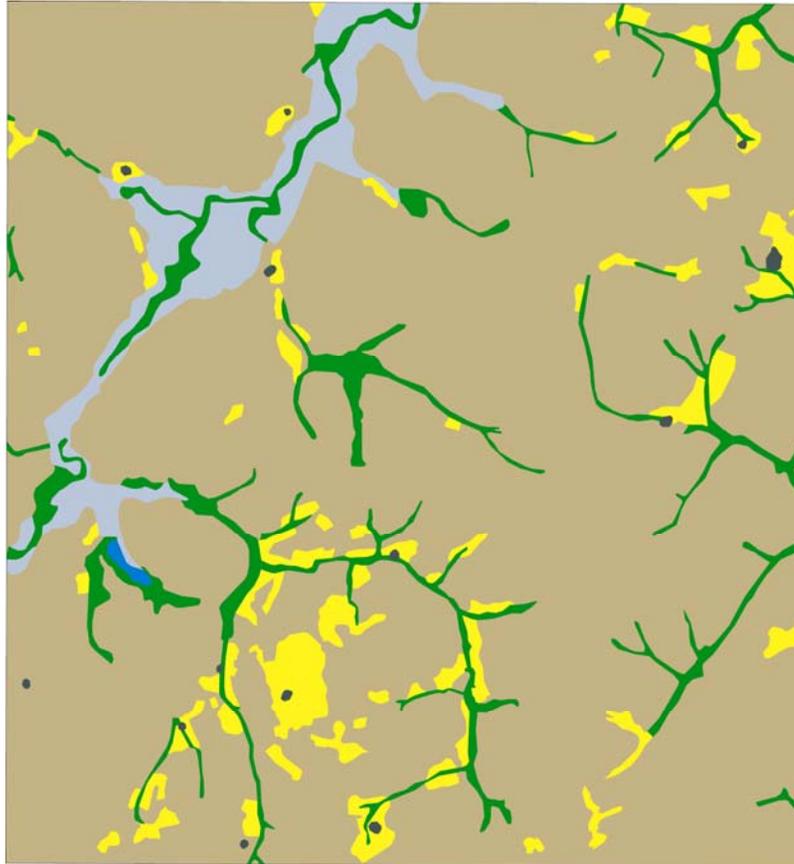
Photographie Argon
Lac Tchad : octobre 1963

Photographie Corona
Niamey : octobre 1965



Results :

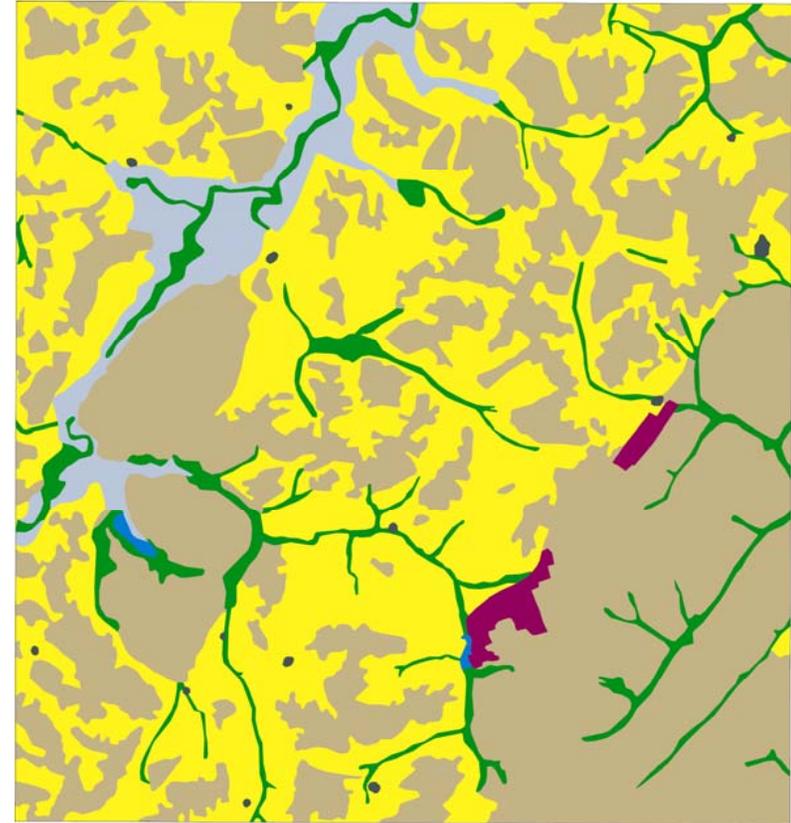
1965



- Terres Cultivées / Cultivated Lands
- Forêt Amenagée / Forest Plantation
- Savanes / Savannas
- Forêt Ripicole / Riparian Woodland
- Marécage Herbacé / Herbaceous Wetland
- Habitation / Settlement
- Eau / Water



1999



- Terres Cultivées / Cultivated Lands
- Forêt Amenagée / Forest Plantation
- Savanes / Savannas
- Forêt Ripicole / Riparian Woodland
- Marécage Herbacé / Herbaceous Wetland
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Burkina Case Study: Mare aux Hippopotames

