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# *Modelling Land Use Change in Brazil : 2000-2050*

*São Paulo, 07.07.2015*

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*FAPESP Programme on Global Change Research*

*National Institute for Space Research, INPE*

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REDD<sup>pac</sup>

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Partner  
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International Institute for  
Applied Systems Analysis  
[www.iiasa.ac.at](http://www.iiasa.ac.at)



**UNEP**



**WCMC**



Duration: November 2011 – March 2016

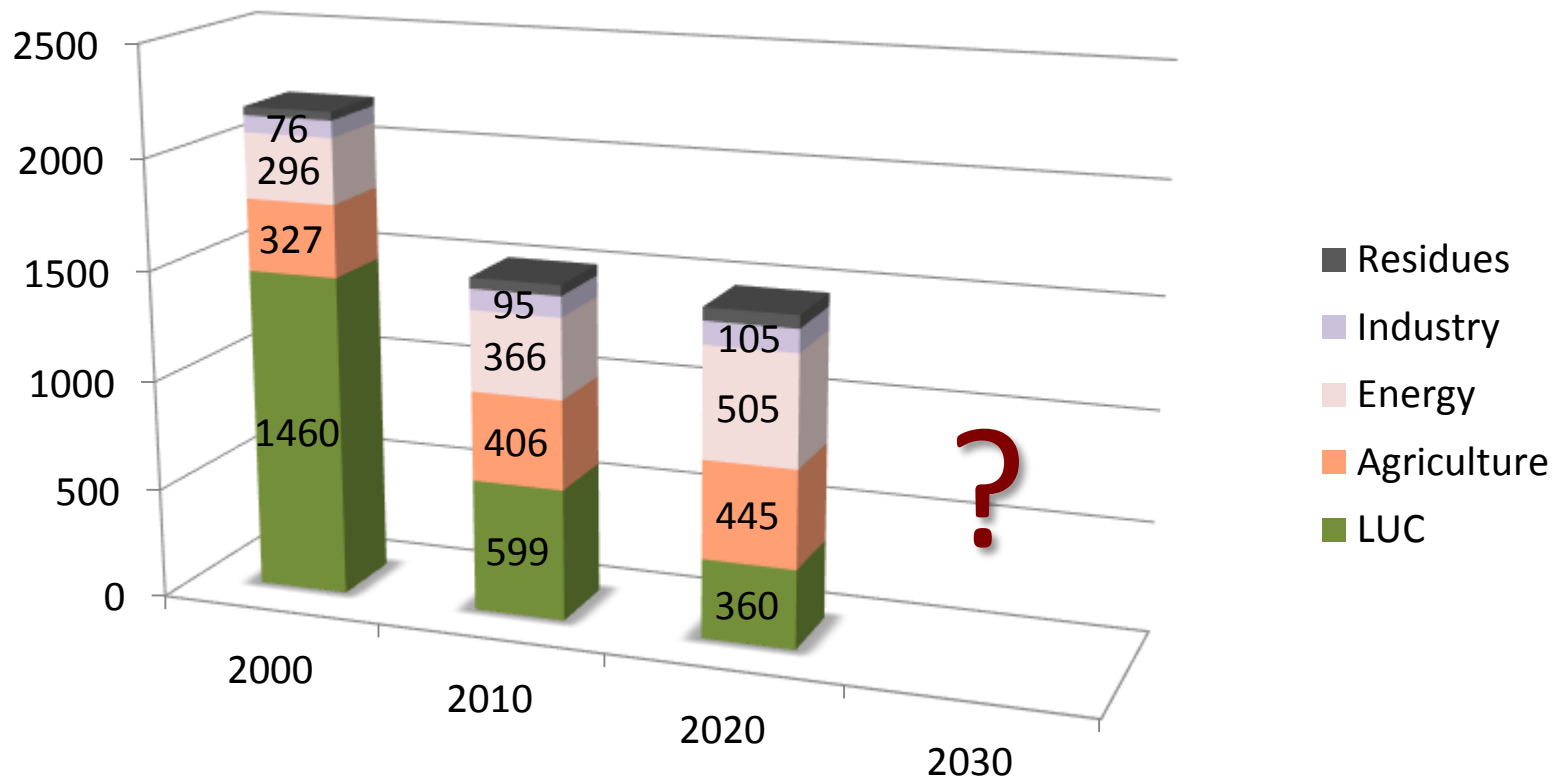
Funding: German Ministry for the Environment (BMU)  
International Climate Initiative (ICI)



