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DIV 8 CONFERENCE 2023

Priority areas and management strategies identification for landscape forest restoration in Mozambique

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cirad LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

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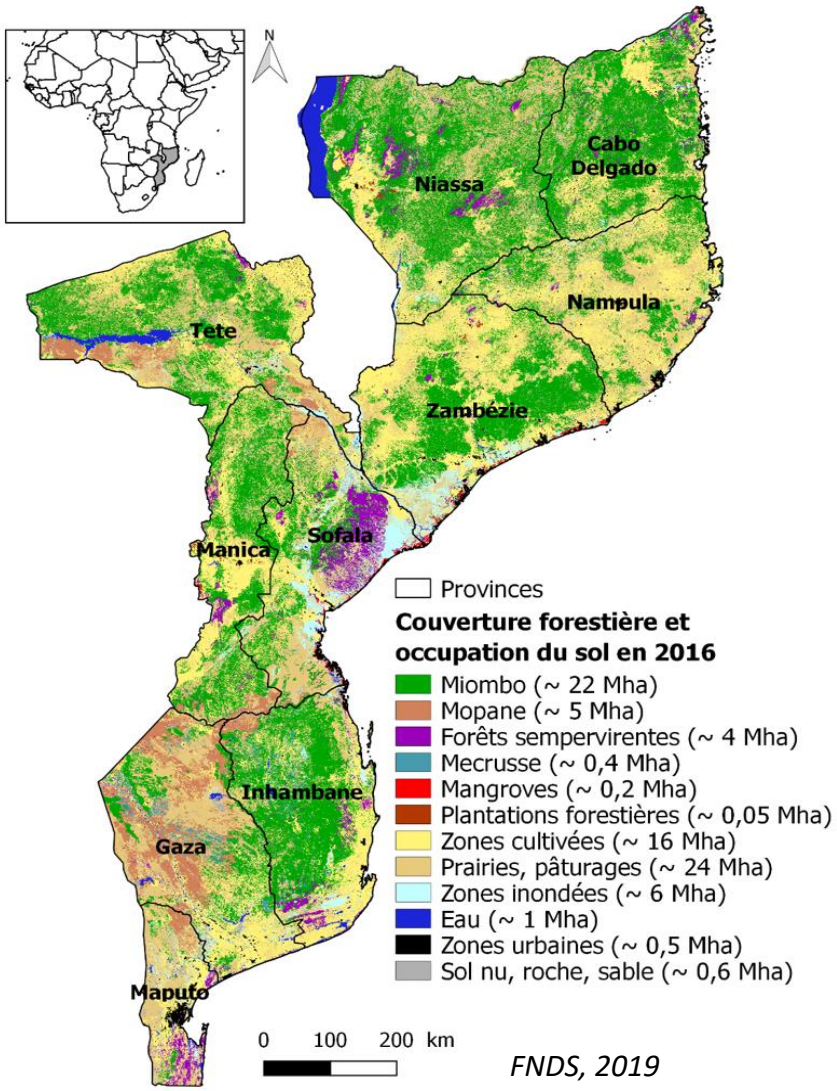
Ecole Doctorale ABIES

Mozambique



FNDS, 2019

- Natural forest : 38 % of the country

Land degradation : deforestation, erosion…

afr100

Objective : 1 Mha of degraded land by 2030

- **Forest landscape restoration**

« Regain ecological integrity and enhancing human well-being in deforested or degraded forest landscape »

Where to restore and what restoration strategies to adopt?

- Location: multiple ecosystem functions
- Strategies (passive/active) : Depends on the state of the ecosystem, the functions to be restored, the time and resources available

