

MATOPIBA - BRAZIL

JECAM/GEOGLAM Science Meeting

Brussels

16 - 17 November 2015

Margareth Simões

Rodrigo Ferraz, Pedro Freitas, Balbino Evangelista (Embrapa)

Agnès Bégué & Beatriz Bellon (CIRAD)

Site proposed early 2014 (in replacement of Amazon site)

Amazon/Tapajos issues:

- Mainly biodiversity studies;
- No Pleiades acquisition for 8 months;
- Access difficult.

Tocantins Facilities:

- Near Embrapa Pesca e Aquicultura Center
- Availability of field data
- Availability of secondary data
- Easy access
- ABC project (low carbon agriculture)

Goals

Develop methodologies for monitoring of land use complex systems to subsidize the Brazilian program of low carbon agriculture program ABC



Brazilian Low Carbon Agriculture Program ABC Program



Crop livestock forest integration



No-tillage systems

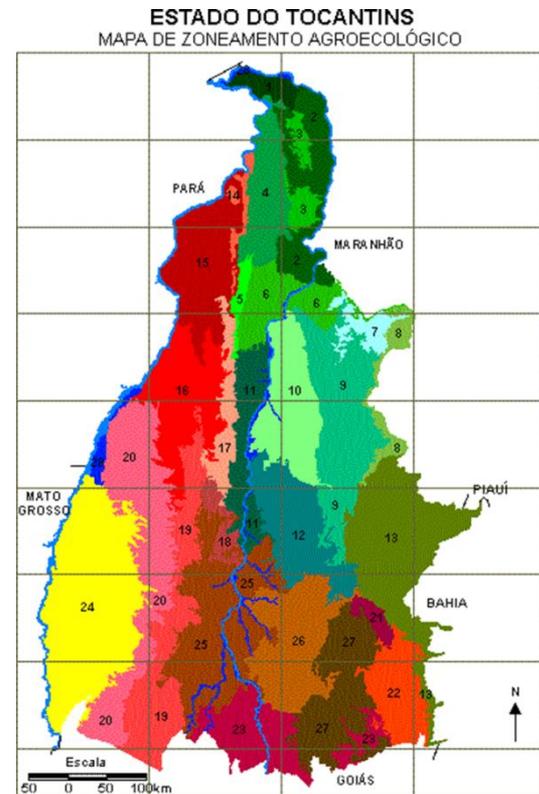
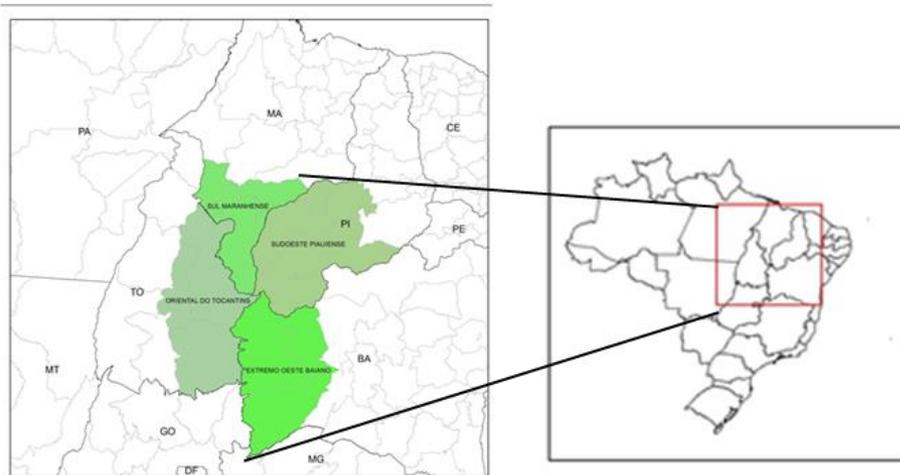


Livestock forest integration

Site Description

Location:

- Guaraí Municipality and surroundings (Center-North Region of Brazil)
- Case study of agriculture expansion on MATOPIBA Region



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Topography:

- Globally, mild relief, slightly undulating with soft slopes (declivity equal or less than 5%).