Federal Ministry for the  
Environment, Nature Conservation  
and Nuclear Safety

**ICI**

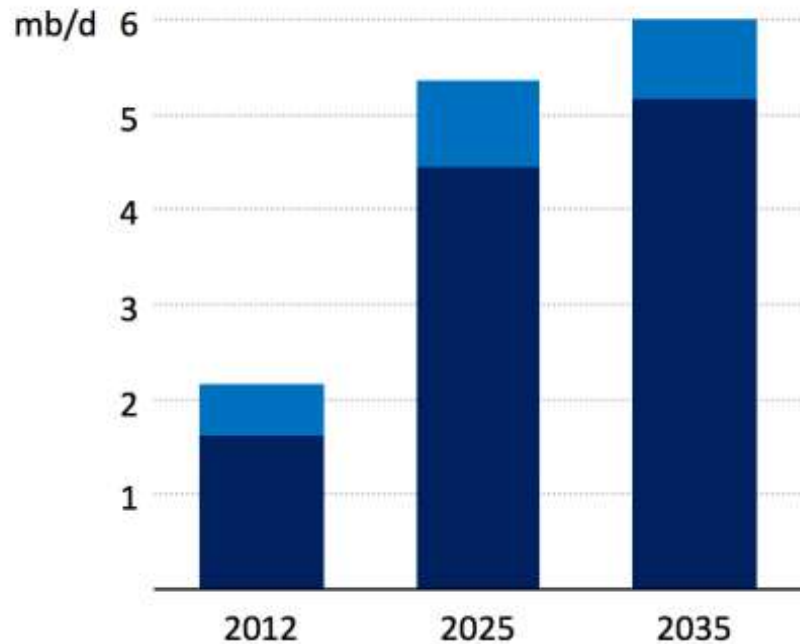
# What are the likely trajectories on Brazilian emissions?



Redução de 75% em florestas, crescimento em energia e agricultura

# Brazil's dilemma: deep-sea oil or renewables?

### Brazil oil production



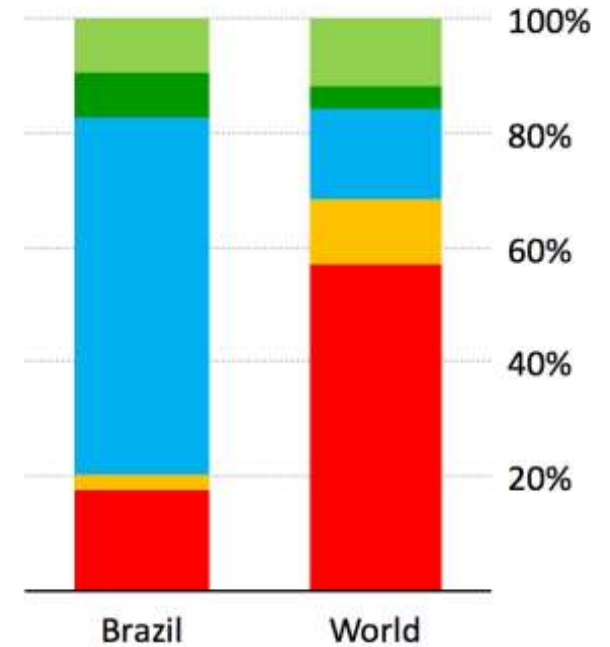
#### Oil production:

