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Climate smart practices impact soil organic carbon storage in Madagascar

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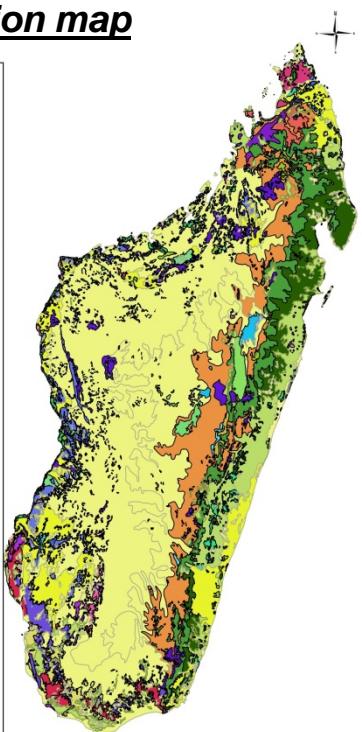
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Malagasy contexts: showing particularities

Vegetation map

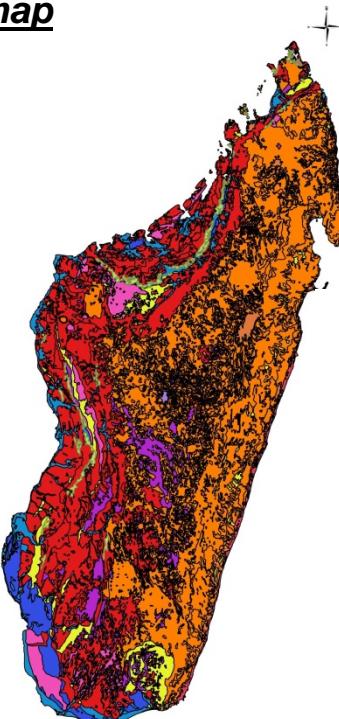


0 100 200 300 400 km



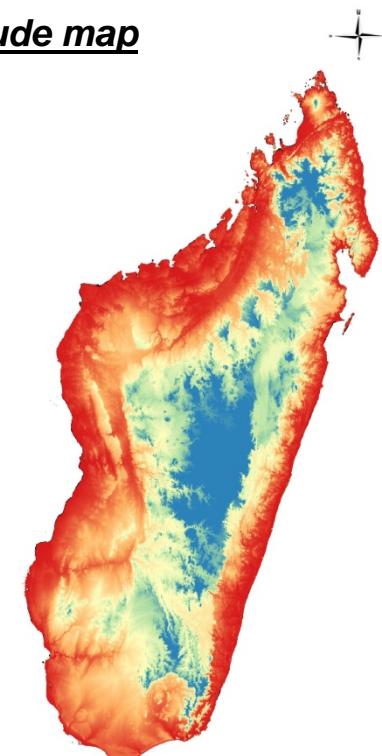
0 100 200 300 400 km

Soil map



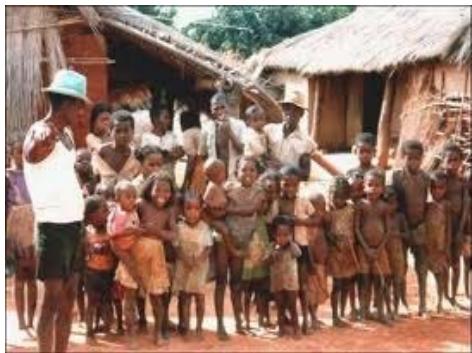
0 100 200 300 400 km

Altitude map



- Mini-continent, a sanctuary of nature:
 - o area of 590 000 km²
 - o among of the 25 worldwide hotspots

Malagasy contexts: showing particularities



Population: 20 millions with \approx 80% rural people,
 \approx 77% poor people based on HDI assessment.

Traditional practices

**Deforestation and slash
and burn practices.**



Agricultural practices:
tillage, less or no use of
fertilisation, residues
exportation.