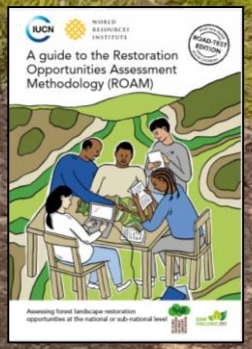
Agroforestry

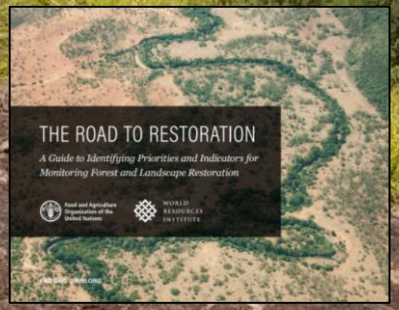
Reforestation

Fire management

Soil restoration

Assisted Natural Regeneration



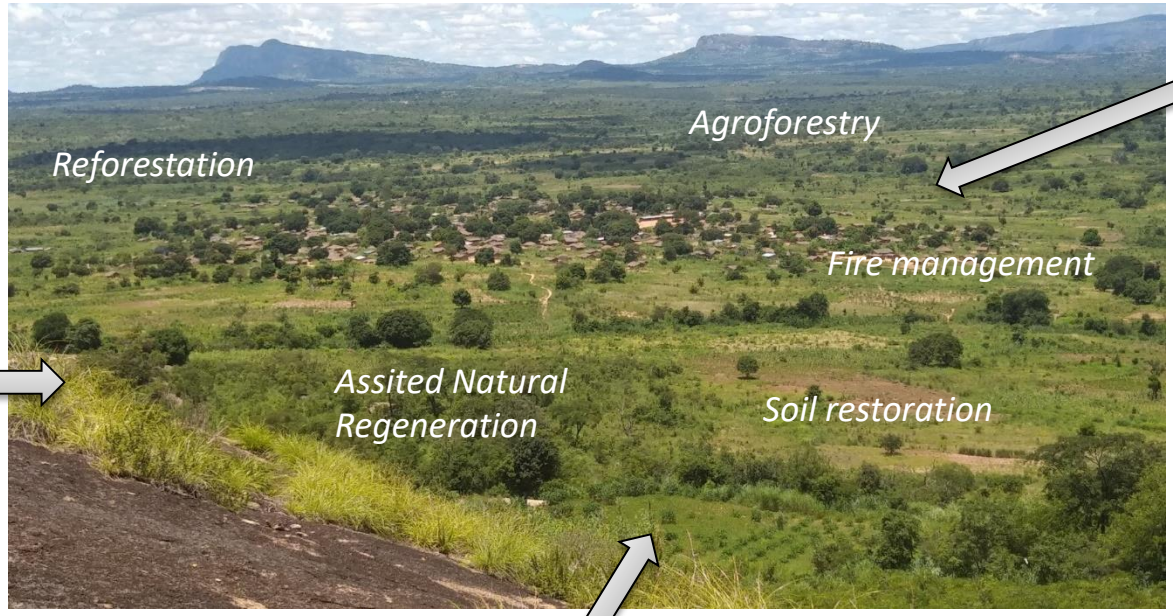


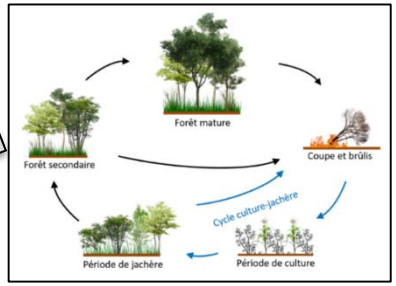
Objectives

- identification of priority areas => multiple ecosystem functions
- identification of restoration strategies => regeneration potential & objectives

Ecosystem functions

(carbon sequestration, habitat connectivity, etc.)