Soils and drainage

- Yellowish Red Oxisols : Range from strongly to well drained depending on the texture and porosity, but can have adequate moisture.
- Entisols : Range from of excessively drained to strongly drained depending on topographic position and the level of the water table so can have moisture limitations in drier times.

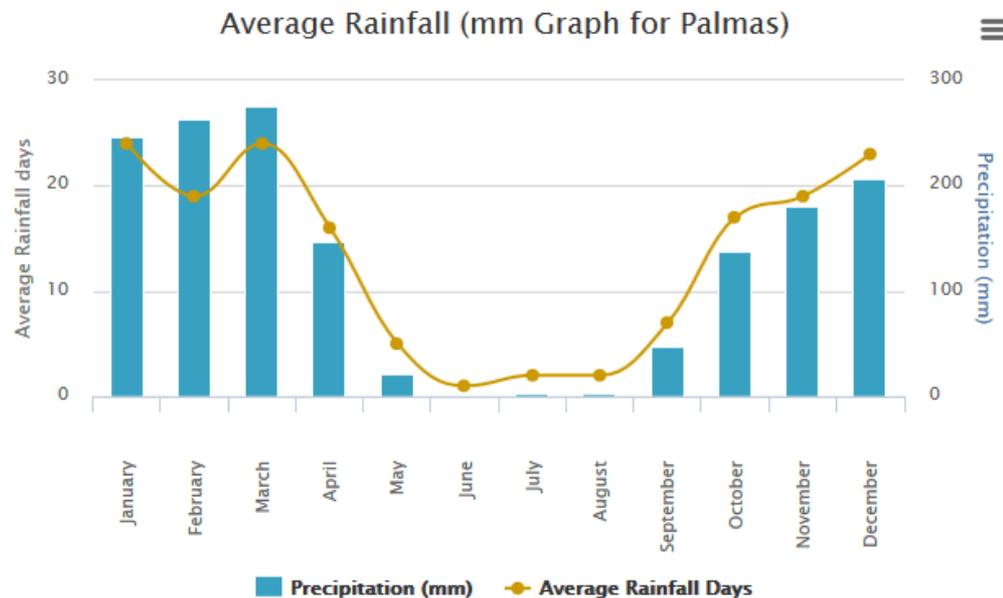
Site Description

Original Vegetation:

- Dominance: Savannah field (Campo Cerrado)
- Sub dominance: Open mixed forest and Submontane Forest

Climate and weather:

- Megathermal wet weather (Thormthwaite-Mather (1955);
- Average annual rainfall from 1200 to 1500 mm, with moderate winter water deficit.



<http://www.worldweatheronline.com>

Site Description

Crop calendar:

- Soybean crop: From November to February
- Sugarcane crop: annual cycle (12 months) or longer (15-18 months)

Field size:

Mostly large (fazendas with fields ~ 100 ha), and some smallholders

Agricultural methods used:

The new agricultural expansion area in Brazil.

- Summer soybean monoculture (mostly no-tillage or minority with conventional tillage), usually with a cereal crop (corn, millet or sorghum) at the end of the same season (double crop system); 634 800 hectares for the whole state of Tocantins.
- Sugarcane crop: burning and/or mechanized harvesting ; 31 150 hectares for the whole state of Tocantins.
- Pasture/livestock: mostly livestock on planted pasture (extensive production); different pasture conditions (good to degraded); livestock agriculture integrated systems.

JECAM

Joint Experiment for Crop Assessment and Monitoring



GROUP ON
EARTH OBSERVATIONS



Soy crop





October
2015



Project Objectives

Crop identification and Crop Area Estimation:

- Cropland
- Crop types
- Agricultural systems : level of intensification : crop livestock forest integration; crop rotation; cropping patterns; agroforestry systems.