Malagasy contexts within Climate Change framework

Emissions	: +1747 GgCO₂
	: +14% from Agriculture
	: +13% from LULUCF



- A vulnerable country: Agriculture and Forestry among the most sensible sectors.

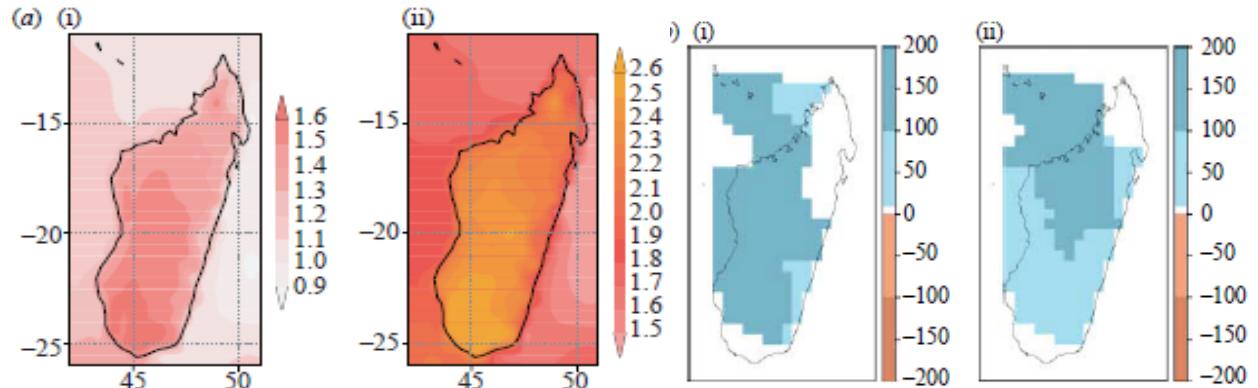


- Environmental and Land degradation
- Exhausted Soil and Forest ecosystem services
- ...

Malagasy contexts within Climate Change framework

Trend of climate change (2055) :

- Increase of temperature
- Increase of precipitation



Deforestation and slash and burn practices:

➡ Amplification of climate disturbance



Traditional agricultural practices:

➡ Speed-up of soil degradation and GHG emission

REDD+ and REALU initiatives

Sustainable agricultural practices

Existing sustainable agriculture practices to face climate change



**Conservation
agriculture**



**Crop rotation/
association**



Agroforestry



Organic fertilizers

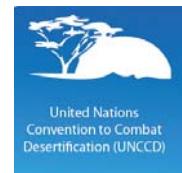


**Improved Rice
practices**



Malagasy contexts : Laboratoire des Radiosotopes and partners activities

- Research and Training in Agronomy and Environment for national and local developments.
- Topics on the crossroads of the three International Conventions:



- Carbon sequestration (soil and biomass)
- Nutrient cycling
- Different agroecosystems



- Since 2004: integrated research and formation activities on **soil ecosystem services** and their responses to **global change**



Main objective ...



Conser
agricu



fertilizers

“To compare the soil organic carbon (SOC) storage of some sustainable agricultural practices in Malagasy context”