- **Land Use / Land Cover Change**
 - ◆ **agricultural area shows 7 times an increase in 34 years**
 - ◆ **agricultural expansion has consumed most arable lands**
 - ◆ **loss of nearly half of the natural vegetation in 34 years**
 - ◆ **high level of vegetation degradation in natural areas**



Phase 2 : Workshop for Interpretation of Landsat data

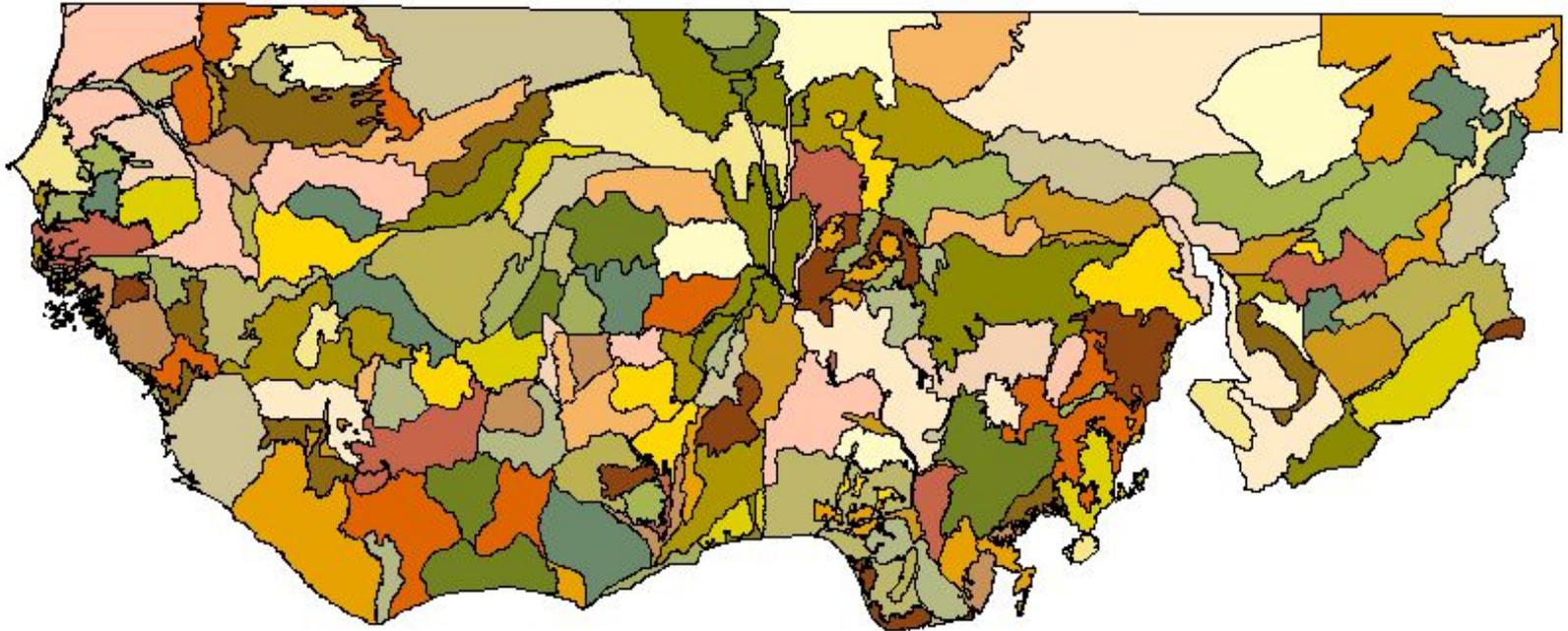
At Agrhymet, Niamey



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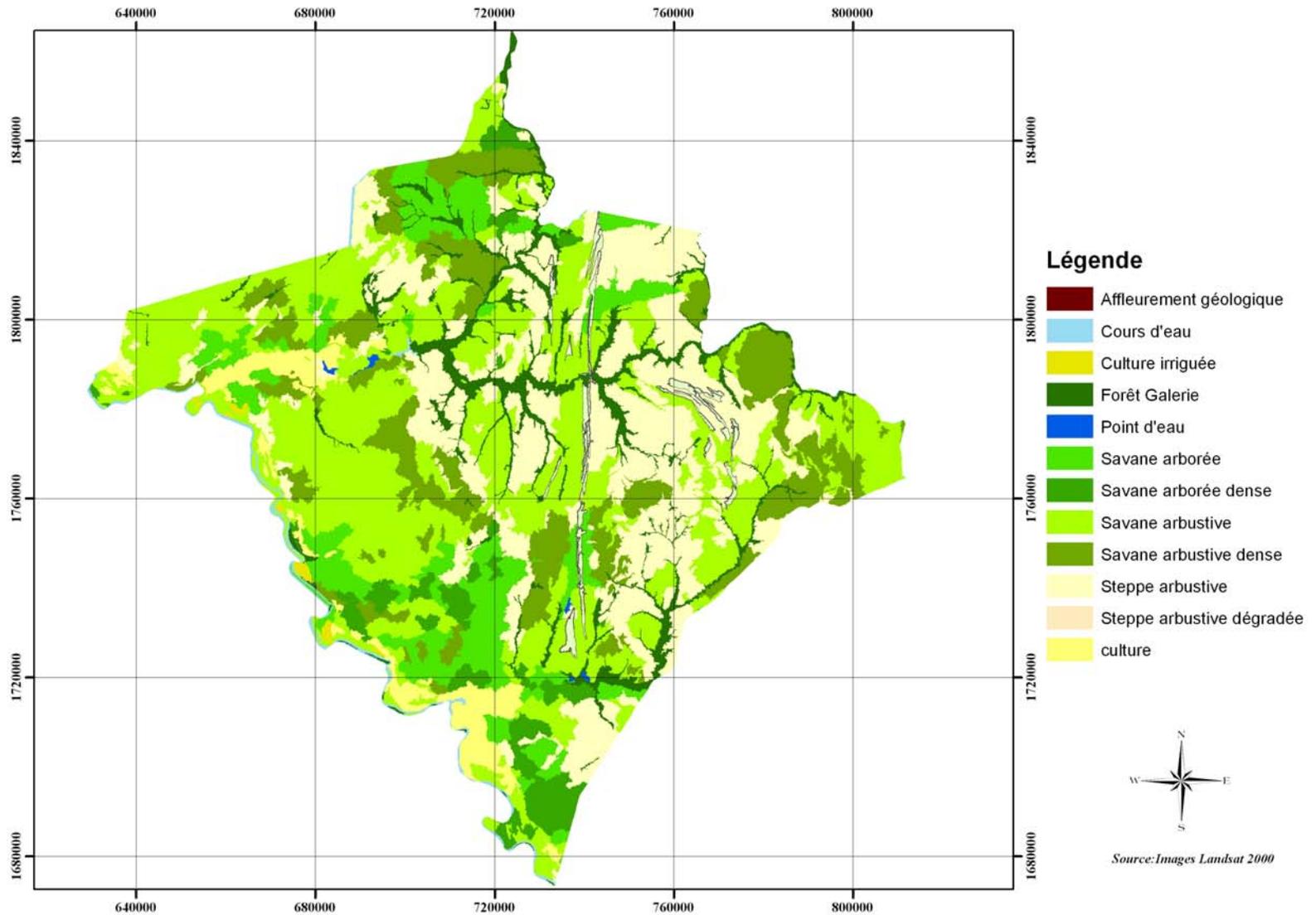
Ecoregion Map for West Africa



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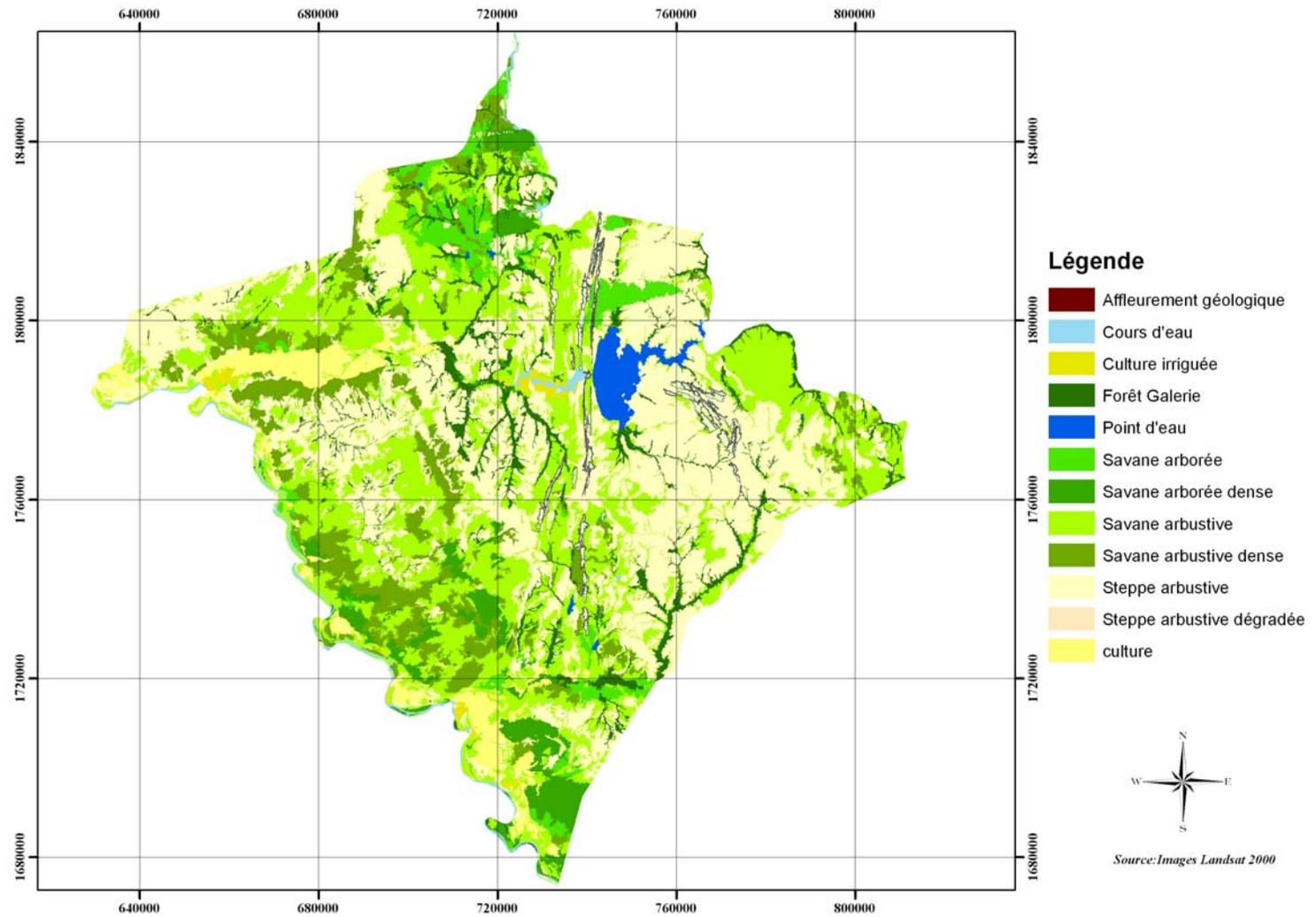