Note: To support the Brazilian Low Carbon Agriculture Program (ABC Program)

Crop Condition/Stress: not at the moment

Soil Moisture: not at the moment

Yield Prediction and Forecasting: not at the moment

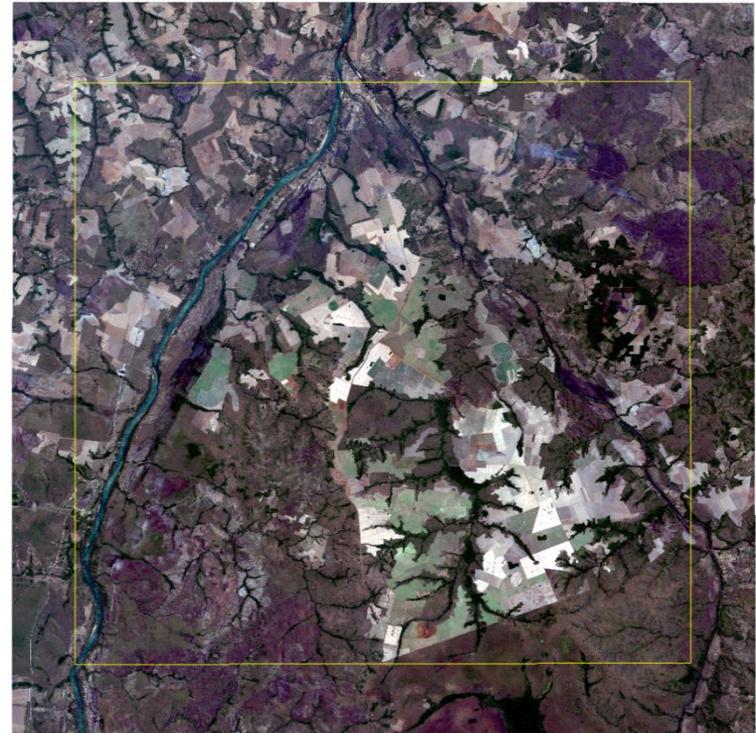
Crop Residue, Tillage and Crop Cover Mapping:

- Different types of soil management (no-tillage systems, convention systems) as indicators of different cropping systems.

Agro-region mapping

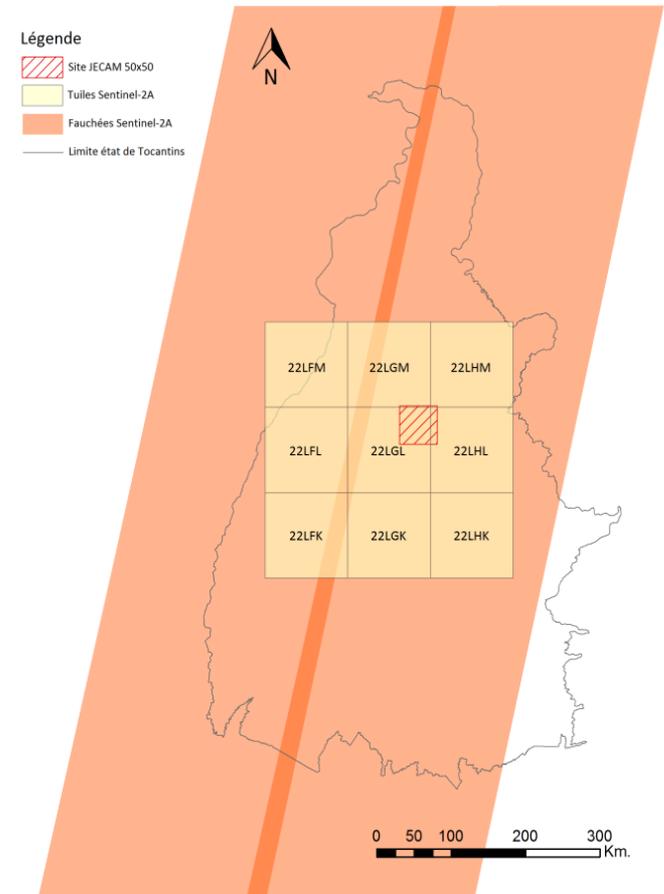
Earth Observation (EO) Data Received/Used

- SPOT 7 image
- Acquisition date : 16 sept. 2015
- 60 km x 60 km
- Bundle : B, G, R, NIR and PAN (1.50 m spatial resolution)
- Used for ground observations (GPS points)
- Two more acquisitions planned in March and July.