- Other
- Deepwater

#### Electricity generation:

- Other renewables
- Bioenergy
- Hydropower
- Nuclear
- Fossil fuels

### Electricity mix by fuel, 2035

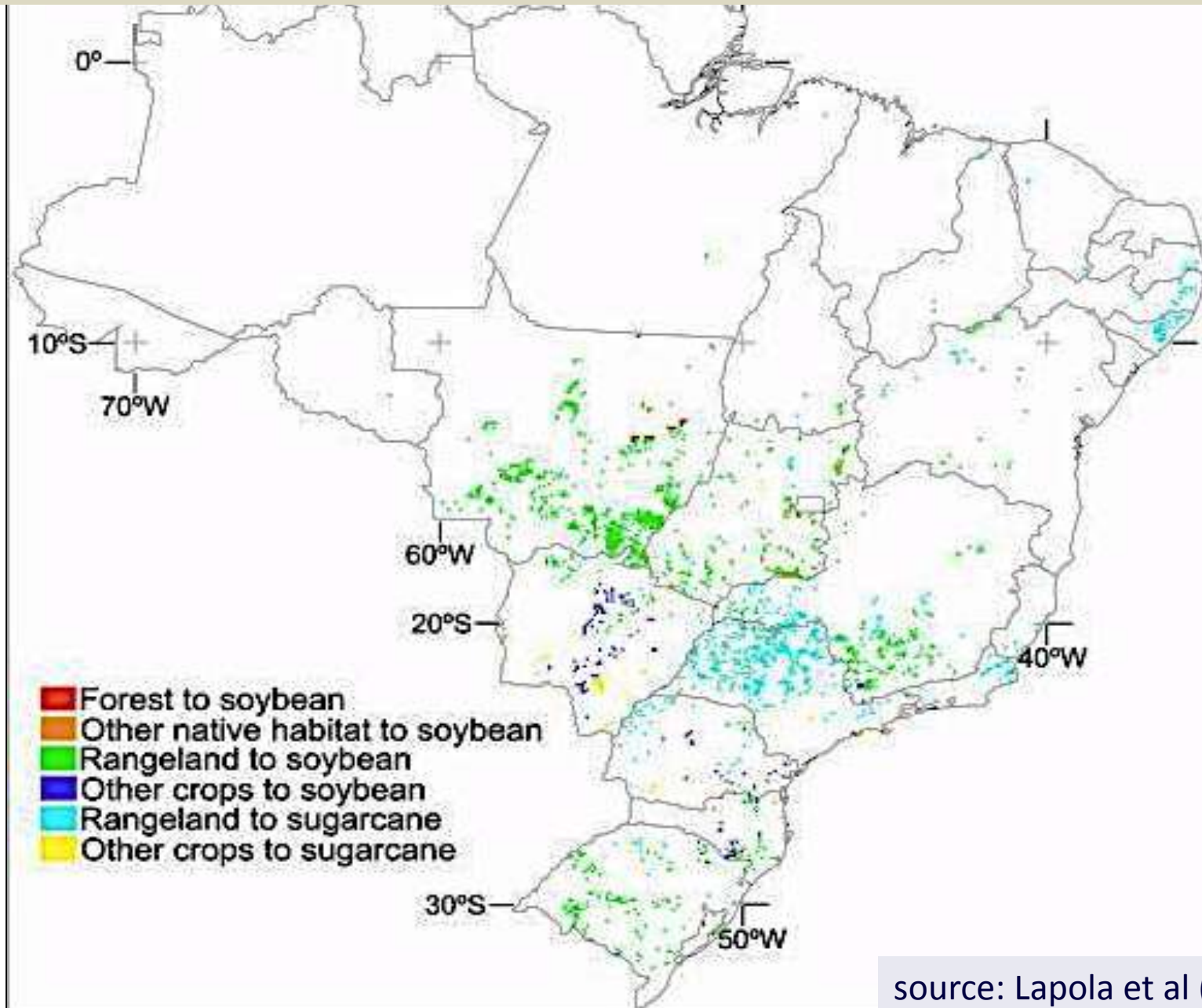


***Complex deepwater projects see Brazil joining the top ranks of global oil producers, while the domestic power mix remains one of the least carbon-intensive in the world***