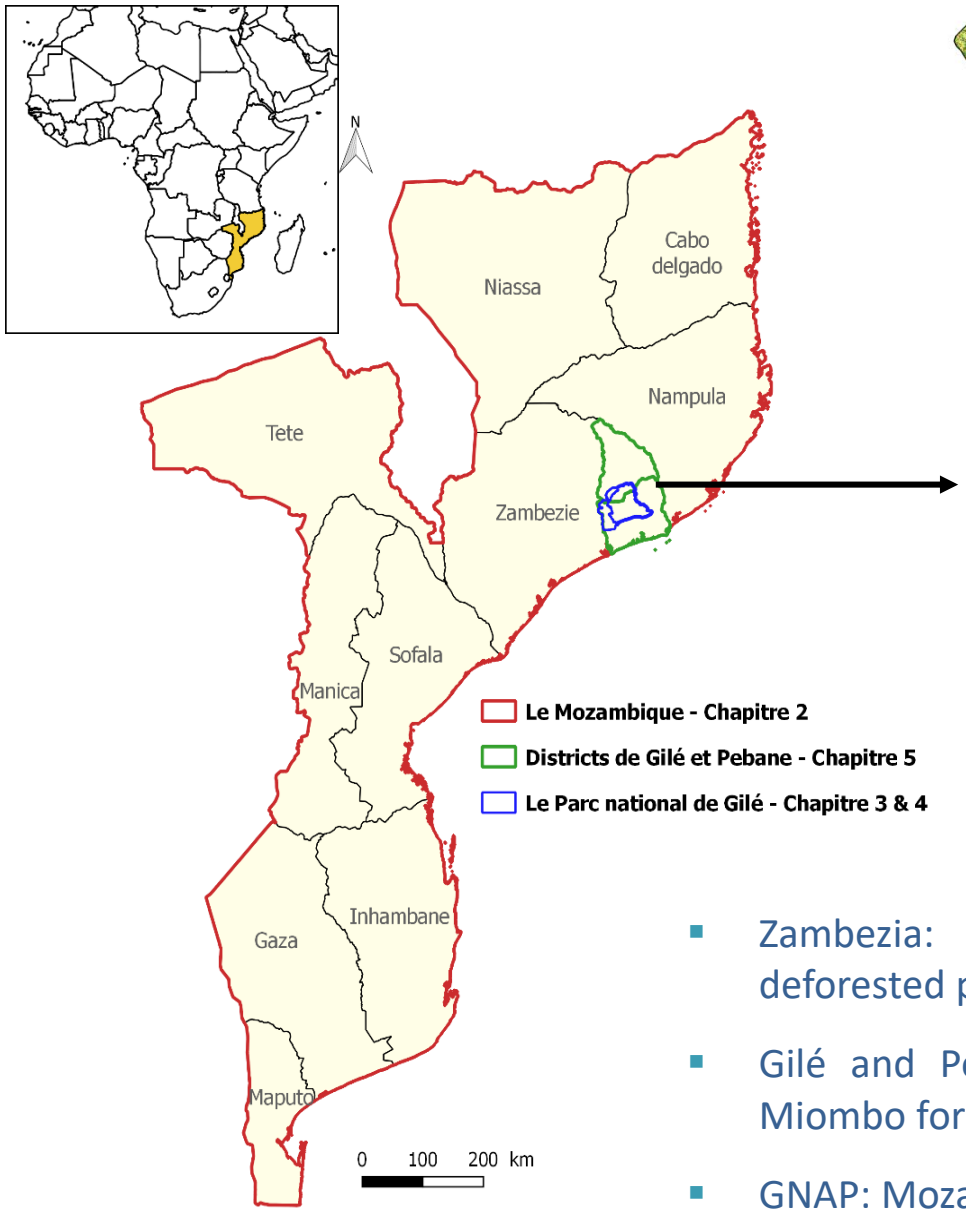
Land use history

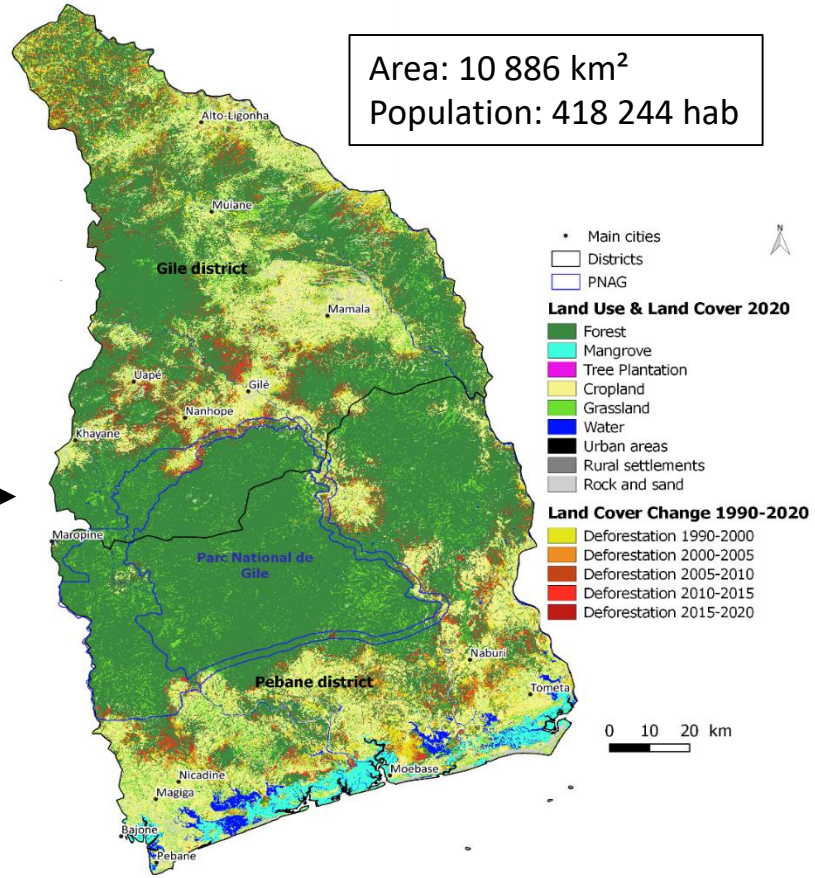
(number of cycles, fallow period, etc.)