Carte d'occupation des terres de l'année 1974 de Gorgol





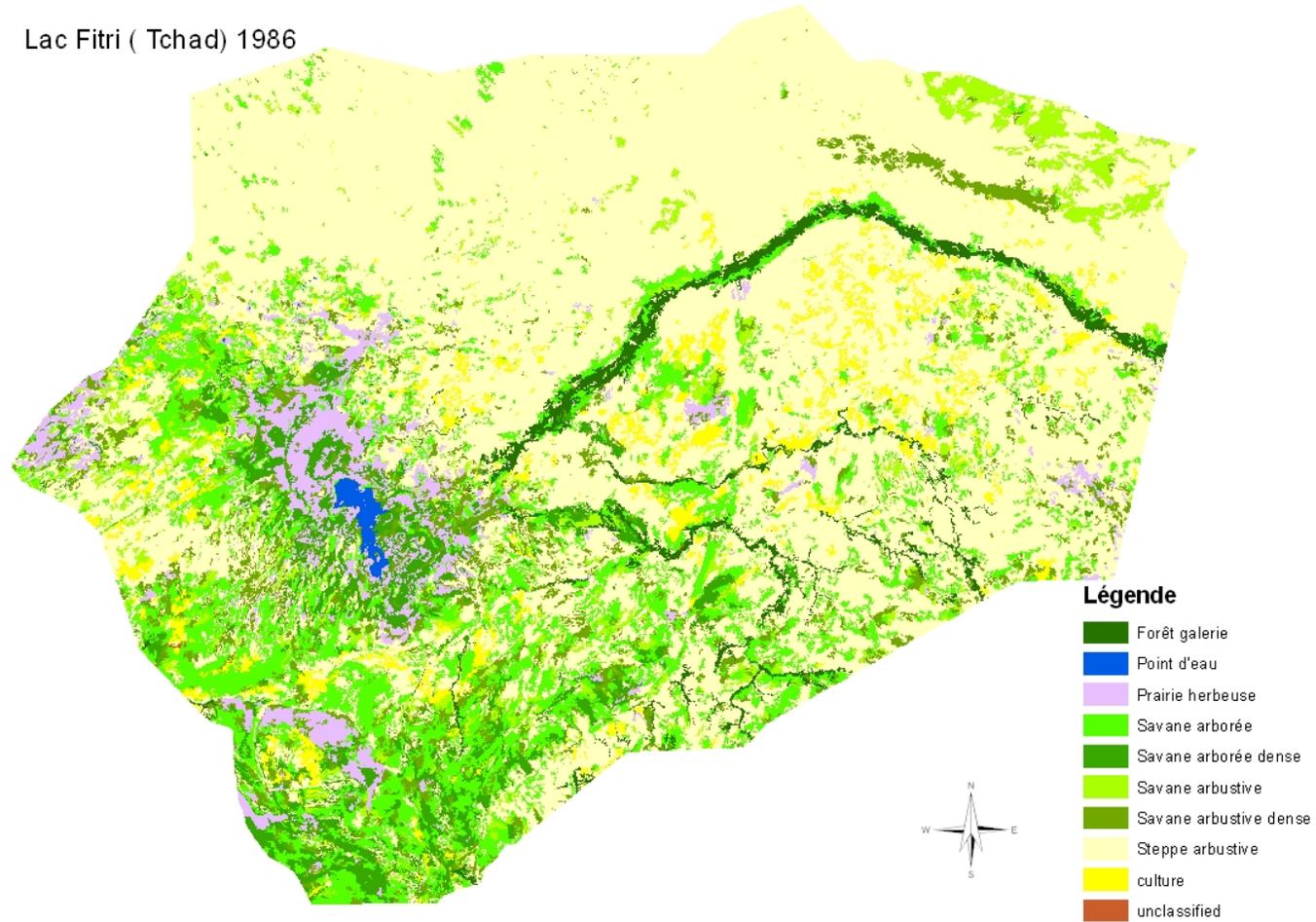
Carte d'occupation des terres de l'année 2000 de Gorgol