Earth Observation (EO) Data Received/Used

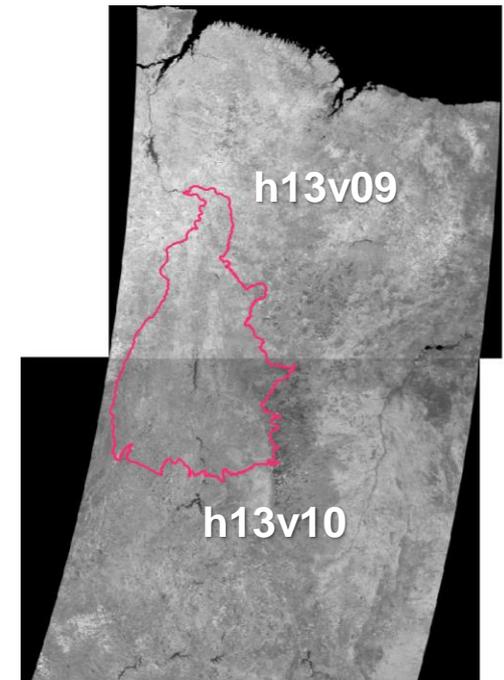
- Landsat 8 : 11 images -> mosaic
- Acquisition dates : 11, 18 and 20 august 2015
- Product : Surface reflectance
- Pan-sharpened : 15m spatial resolution



Earth Observation (EO) Data Received/Used

- MODIS : 80 composites 16-day (MOD13Q1 EVI band)
- Time series : Jan 2014 – Sep 2015 (21 months)
- Spatial resolution : 250m

MOD13Q1 tiles :



In situ Data

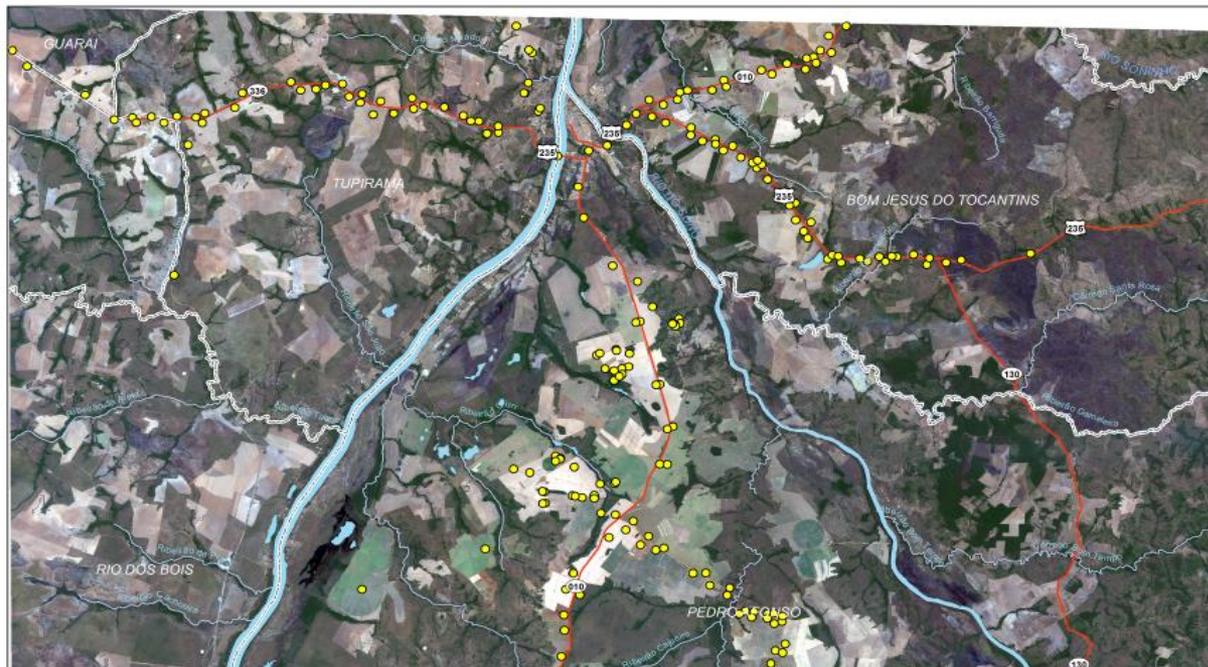
For JECAM site (50 km x 50 km) :