Restoration objectives

Methodology adapted from : ROAM 2015, Schulz and Schröder, 2017…

Study area





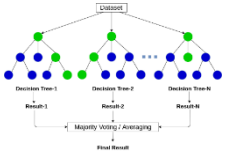
- Zambezia: the country's second most populous and deforested province
- Gilé and Pébane districts: 57% of the area covered by Miombo forests
- GNAP: Mozambique's only uninhabited protected area

Methodology : identification of priority areas

1. Mapping ecosystem functions and properties

- **Biomass carbon sequestration potential**
- **Soil carbon sequestration potential**
- **Woody species diversity (Shannon)**
- **Maintain habitat connectivity**

Method: Spatial modelling with field inventories and spatial variables



graphab

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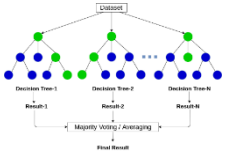

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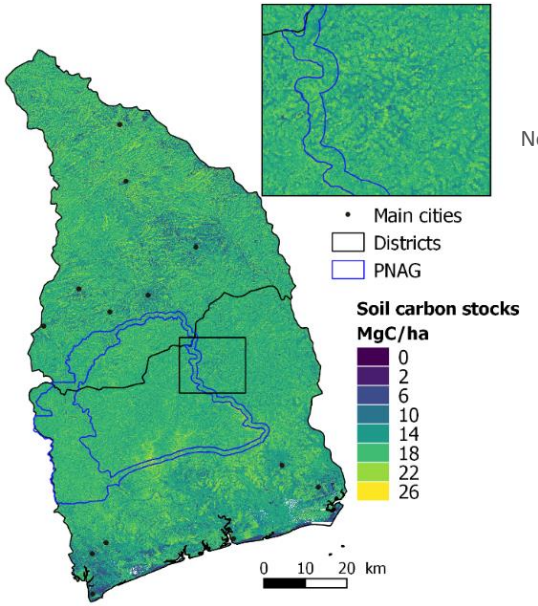
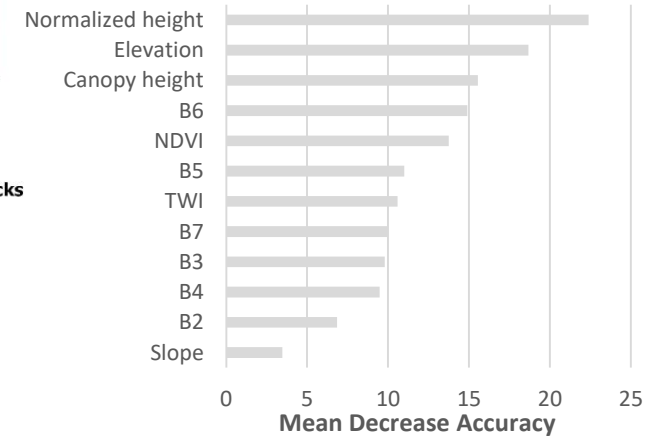
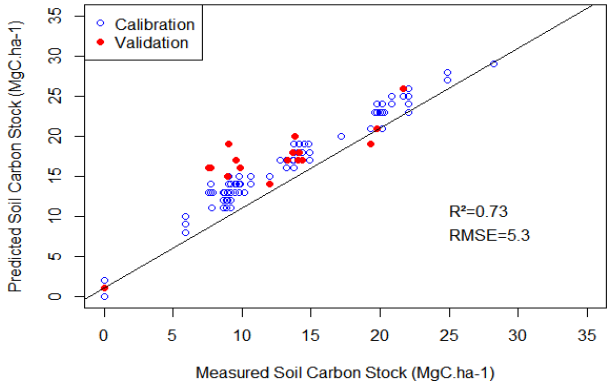






Field inventories (50 plots) and spatial variables (12)

Methodology : identification of priority areas

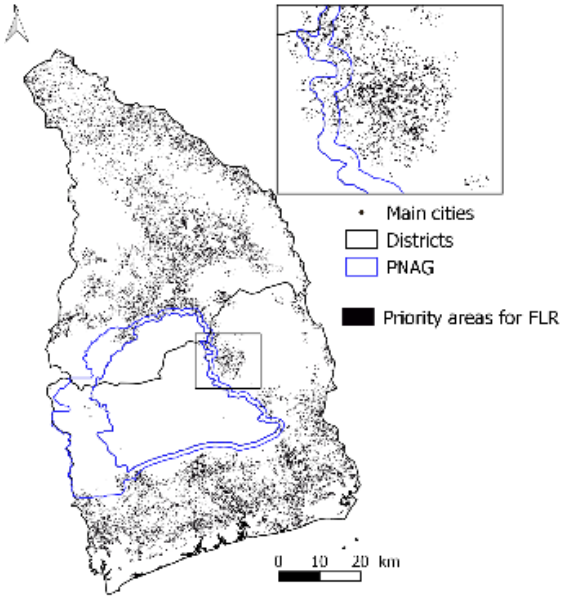
1. Mapping ecosystem functions and properties