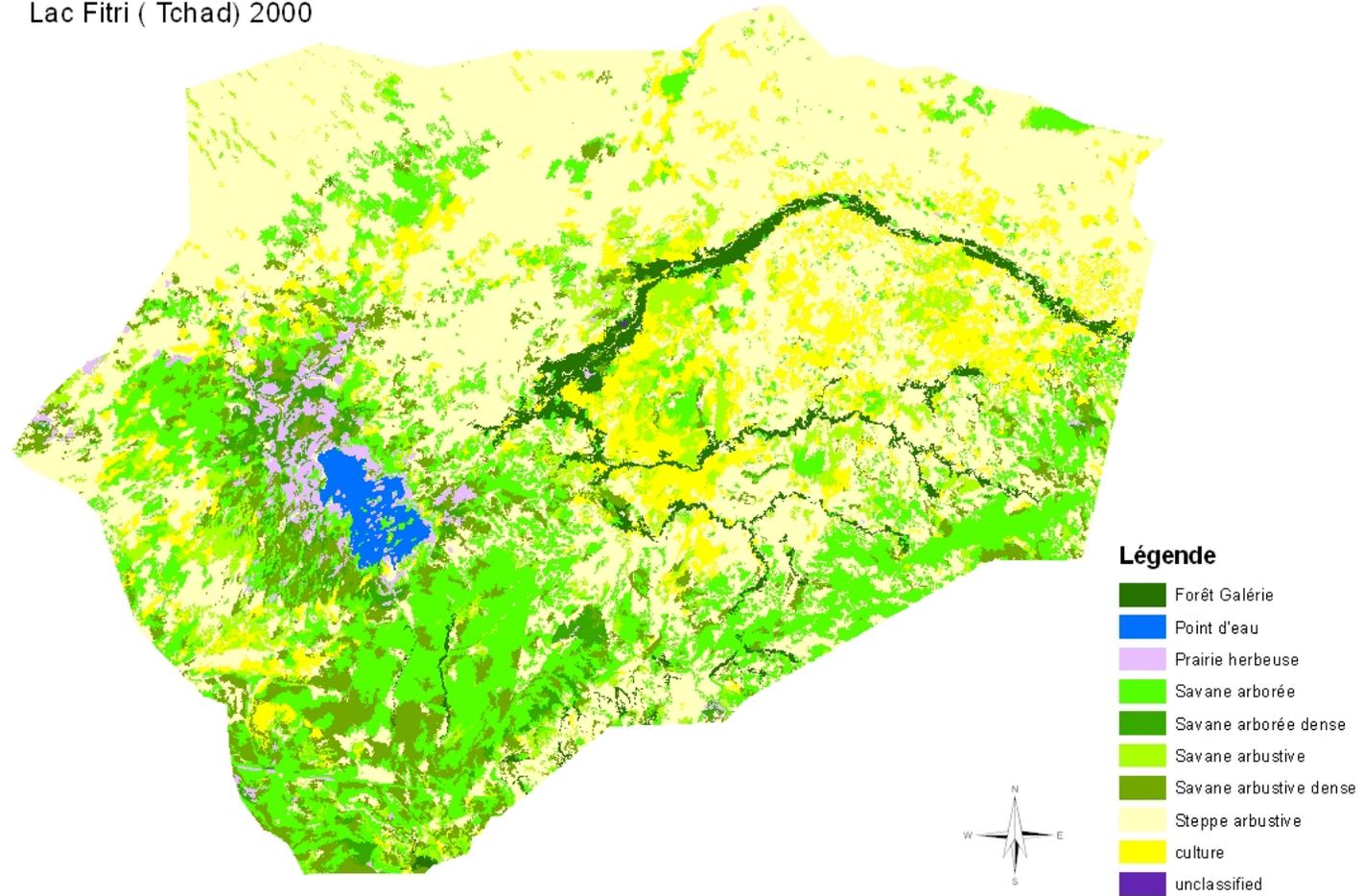
Chad : Land Cover Change around the Lake Fitri

