IMPROVED SPACE-BASED REMOTE SENSING FOR LAND USE MAPPING: TOWARDS A SUSTAINABLE EXPANSION OF THE BIOETHANOL SECTOR IN BRAZIL

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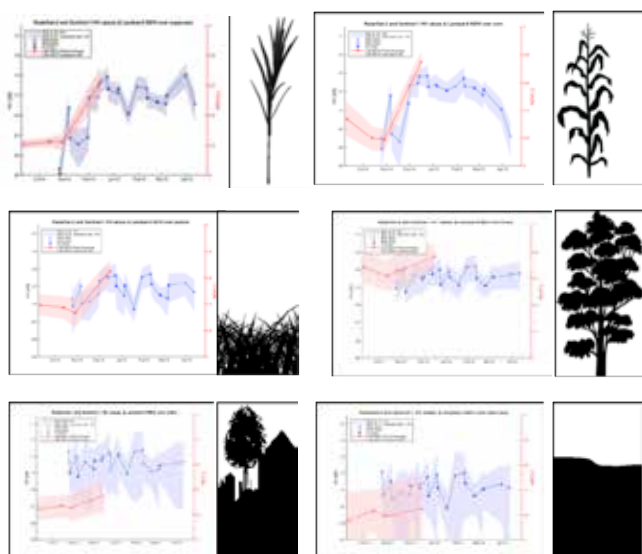FAPESP Process 2013/50943-9 | Term: Aug 2014 to Jul 2016| FAPESP-BE-Basic

Figure 1. Radar and optical profiles

It is projected that ethanol production in Brazil will increase from 22 billion liters (2011) to 46-65 billion liters in 2020. However, an increased deployment of biomass for energy and materials could have significant adverse socio-economic and environmental impacts. Many initiatives for sustainability frameworks for biomass for energy have addressed the importance of the monitoring of direct and indirect land use (LU) change in respect to enable the identification and quantification of their impacts such as GHG emission, food security, biodiversity and competition for water etc. The objective of this project is to develop a methodology for the accurate and systematic monitoring of land use change dynamics as a result of the expansion of the cultivation area of sugar cane for ethanol by the assimilation of remotely sensed data. The development of the methodology aims at combining optical and radar data in order to allow for the development of reliable, high resolution, discriminative land use maps in a time and cost effective way. For two case study areas optical, radar and ground truthing data is collected. For both the optical and the radar data, the signatures of the different land uses are identified and an effective methodology will be designed to assimilate the radar and optical information for the production of land use maps in robust and effective way. The methodology will be validated for the two selected regions, after which it will be scaled to enable land use change mapping at a larger area (micro region / state level). Based on sequential maps of land use for the two larger areas, a first order environmental and socio-economic impact analysis of the expansion of sugar cane is made. The data developed in this project will be implemented in a database management system which will allow for interactive exchange and analysis of the data and will ensure access for potential users.

SUMMARY OF RESULTS
TO DATE AND PERSPECTIVES

The results of the project can be reduced to Preliminary data. The majority of time had been spent in the field data collecting, storage and calibration of the classification algorithms for generating the Land Use Maps. Remote Sensing applied to crops monitoring need a huge amount of field data to understand completely their cycles.

The preliminary data have shown some profile built from Radar and Optical Remote Sensing data for some crops as sugarcane, pasture, corn, forest, water and urban area. These data will help in the identification the differences among the profiles in time per target. In the *Figure 1* are shown some profiles until now processed from SAR data and OLI/Landsat 8 data as well. This procedure is being followed for a small area where it is possible collect data. Two areas are being used as sampling areas: around Capivari Municipality/SP and Mogi Guaçú Municipality/SP considering that in the first one are found areas with sugarcane and pasture while in the latter area is very common to find annual crops, citrus and forestry.
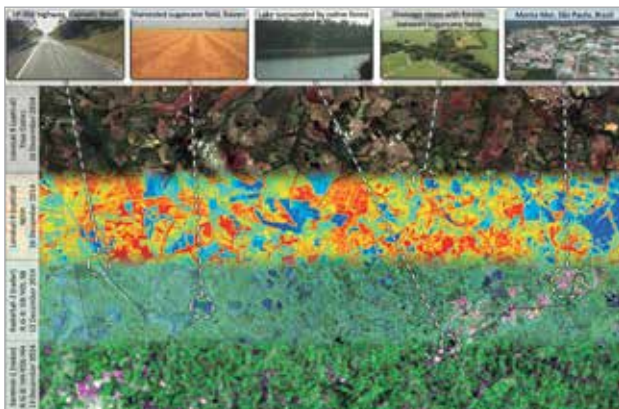

Figure 2. From: Iannini L, Molijn R, Mousivand A, Hanssen R. Sugarcane identification through time-series of landsat and ERS/ENVISAT Data. SBSR 2015, Brasilian remote sensing symposium, April 2015, João Pessoa, Brazil

For the second part of the project, the sustainability study will be used two maps for starting the analyses. Both are being processed from the maps available by Brazilian Environment Ministry until the new Land Use maps, described previously, to be generated.

Radar profiles

The radar profiles and optical data (*Figure 1*) from specific fields per crop type, only now for qualitative and illustrative means.

MAIN PUBLICATIONS

Iannini L, Molijn R, Mousivand A, Hanssen R. Sugarcane identification through time-series of landsat and ERS/ENVISAT data. SBSR 2015, Brasilian remote sensing symposium, April 2015, João Pessoa, Brazil.

Iannini L, Molijn R, Mousivand A, Hanssen R. Monitoring LULC dynamics in the São Paulo region through landsat and c-band sar time series. IEEE International Remote Sensing Syposium, July 2015, Milan, Italy.

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