- **Biomass carbon sequestration potential**
- **Soil carbon sequestration potential**
- **Woody species diversity (Shannon) potential**
- **Maintain habitat connectivity**

Maximising functions or multifunctional hotspot

Mask

2. Priority area

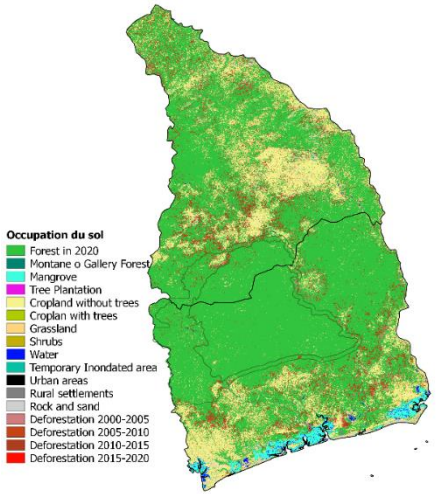


Methodology : identification of management strategies

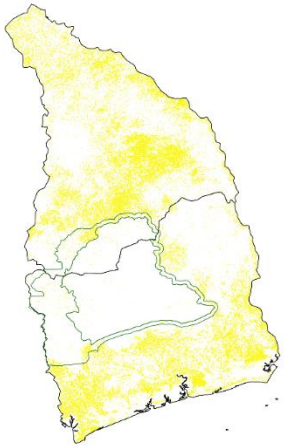
3. Land-use history assessment

- **On-going fallow age**
- **Time since the first clearcutting**
- **Crop-fallow cycles number**

Methodology : identification of management strategies



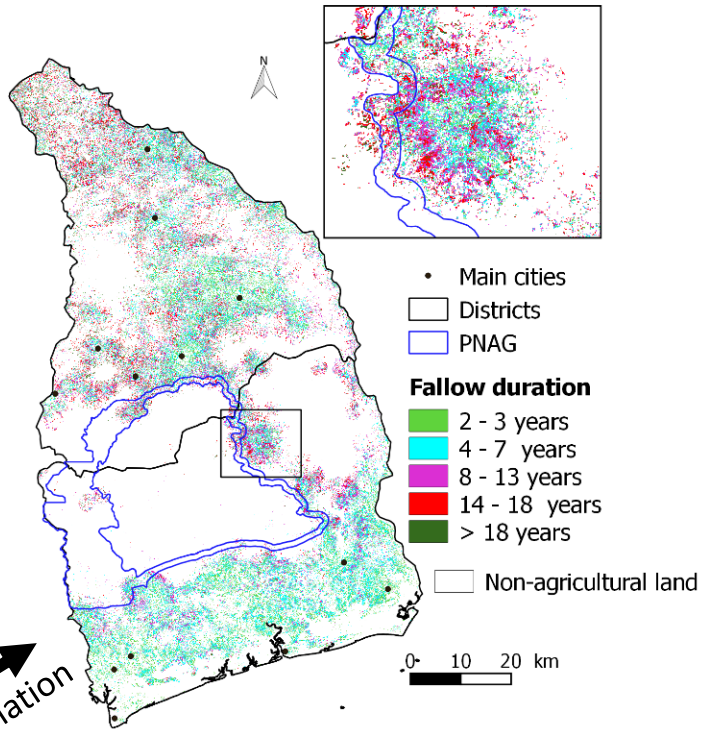
Land use and land cover 1990 -2020



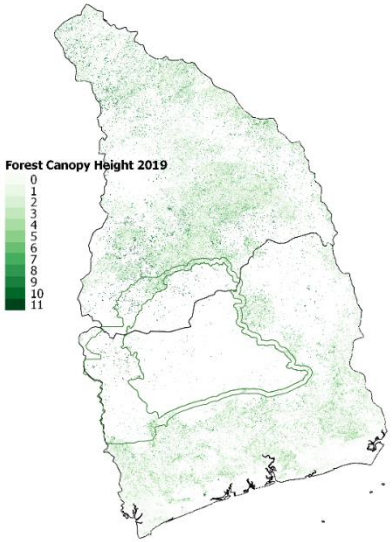
Agricultural land 1990 -2020

mask

On-going fallow age

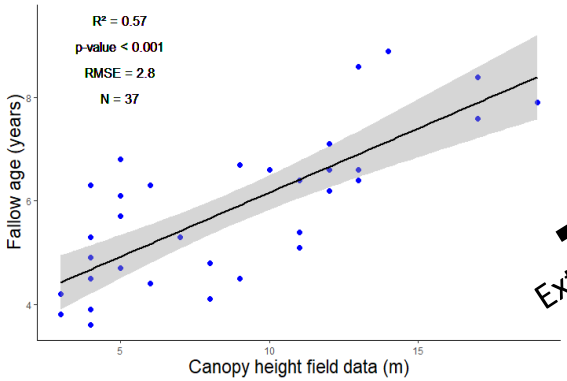


Extrapolation



Canopy height (Potapov et al., 2021)