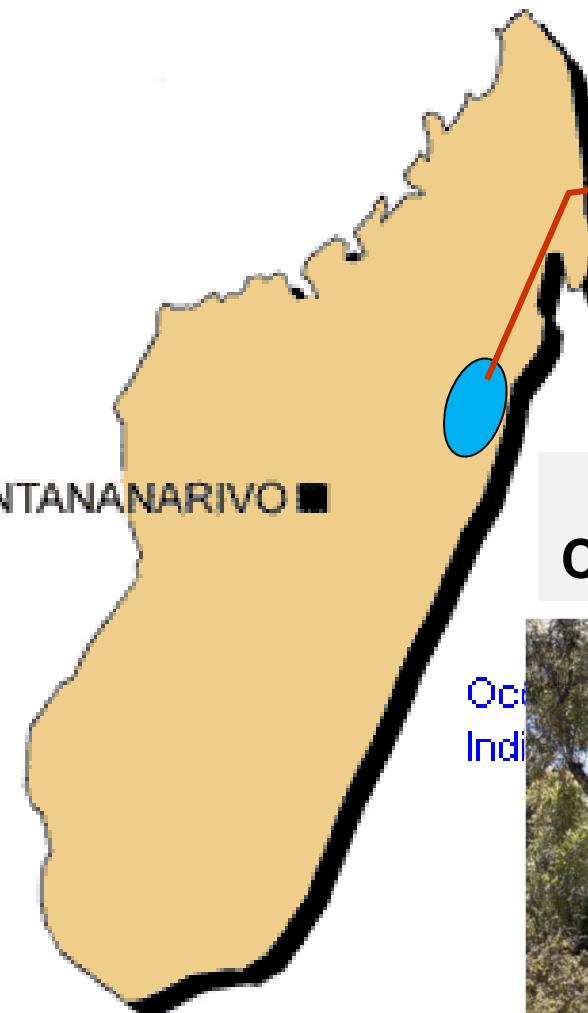
association



Agroforestry

Improved Rice
practices

1) SOC storage in Agroforestry systems ...