- TODAY : 242 points, 131 CROP, 111 NON CROP (of which 35 rangelands and 76 other land covers).
- TOMORROW : 600 points expected



In situ Data

For JECAM site (50 km x 50 km) :



CARTA IMAGEM SPOT 7

Localização dos pontos LULC coletados Outubro/Novembro 2015

CONVENÇÕES CARTOGRÁFICAS

- Prefixo de Rodovia: Estadual, Federal 
- Limite Municipal 
- Massa de Água 
- Rios e Córregos 
- Pontos georreferenciados LULC 

Situação no Estado do Tocantins

In situ Data

For the whole state :

- TODAY : 917 points, 306 CROP, 611 NON CROP (of which 277 rangelands and 334 other lands covers). The number should increase.



CARTA IMAGEM Landsat 8

Localização dos pontos LULC coletados Outubro/Novembro 2015

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Prefixo de Rodovia : Estadual, Federal



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Pontos georreferenciados LULC



Situação no Estado do Tocantins



Collaboration

Please describe the nature of any collaboration with other JECAM sites or other relevant partners (i.e. who, objective, brief status).

- Project SIGMA
- Project GeoABC (EMBRAPA)
- Comparative approaches between Brazil and Burkina

First Results

- **Mapping Agricultural Areas:** Land Cover (cropped Land), crop types, Pasture/Rangeland

Preliminary 2015 LULC results

Agricultural land

Single cropping systems & permanent meadows and pastures



Multiple cropping systems



Natural vegetation

Cerrado *sensu stricto* (savanna woodland with 10–60% tree cover)



Cerradão (canopy cover near 50%)