&

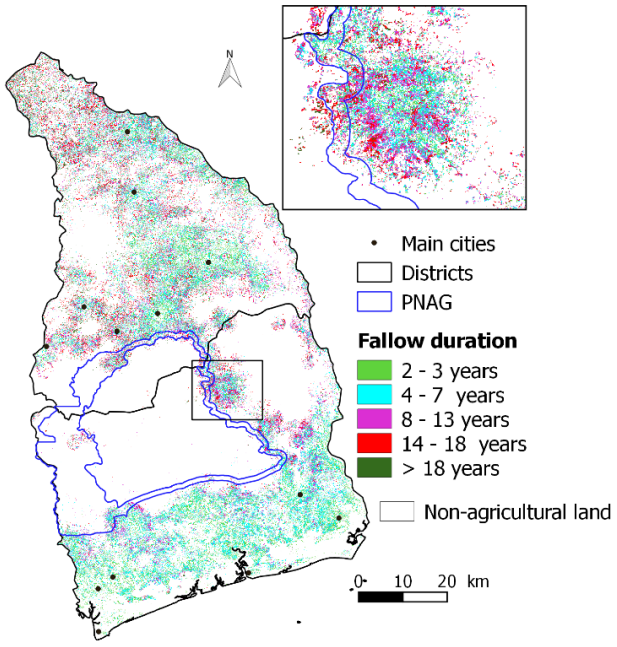


Fallow age estimation model

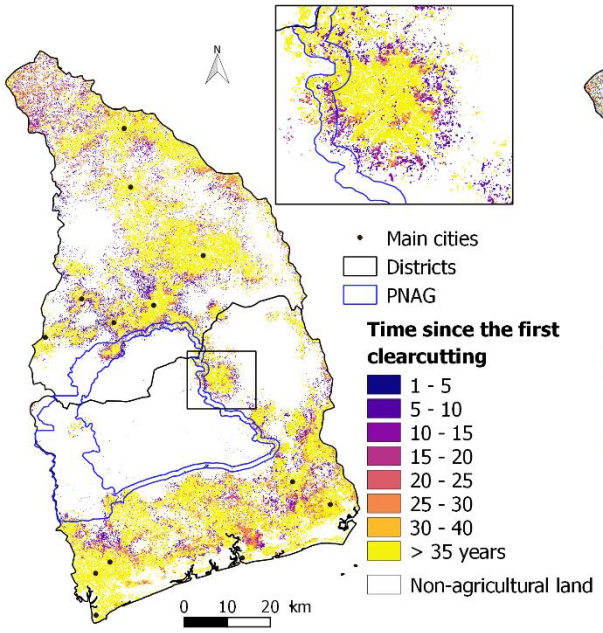
Methodology : identification of management strategies