Fénérive Est
P : 3000 mm
T°: 25°C

Ferralsol

Agroforestry :
Cloves with annual crop

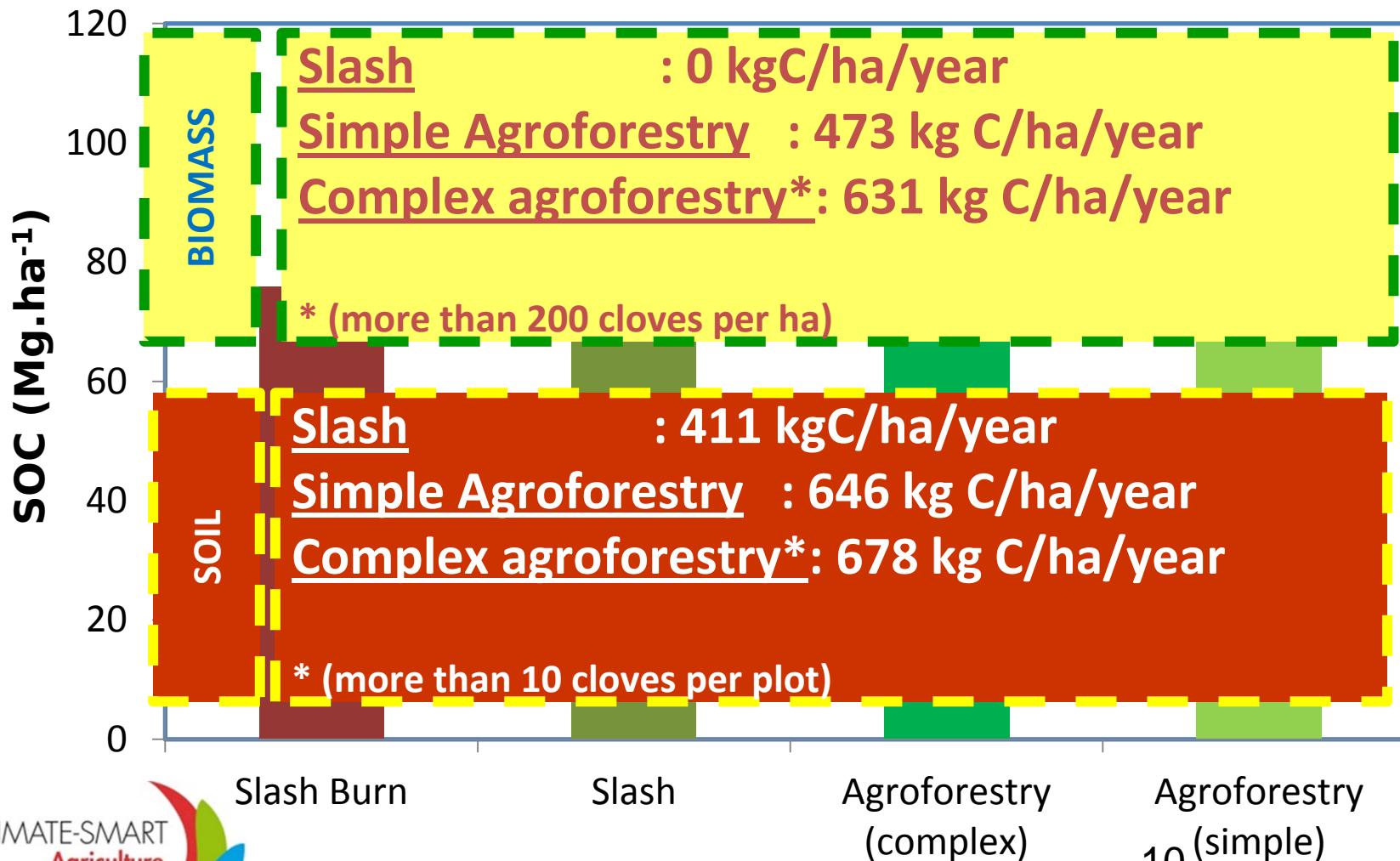


2015

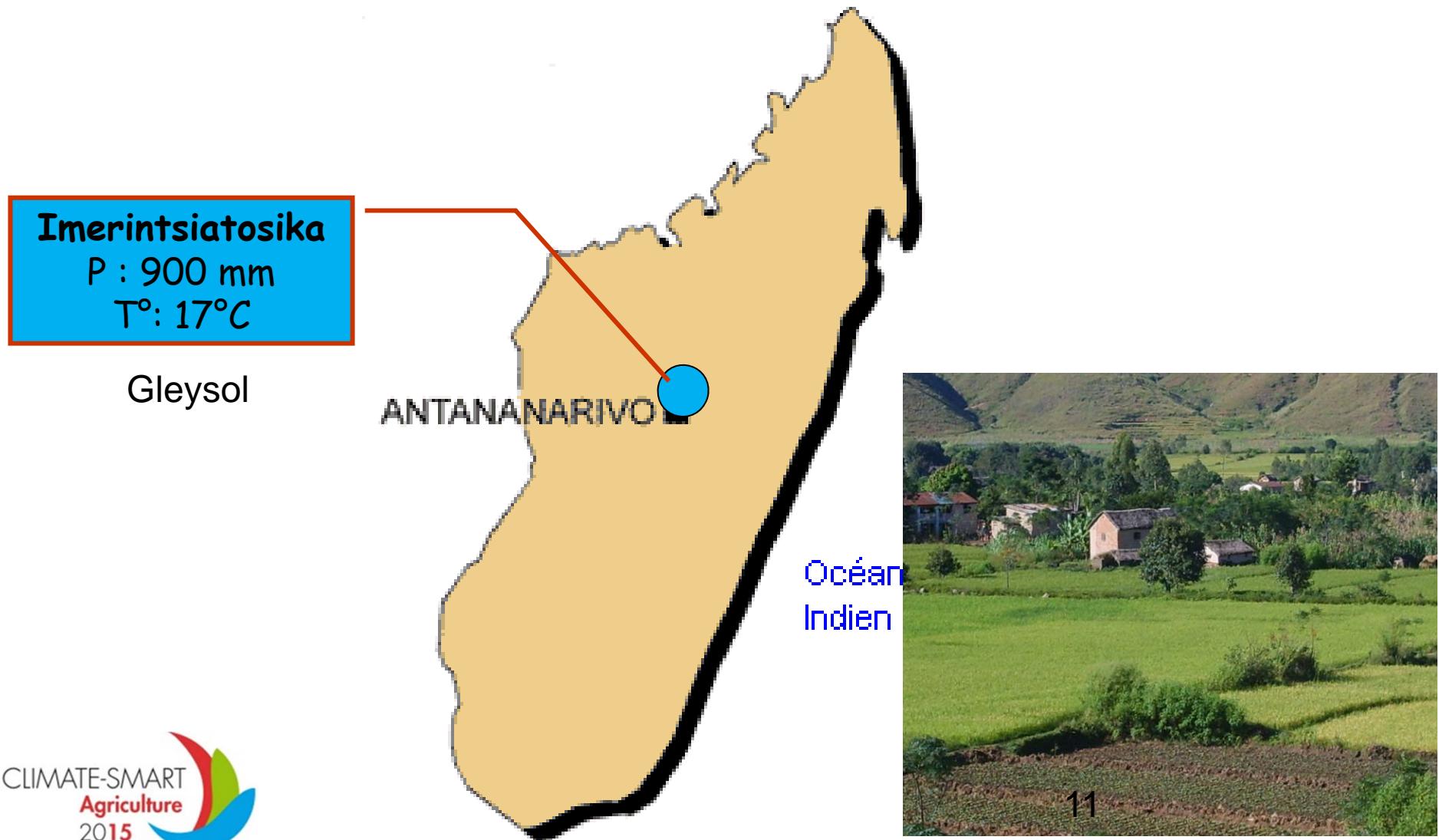


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1) SOC storage in Agroforestry systems ...



2) SOC storage in improved irrigated rice systems ...



2) SOC storage in improved irrigated rice systems ...



- Transplanting seedlings 16-25 days
- In row, **reduced** spacing
- **Less** frequent weedings