# *Brazil: Do biofuels cause indirect land change?*

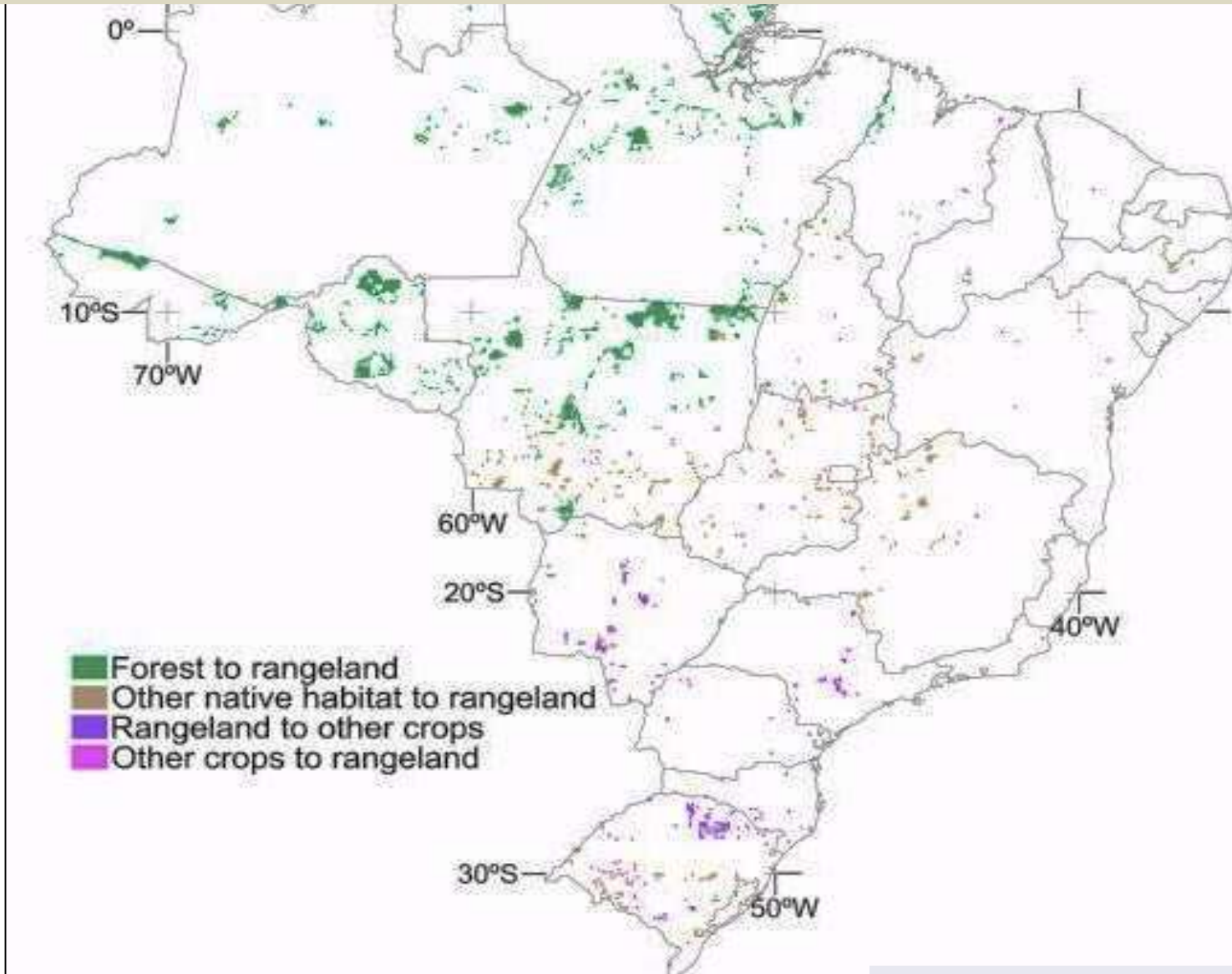


# *Brazil: Projected direct land change from biofuels (2020)*



source: Lapola et al (PNAS, 2010)