3. Land-use history assessment

On – going fallow duration

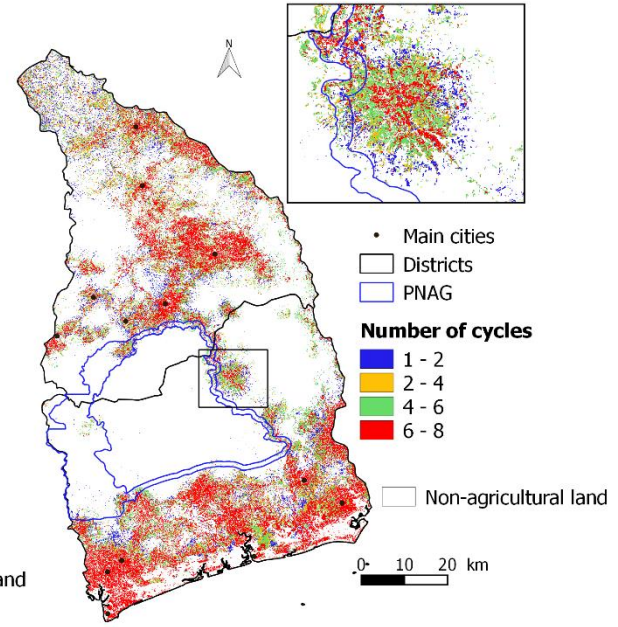


Time since the first clearcutting



-> Year of deforestation

Crop-fallow cycles number



-> Fallow = 4.8 years

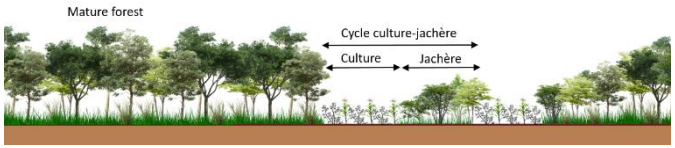
-> Crop = 3 years

Methodology : identification of management strategies

3. Land-use history assessment

- On-going fallow age
- Time since the first clearcutting
- Crop-fallow cycles number
- Other spatial data : degraded area, forest edge distance, population

4. Evaluation of Miombo regeneration potential



Low slash and burn intensity

High slash and burn intensity

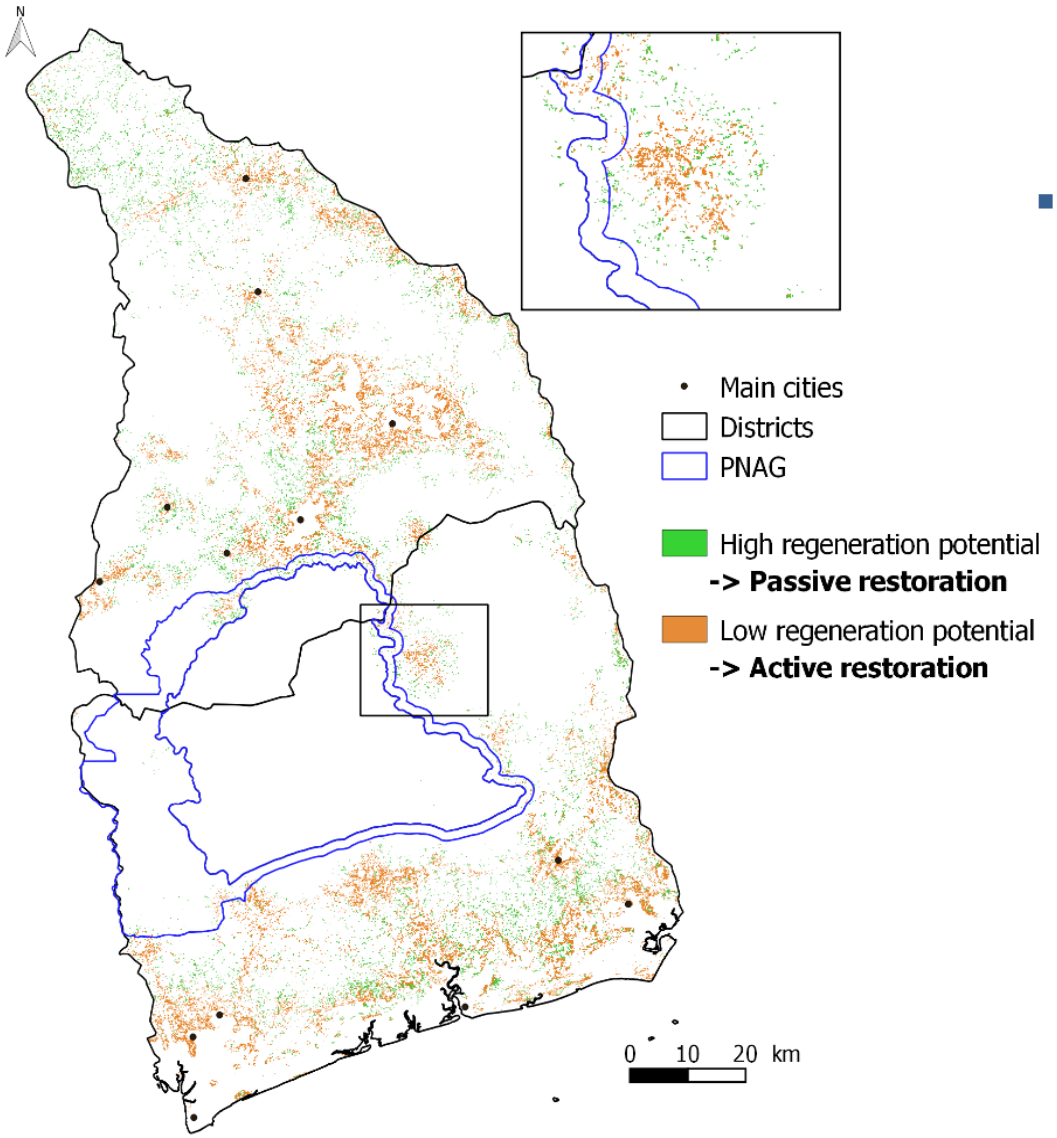
High regeneration potential

Low regeneration potential

5. Management strategies(passive ou active)

Main results

5. Management strategies (passive ou active)



- 118 629 ha of priority areas (10.9% of the study area) for forest landscape restoration