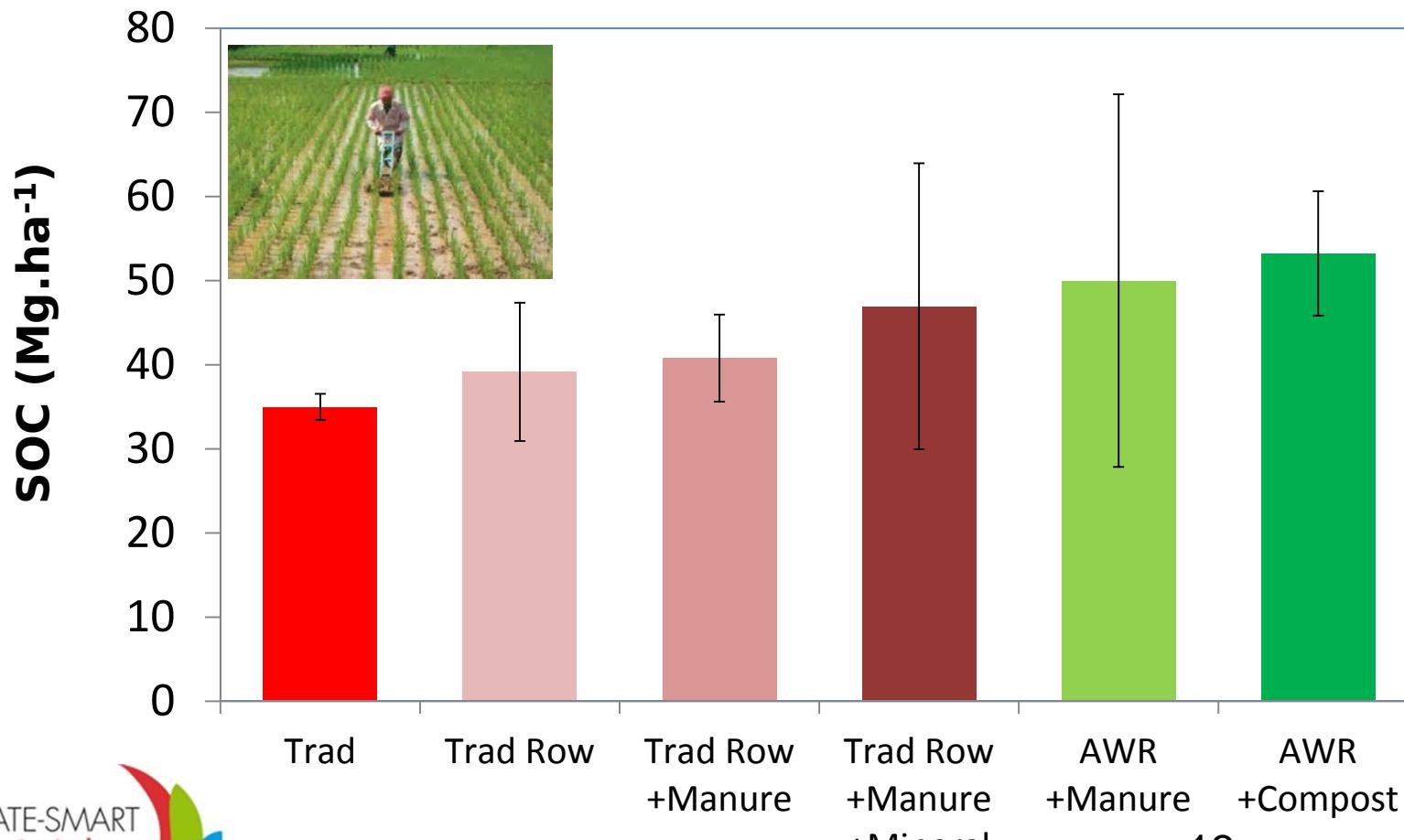


- Transplanting young seedlings : 8 days
- In row, **large** spacing
- **More** frequent weedings

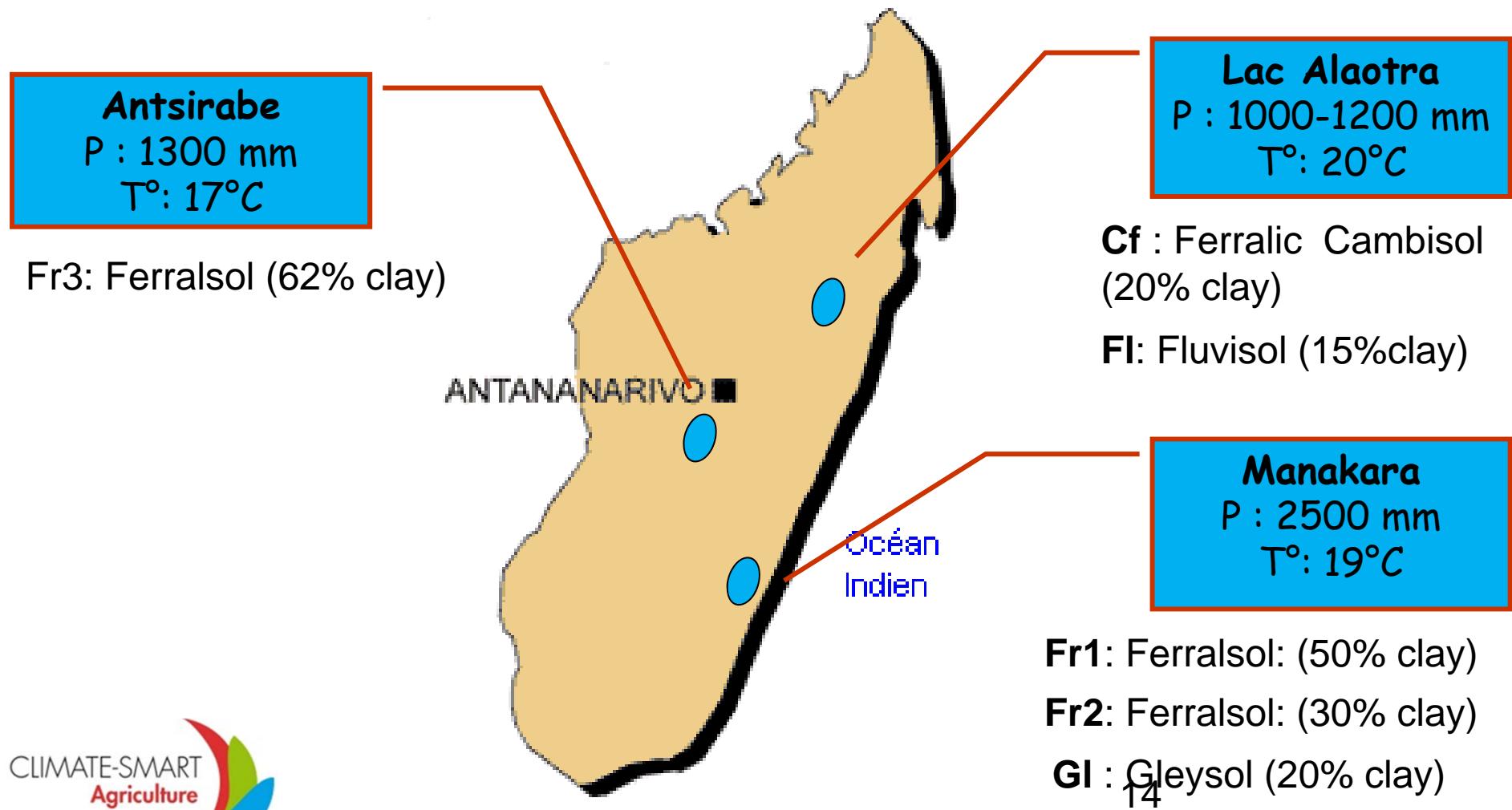
Wetting and drying alternation of rice fields (**flooding only at a specific period**)