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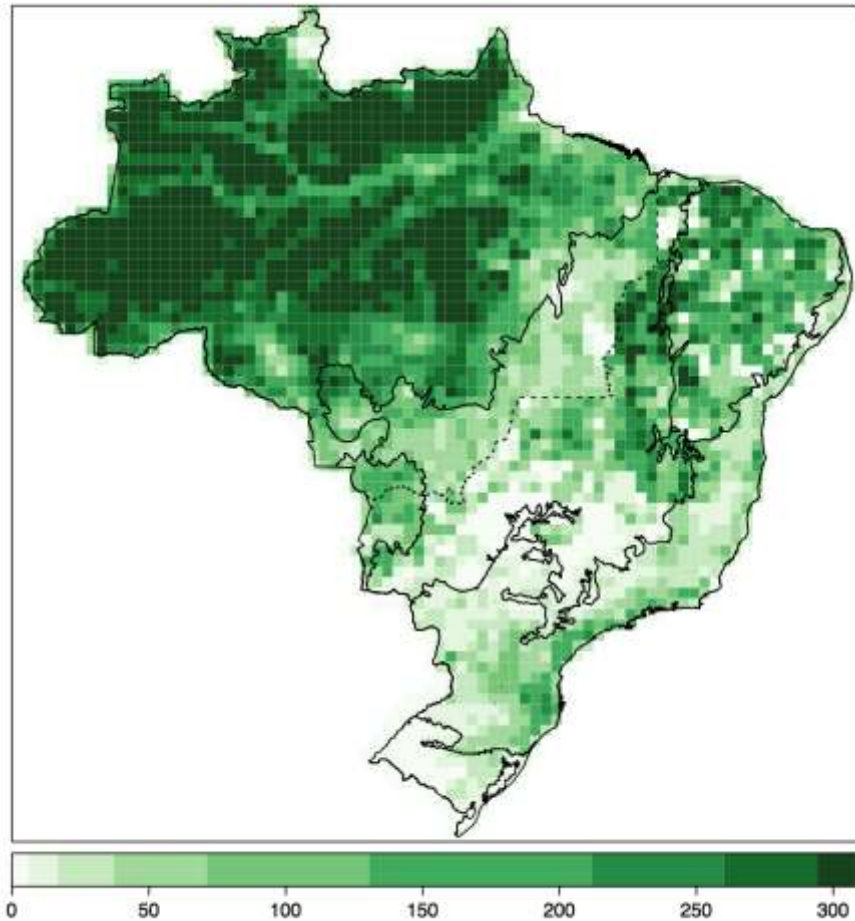