Lac Fitri (Tchad) 1986





Lac Fitri (Tchad) 2000

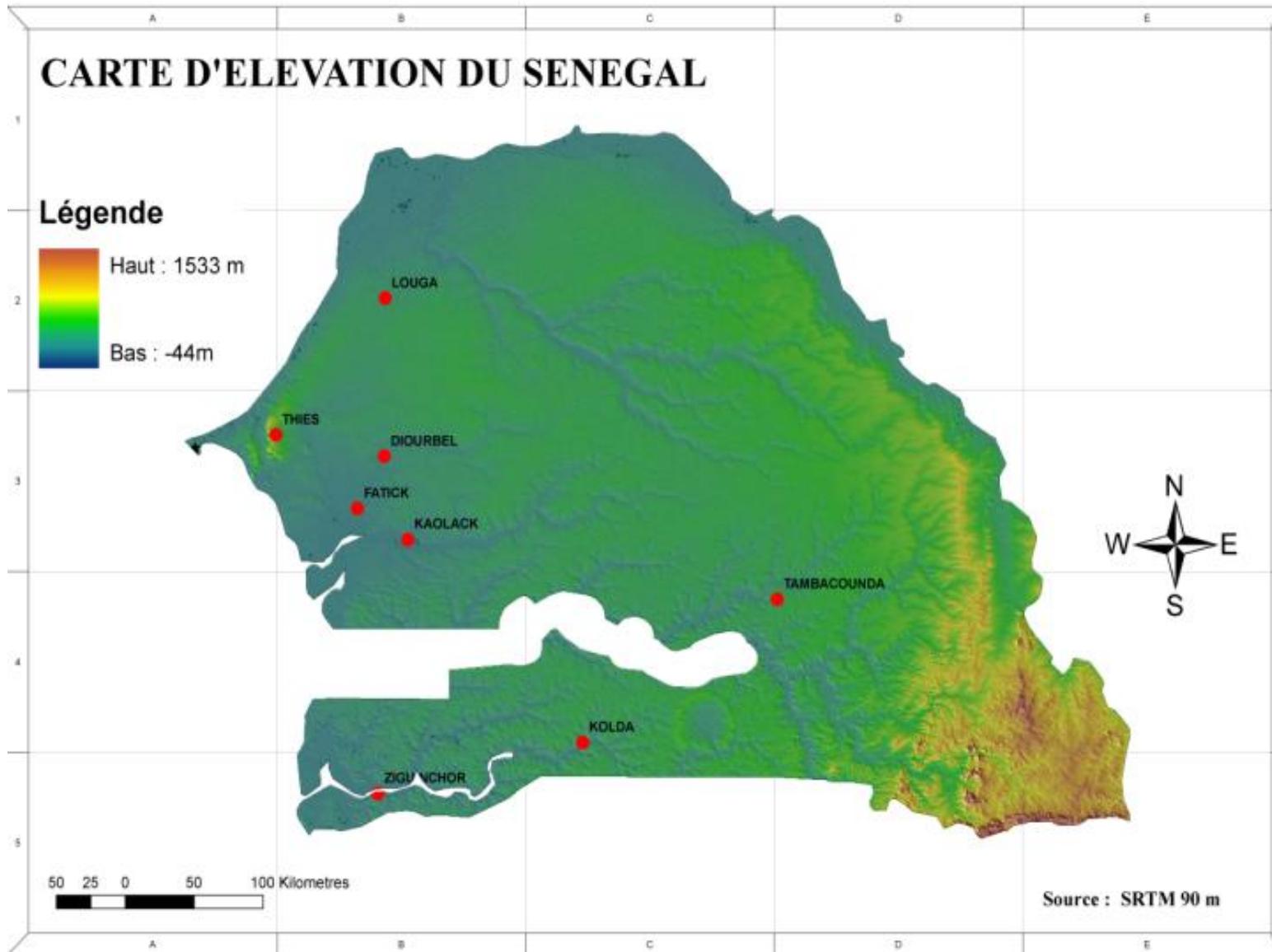


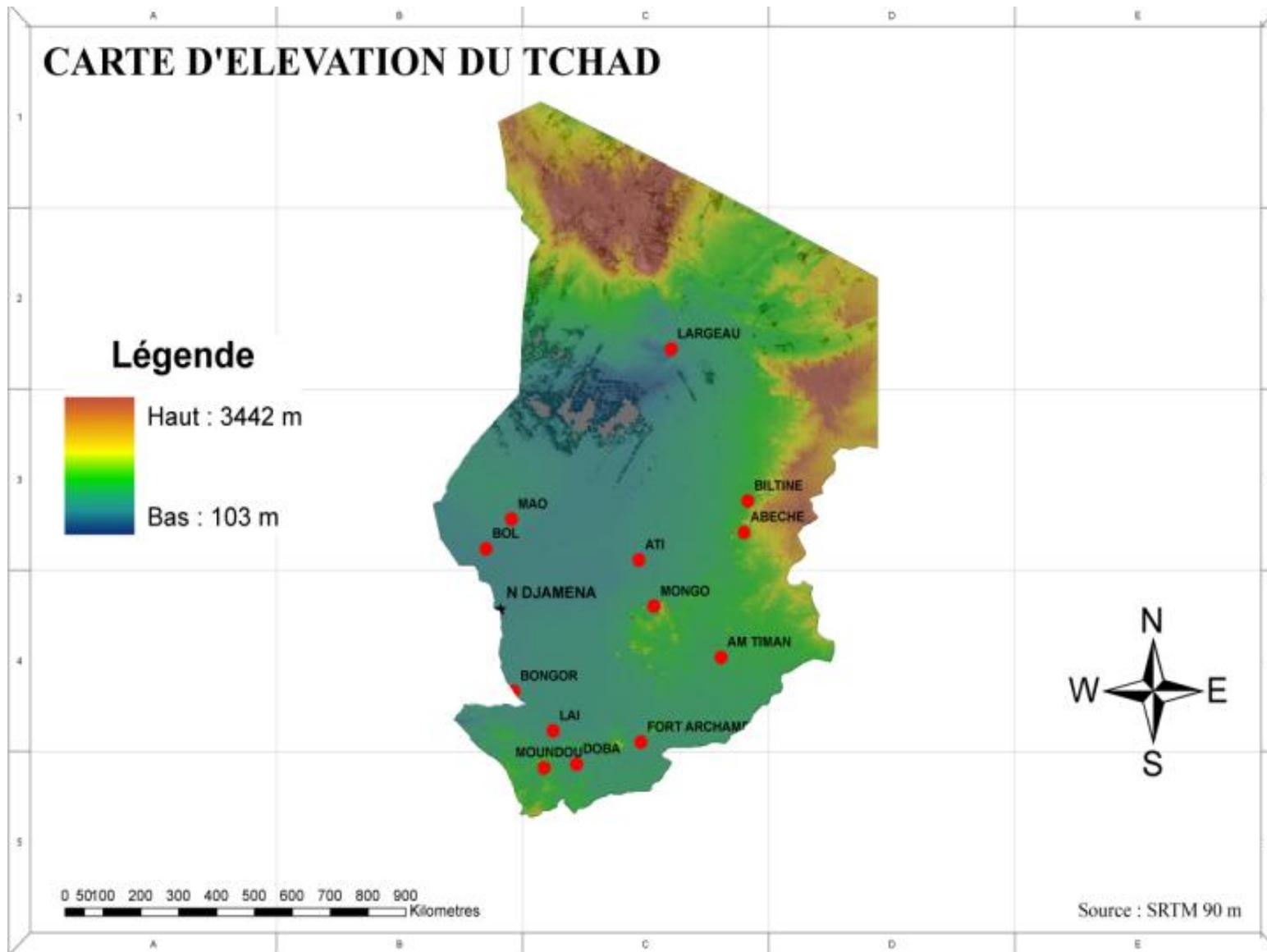


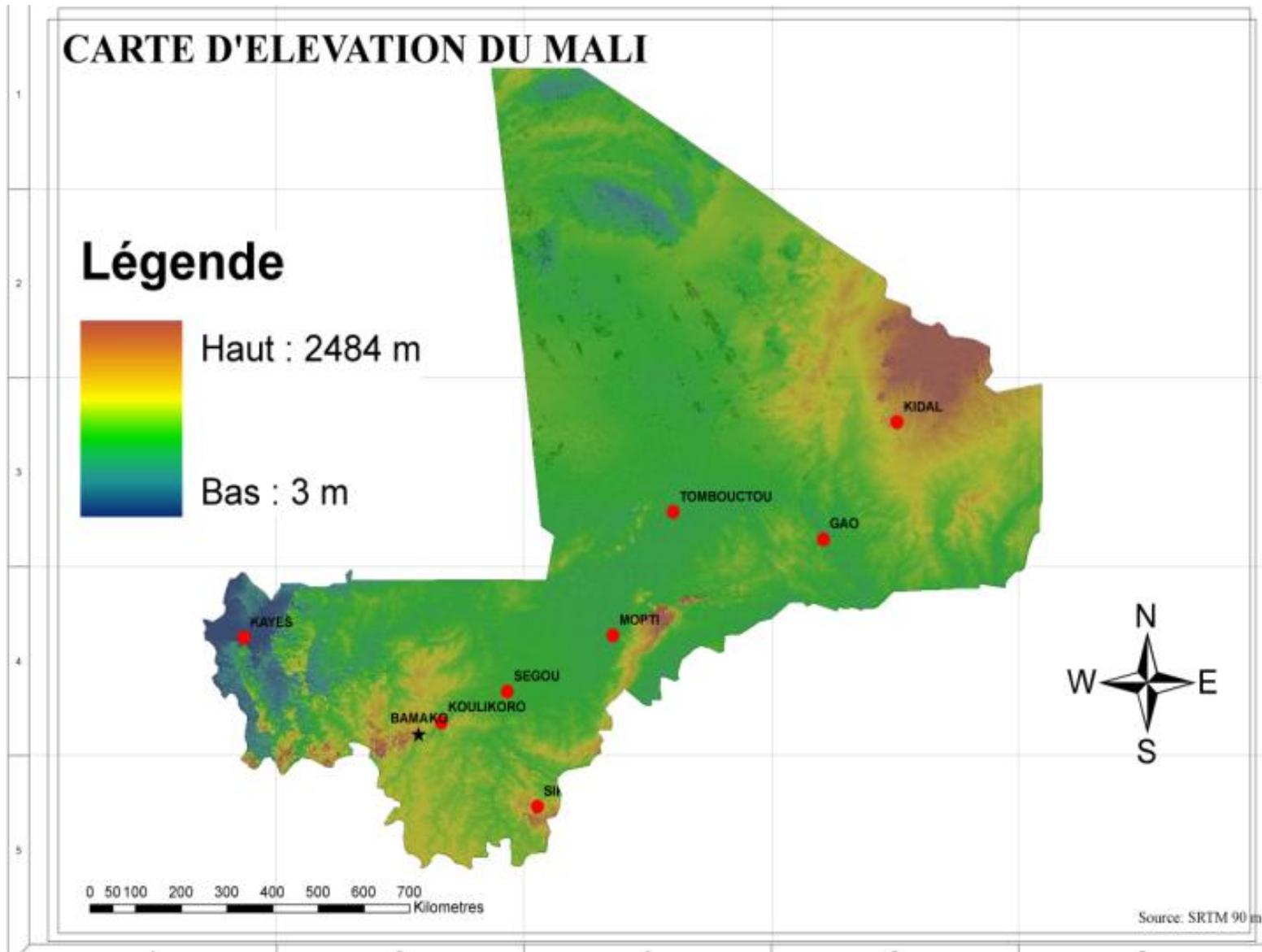
SRTM images

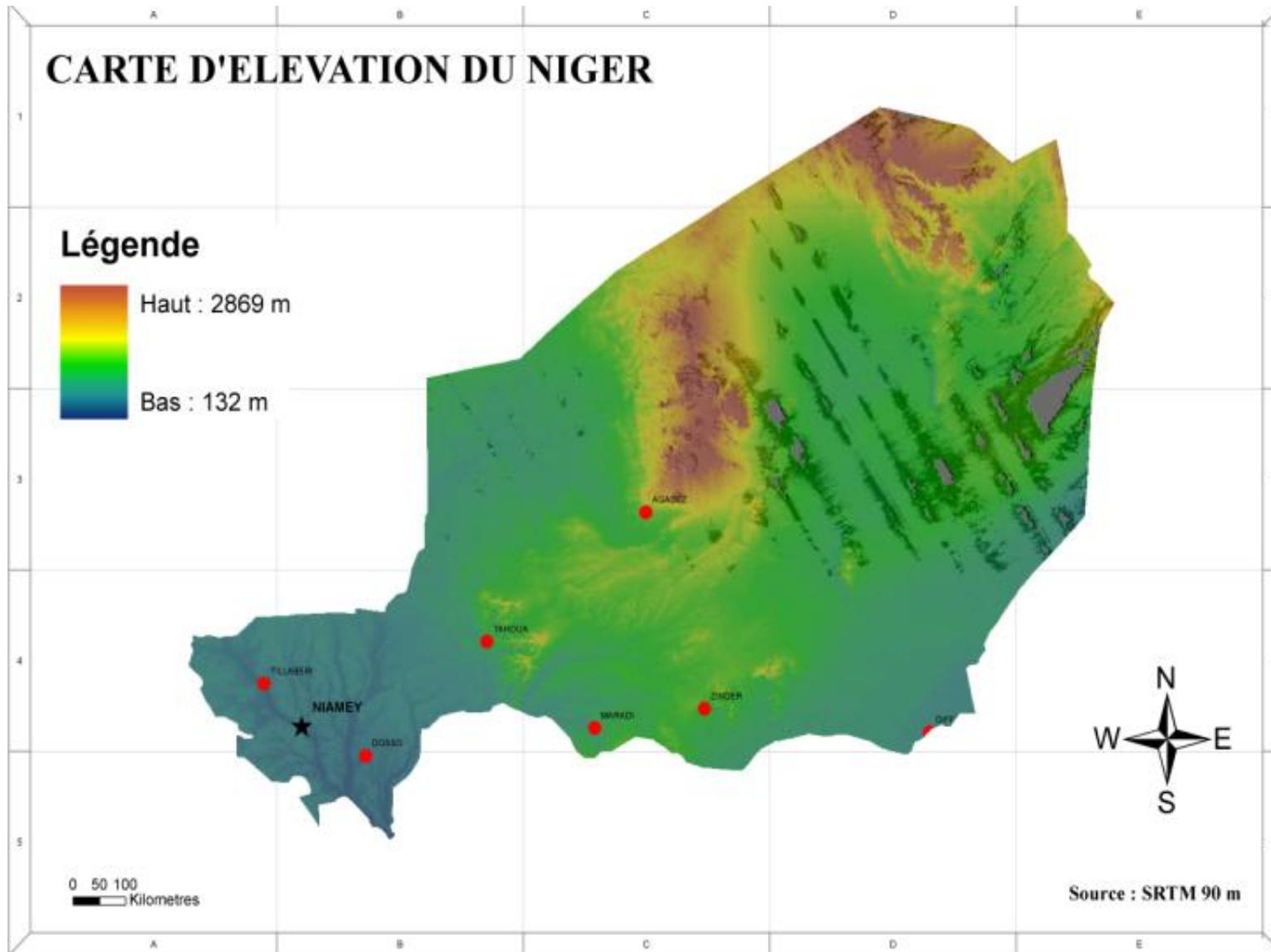
SRTM images were received from USGS covering the whole West Africa countries

- **SRTM: Shuttle Radar Topography Mission,**
- **Launch in février 2000**
- Processing were done on those images to get Elevation data.
- They are being used in many applications at the Agrhymet Center
- The Elevation images will be distributed to all Wesr African countries











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Thank you for your Attention !



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