Other LCC

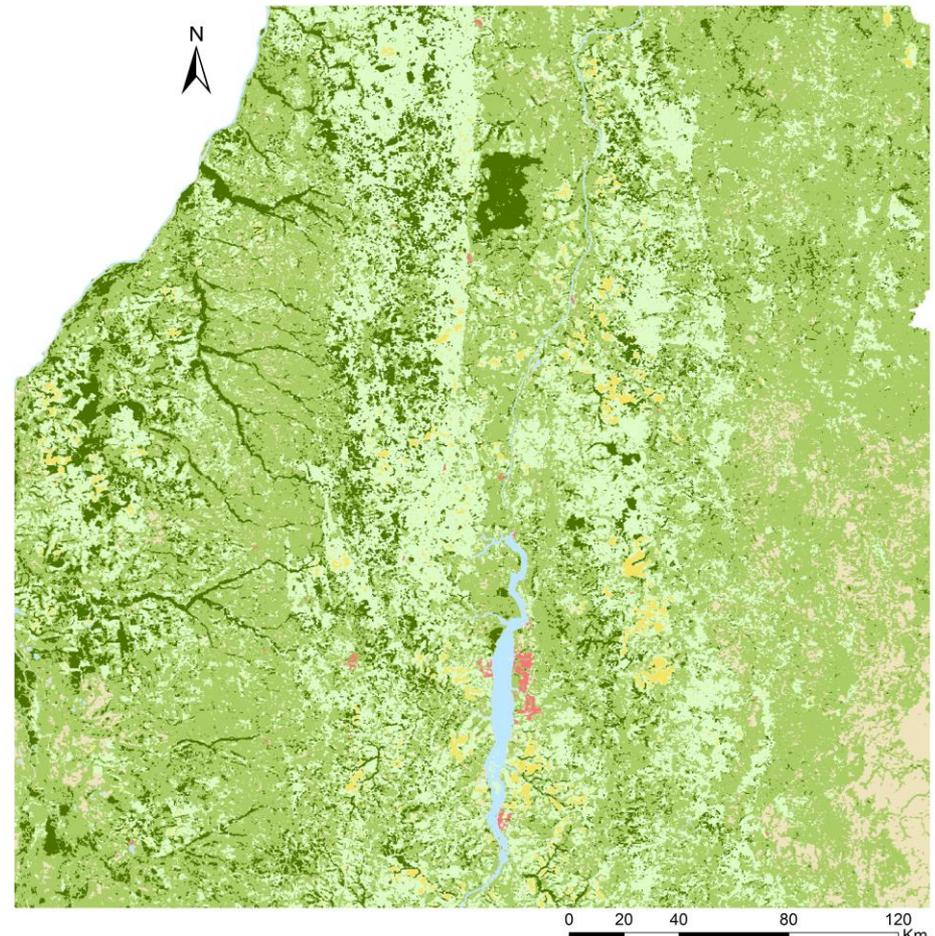
Water bodies



Build-up surface



Bare soil & bare rock



First Results

- Mapping Agricultural Areas:
- Landscape stratification

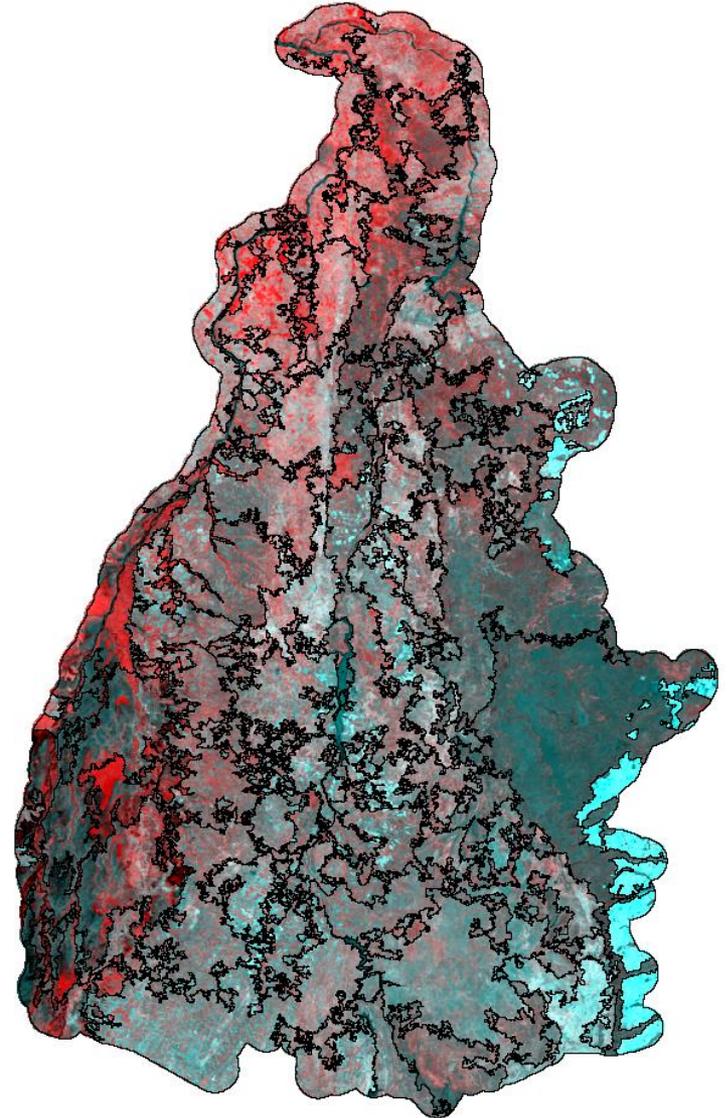
eCognition Developer

Algorithm = *Multiresolution segmentation*

Input Variables : PC2_EVI, PC2 TEXT (MODIS time series)

Shape = 0,1, Compacity = 1

Scale parameter = 2250



JECAM

Joint Experiment for Crop Assessment and Monitoring

First Results

- **Mapping Agricultural Areas:**
- **Landscape stratification**
- **Mapping Sustainable Agriculture Practices**
 - **Livestock-crop-Forest Integration**
 - **No-tillage**

For Brazilian Low Carbon Agriculture Program (ABC Program)

JECAM

Joint Experiment for Crop Assessment and Monitoring



GROUP ON
EARTH OBSERVATIONS

Research Plans for Next Growing Season

- Will you hold the course, or modify the approach?
 - Depends on the results
- Do you anticipate ordering the same type/quantity of EO data next year?
 - Yes
- If no, how have your needs changed?

Thank you and thanks to ...