# GLOBIOM: Global Biosphere Management Model

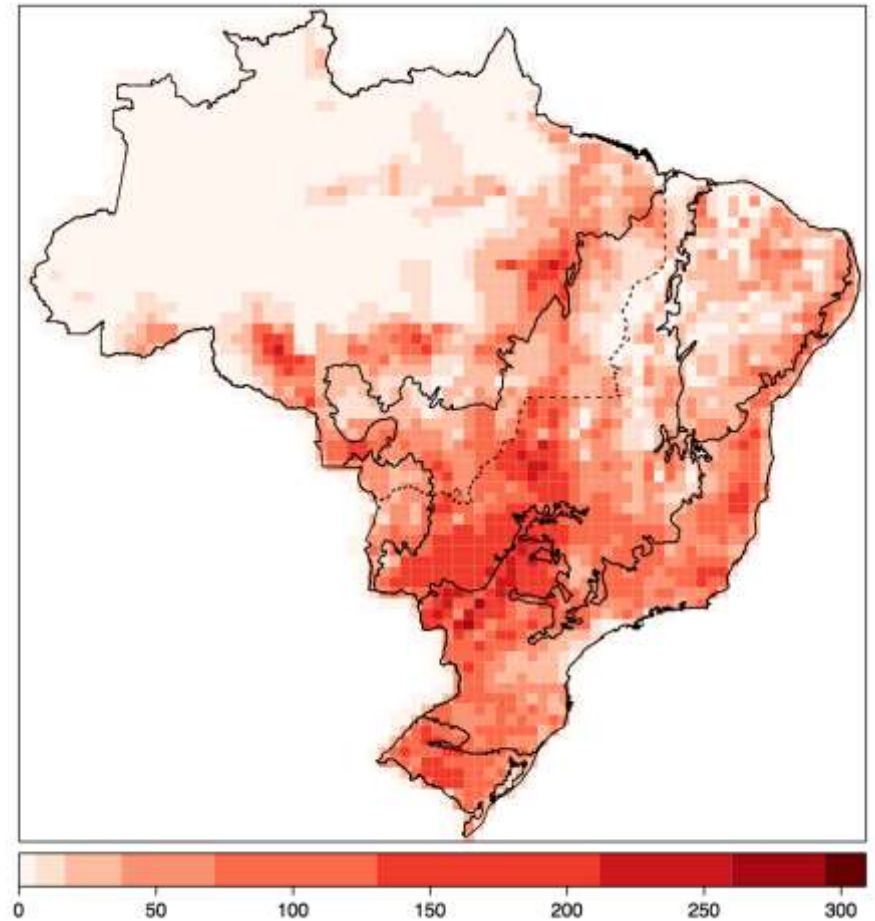
Partial equilibrium model: Agriculture, Forestry and Bioenergy sectors