2) SOC storage in improved irrigated rice systems ...

kgC/ha/year 208 290 598 1 841 2 488



3) SOC storage in conservation agriculture ...

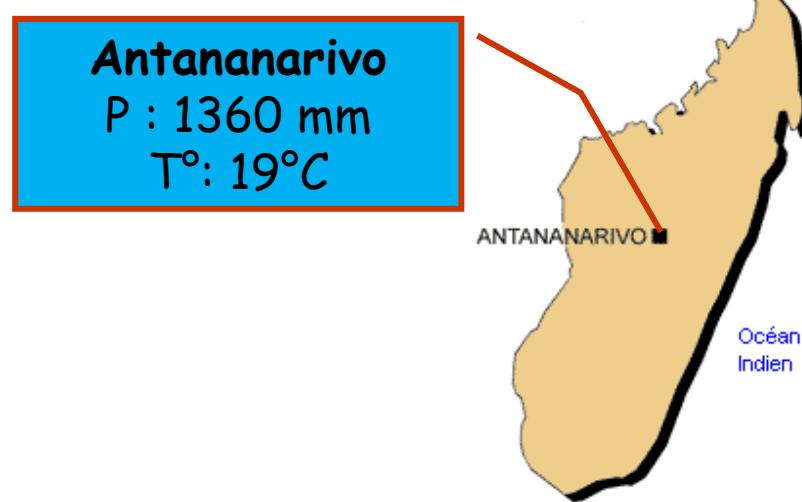


3) SOC storage in conservation agriculture ...



Site	Soil	System	kgC/ha/year
Manakara	Gl	Rice-Stylosanthes + 0	803
	Gl	Rice-Stylosanthes +Mineral Fertilizer	1816*
	Fr1	Rice Stylosanthes + 0	527
	Fr2	Rice Stylosanthes +Mineral Fertilizer	0
Lac Alaotra	Cf	Maïze+niebe/Rice+leg +Manure	137
		Maïze+niebe/Rice+leg +Manure and	
	Cf	Mineral Fertilizer	220
	Fl	Rice+leg / Maize+leg + Manure	727*
		Rice+leg / Maize+leg + Manure and	
	Fl	Mineral fertilizer	600
Antsirabe	Fr3	Maize/soybean	324

4) SOC storage in systems using organic fertilizers



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2015



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4) SOC storage in systems using organic fertilizers