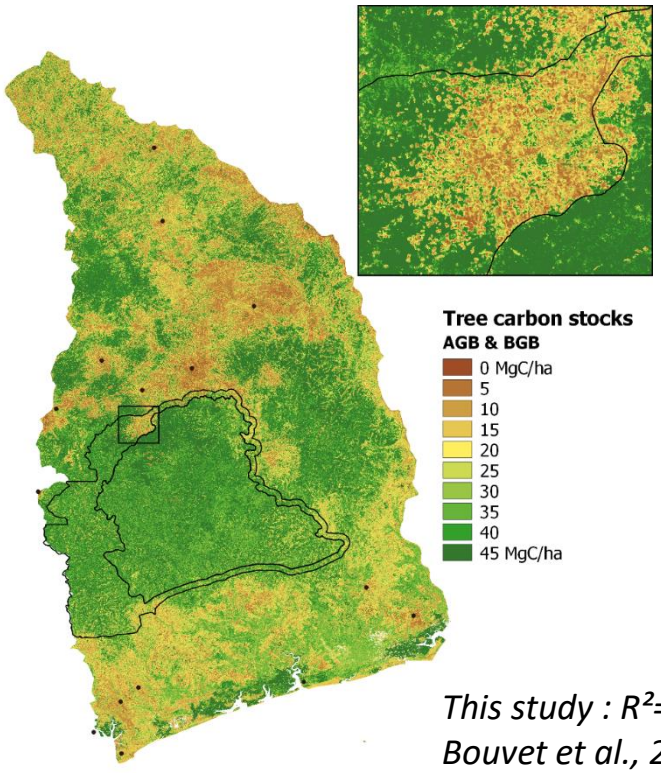
- **36 % : high regeneration potential**

- **64 % : low regeneration potential**

Main conclusions

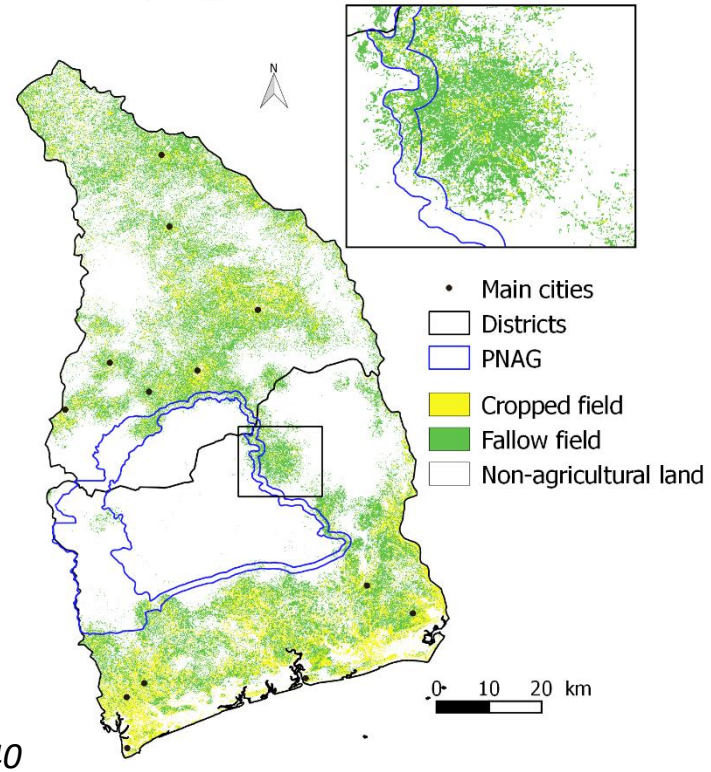
- Innovative methodology based on field data
- New indicators
- Flexible methodology that complements what already exists
- Further field-based information, inclusion of stakeholder and expert knowledge are required

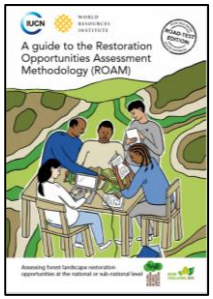
Tree carbon stock (AGB & BGB)



This study : R^2= 0,66
Bouvet et al., 2018 : R^2= 0,40

A) Cropped and fallowed fields





Thank you for your attention

Contact :
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