Environmental Security and Ecosystem Services: biodiversity, restoring soils and protecting ecosystems in bioenergy landscapes, harmonizing forestry and agriculture policies

Mateus Batistella
Embrapa Satellite Monitoring

Bioenergy & Sustainability
a SCOPE series volume
Launching the report of a global assessment of bioenergy sustainability

São Paulo, January 14, 2015 (www.fapesp.br/eventos/scope)
Brazilian Agricultural Research Corporation - Embrapa

46 research centers: thematic, ecoregional, and products
Geospatial Research and Innovation

Livestock
INDICATION OF PASTURE DEGRADATION PROCESSES

Data:
Time Series Satellite SpotVeg
Pasture Mask – PROBIO (2006)

Analysis:
Spectro-temporal analysis
Long-term trend of vegetation cover
(2001/2011 years)

NDVI (Slope)

-0.0632 - -0.029
-0.0289 - -0.013
-0.0129 - -0.005
-0.0049 - -0.001
-0.0009 - 0.001
0.0011 - 0.005
0.0051 - 0.013
0.0131 - 0.029
0.0291 - 0.061

Strong
Moderate
Low

No Indication of Degradation

27%
(3,600,000 ha)
WITH INDICATION OF DEGRADATION
ATLANTIC FOREST TRANSITION AND PLANTATIONS

Geospatial distribution of Eucalyptus plantations and native forest: a win-win situation?
Geospatial Research and Innovation

Agriculture
IDENTIFICATION OF AGRICULTURAL AREAS IN BRAZIL - GRAINS

- Classification and spatial distribution of grain production systems using satellite information
- Economic evaluation of technologies and policies to mitigate emissions of greenhouse gases

Modis data - Time Series
IDENTIFICATION OF AGRICULTURAL AREAS IN BRAZIL – SUGAR CANE

Spot Vegetation Data - Time Series

\[ p = 2.2 \times 10^{-16} \quad r^2 = 0.8 \]
WebGIS Interface

Biophysical data
- Soil, Topography, Hydrography, Vegetation, etc.

Spatial representation of agricultural statistics
- Planted area
- Production
- Queries
- Multitemporal perspective

Remote sensing products

http://www.embrapa.br/somabrasil
SPATIAL ANALYSIS OF LARGE AGRICULTURAL AREAS
1st AND 2nd CROPS – BRAZIL (2011)
SPATIAL ANALYSIS OF LARGE AGRICULTURAL AREAS
SPATIAL ANALYSIS OF LARGE AGRICULTURAL AREAS
1st AND 2nd CROPS – MATO GROSSO (2011)

INTENSIFICATION
WATER AVAILABILITY IN THE SOIL IN MID JANUARY, 2015 COMPARED TO THE HISTORICAL AVERAGE

Source: Agritemp, IBGE. Analysis: Embrapa
SUGAR CANE PRODUCTION AREAS
WATER AVAILABILITY IN THE SOIL

Source: Agritempo, IBGE. Analysis:
PRECIPIATION FORECAST—
JANUARY/2015
VALID FOR MARCH-APRIL/2015

(SUGAR CANE)

Source: INMET, IBGE. Analysis:

Embrapa
Ministério da Agricultura, Pecuária e Abastecimento
GOVERNO FEDERAL
BRASIL
PÁTRIA EDUCADORA

Source: INMET, IBGE. Analysis:

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Ministério da Agricultura, Pecuária e Abastecimento
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BRASIL
PÁTRIA EDUCADORA
CONCEPTUAL FRAMEWORK FOR THE LAND USE AND LAND COVER DYNAMICS PORTFOLIO

DEMands, Offer and Impacts

INTERACTIONS - I.1
Ecosystem Services
Land-Cover Changes
Carrying Capacity

INTERACTIONS - I.3
Land-Use Policy
International Protocols
Health Barriers - sanitary barriers

INTERACTIONS - I.2
Land Demand and Offer in Brazil
Land-Use Changes
Land security

RESULTS/PRODUCTS - RP.1
Land Zonings: Environmental, Climate
Land-use aptitude
Sustainability and Risk Analysis
Impacts on Hydric Resources
Biosphere-Atmosphere Interactions

RESULTS/PRODUCTS - RP.2
Geospatial Impacts by New Technologies
Social and Economic Vulnerability Analysis
Human Dimensions of Land Use and Cover

RESULTS/PRODUCTS - RP.3
Ecological-Economical Zoning
Land use and cover monitoring
Modeling of Land Use and Cover Dynamics
Production Estimation
Trend analyses and future scenarios

PORTFOLIO - RD&I PROGRAMME (THEMES)
Decision Processes for Changes in Land Use and Cover

INTERACTION WITH OTHER PORTFOLIOS

Past

Present

Future
The use of geotechnologies for ecosystem services assessments

- Degradation assessments (land, soil, and pasture)
- Land use intensification
- Environmental restrictions
- Multiscale analysis
- Seasonality
- Urbanization
- Logistics and infrastructure
mateus.batistella@embrapa.br
www.embrapa.br/monitoramento-por-satelite