GLOBIOM-BRAZIL

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Victor Maus – INPE/IFGI

Steering Committee Meeting, Vienna, October 2014
Brazil has a policy for Amazon deforestation until 2020. What about the other biomes? What happens after 2020?
Why GLOBIOM Brazil?

Dalla-Nora et al. (Land Use Policy, 2014)

Fig. 2. Yearly forest loss area observed (2000–2010) and projected (2000–2050) for the Amazon in baseline trajectories.

Land change models have failed to capture the interactions between policies, markets, and farmers in Amazonia.
Dynamics of Brazilian agriculture: 2010-2011

source: Bernardo Rudorff (INPE)
THE GLOBAL FARM

With its plentiful sun, water and land, Brazil is quickly surpassing other countries in food production and exports. But can it continue to make agricultural gains without destroying the Amazon?
Why GLOBIOM Brazil?

GLOBIOM is the best model to capture the processes involved in land change.
Land Cover Map – GLOBIOM default

Cropland
Other Agric
Grasslands
Wetlands
Forest
Not Relevant
Other Natural Land

GLC/GLU

Global Land Cover 2000

GLOBIOM depends on initial conditions: it is important to get the data right
Land Cover Map – GLOBIOM-Brazil

IBGE annual agricultural (PAM) and livestock (PPM) surveys
MODIS land cover
GLOBIOM-Brazil represents biomes and regions

- Amazon
- Cerrado
- Caatinga
- Atlantic Forest
- Pantanal
- Pampa

Legal Pantanal: Pantanal inside Legal Amazon

Cerrado (outside): Cerrado outside Legal Amazon

Legal Cerrado: Cerrado inside Legal Amazon

Legal Amazon border
Brazil’s official vegetation map (IBGE)

GLOBIOM-Brazil is consistent with Brazil’s 2014 forest reference emissions level submission to UNFCCC
Brazil has a national forest definition

Brazil’s FREL and GLOBIOM-Brazil use the same IBGE forest definition
Protected Areas – PAs

- Federal, State, and Municipal Conservation Units
- Indigenous lands

100% preserved
Cropland – 18 Globiom Crops

- Barl: Barley
- BeaD: Dry beans
- Cass: Cassava
- ChkP: Chickpea
- Corn: Corn
- Cott: Cotton
- Gnut: Groundnuts
- Mill: Millet
- OPAL: Palm oil
- Pota: Potato
- Rape: Rapeseed
- Rice: Rice
- Soya: Soybeans
- Srgh: Sorghum
- SugC: Sugar cane
- Sunf: Sunflower
- SwPo: Sweet potatoes
- Whea: wheat

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Other Agricultural Land
(Original and GLOBIOM-Brazil)

217 Mha
7 Mha
Grassland: original and GLOBIOM-Brazil

74.12 Mha

170 Mha
Transport Cost (per crop and per destination)

- Roads
- Nearest state capital
- Nearest sea port

Costs to state capitals
Costs to sea port

Pulp Biomass
Bovine Meat
Validation: Cropland in 2010

IBGE

GLOBIOM Brazil

57 Mha

52 Mha
Validation: Deforestation in Legal Amazon (2000-2010)

PRODES

GLOBIOM Brazil

16 Mha

16.5 Mha
New Forest Code: Legal Reserve – LR

• Legal Reserve (LR): the minimum amount of forest that a landowner must keep over permanent protection

• If a landowner is below the LR requirement, a forest regrowth should be implemented

LR Percentages
- 80%
- 50%
- 35%
- 20%
New Forest Code: Legal Reserve

Private farmers must keep percentage of the original land cover.
CRA (Cota de Reserva Ambiental, in Portuguese) is a tradable legal title to areas with intact or regenerating forest cover above the Forest Code requirements.

CRA area, or surplus area, of a property can be used to compensate a Legal Reserve debt on another property within the same biome.
Small farms in Brazil are rural properties that have an area of four fiscal modules or less.

Fiscal modules are different in each municipality and varies from 5 ha to 110 ha.