Manure

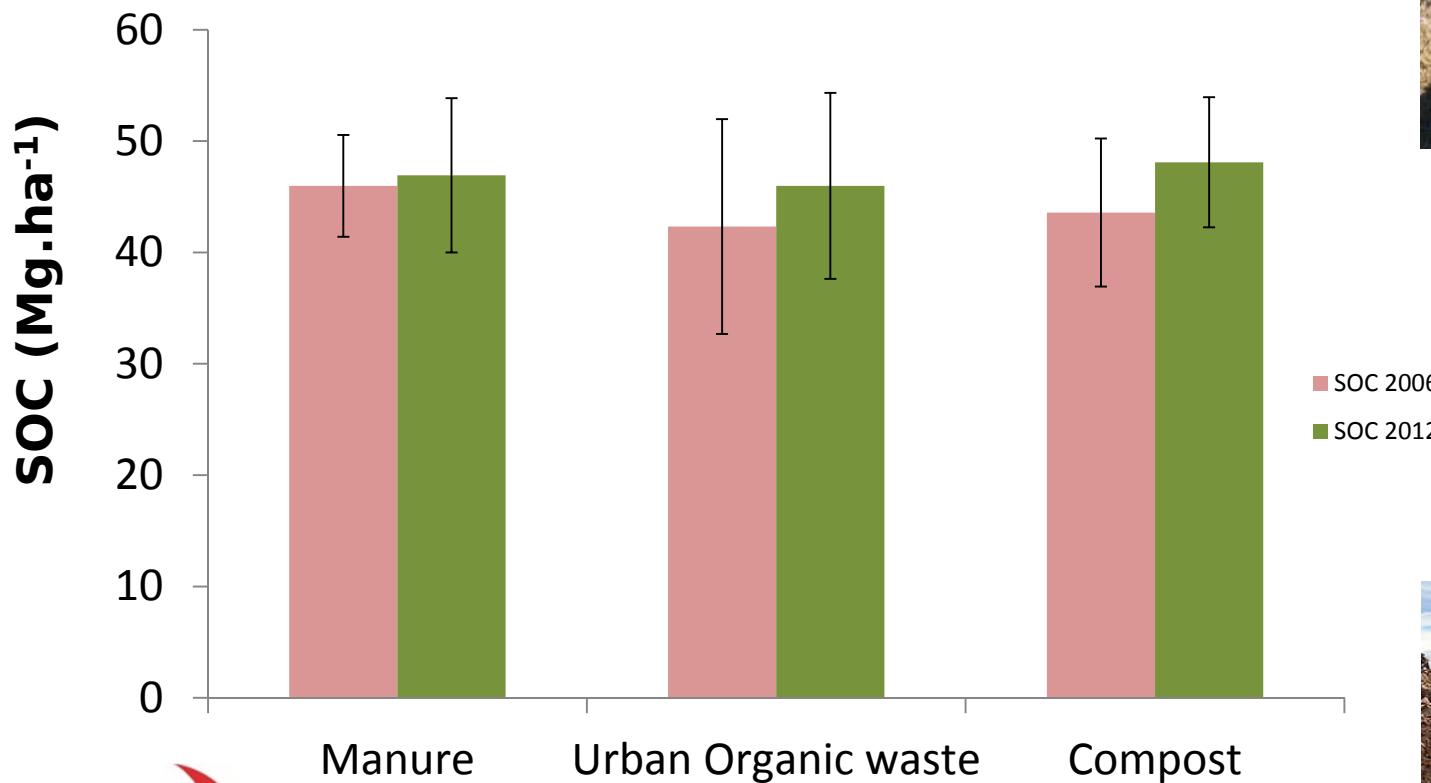
: 158 kgC/ha/year

Urban organic waste

: 609 kgC/ha/year

Compost

: 752 kgC/ha/year



Main conclusions ...

- SOC storage : up to 2 488 kgC/ha/year

With differences between practices.



- Increasing soil organic carbon = increasing soil organic matter

CO₂ sink, in longterm

Soil quality (fertility, less sensibility to erosion)

Yield and water quality

CLIMATE
SMART

- Upscaling : from plot to farm level

Rakotovao, L2.1., Poster 63





Thank you for your attention

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