Small farms have amnesty of LR requirements.
Scenarios

• **NAPS: No Additional Policy Scenario** designed to account for policies as of 2000 and their actual effectiveness during the last decade. This scenario includes projections such as population, GDP, infrastructure network and technological change.

• **FC: Forest Code Scenario** is based on NAPS and accounts for the new reality created on the ground by Brazil’s new forest code (approved in 2012). Forest regeneration requirements are explored with and without the CRA (Environmental Reserve Quota) mechanism.
Legal Reserves: 20%, 35%, 50% or 80%

Amnesty of Small Farms Area (SFA)

CRA mechanism of LR compensation

Enforcement levels: low, medium and strict

Penalty for reducing leakage from PriFor into ForReg

FC: Forest Code Scenario

Transitions

ForReg: Forest Regrowth

New land use class

Cropland

Grassland

Other Natural Land
Expected impacts of incentives to implement Forest Code – 2020 scenario
Possible leakage effect of regeneration due to CRA (2020)
### No Additional Policy Scenario

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*FOREST = PriFor + MngFor + ForReg + Protected Areas

Protected Areas = 235.63 Mha
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*FOREST = PriFor + MngFor + ForReg + Protected Areas
Protected Areas = 235.63 Mha
# Forest Code - Medium Regrowth Scenario

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Forest Code without SFA and without CRA

Legal Reserves: 20%, 35%, 50% or 80%

Amnesty of Small Farms Area (SFA)

CRA mechanism of LR compensation

Enforcement levels: low, medium and strict

Penalty for reducing leakage from PriFor into ForReg
## GHG Emissions MtCO2eq

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LUC Emissions (MtCO2eq/10y)

- **NAPS**
- **FC (medium enforcement)**
- **FC (medium enforcement) without CRA and SFA**

The graph shows a downward trend in emissions from 2010 to 2050, with the NAPS line consistently higher than the FC lines. The FC (medium enforcement) line without CRA and SFA is the lowest among the three.
Evolution of forest area for three scenarios; numbers represent the LUC integrated emission reduction compared to NAPS scenario by 2050.
PriFor Evolution – Amazon

**Graph Description:**
- **Graph Title:** PriFor Evolution – Amazon
- **Y-axis:** PriFor at Amazon (Mna)
- **X-axis:** Year
- **Lines:**
  - Red line: NAPS
  - Green line: FC (medium enforcement)
  - Green line: FC (medium enforcement) without CRA and SFA

The graph illustrates the trend of PriFor at Amazon from the year 2000 to 2050, showing the impact of different enforcement strategies on PriFor levels.
Crop Area – Brazil

- NAPS
- FC (medium enforcement)
- FC (medium enforcement) without CRA and SFA
Pasture Area – Brazil

![Graph showing pasture area in Brazil from 2000 to 2050](image)

- **NAPS**
- **FC (medium enforcement)**
- **FC (medium enforcement) without CRA and SFA**

The graph illustrates the projected pasture area in Brazil with different enforcement levels from 2000 to 2050.
Forest Area – 2020
NAPS x FC

NAPS: 403 Mha

FC with CRA and SFA (medium enforcement): 410 Mha
Forest Area – 2030
NAPS x FC

NAPS

FC with CRA and SFA (medium enforcement)
Forest Regrowth – 2030
(medium enforcement)

FC with CRA and SFA

FC without CRA and SFA
Crop Area – 2020
NAPS x FC

NAPS

FC with CRA and SFA (medium enforcement)
Crop Area – 2030
NAPS x FC

NAPS

FC with CRA and SFA (medium enforcement)
Biodiversity impact: change in priority areas

Legend
- Important Pri Areas NOT PAs
- PAs
Biodiversity impact: change in priority areas
Biodiversity impact: change in priority areas

Legend
- Increase in productive use
- Decrease in productive use
- No change
- PAs

FC with CRA with SFA
Biodiversity impact:
change in priority areas

Legend
- Red: Increase in productive use
- Yellow: No change
- Green: Decrease in productive use
- Blue: PAs
Under development

- Double cropping
- Grassland productivity and pasture intensification
- Emission impacts
- Impact of the new rural cadastre