## *Base maps for GLOBIOM-Brazil*

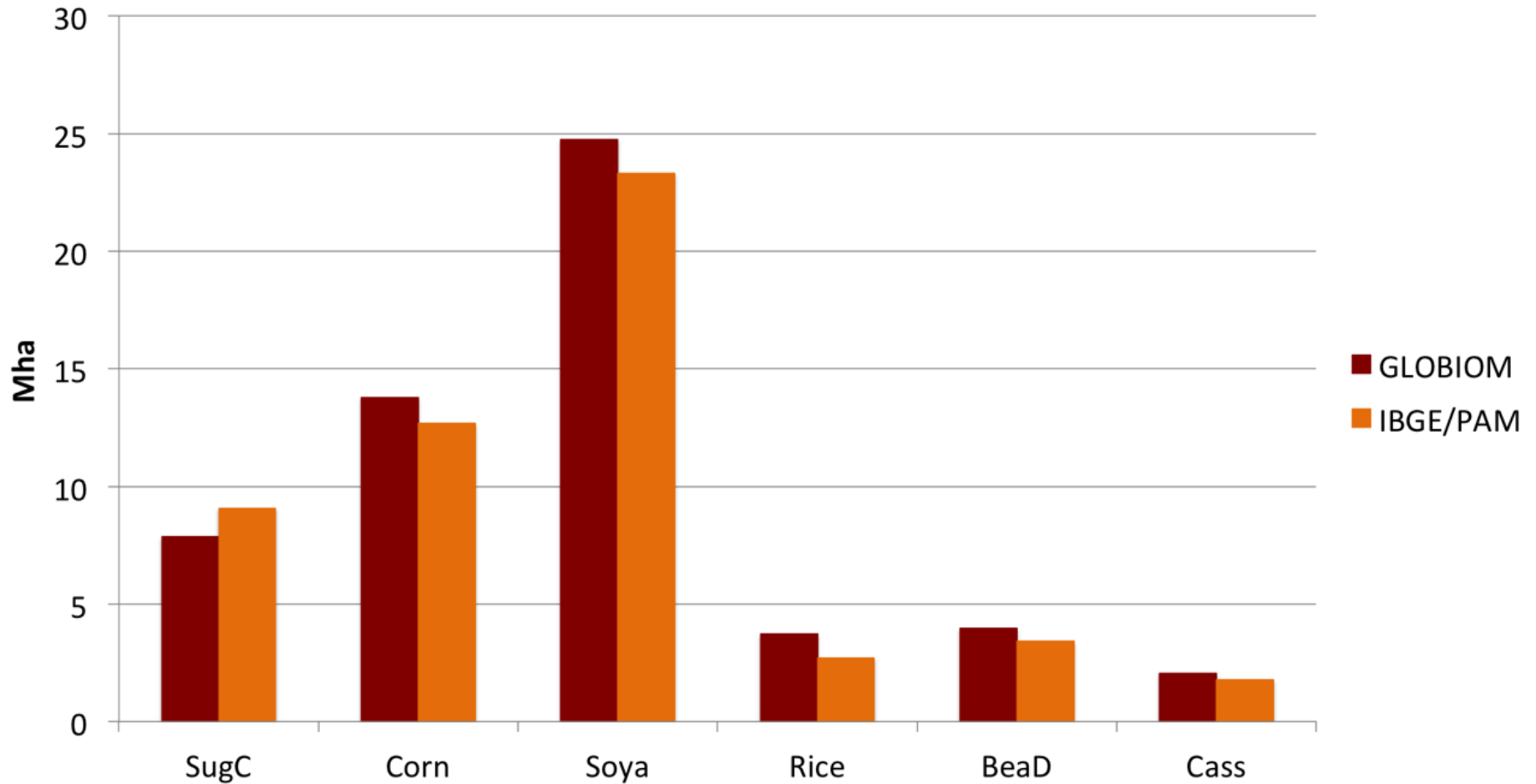


Forest 2000

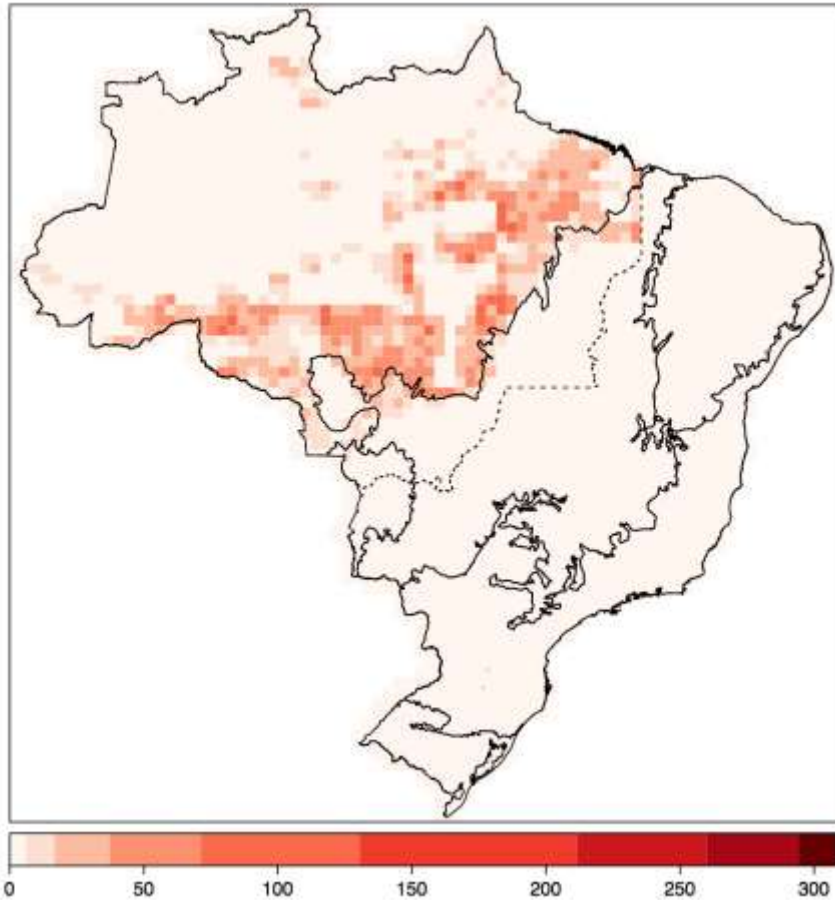


Livestock 2000

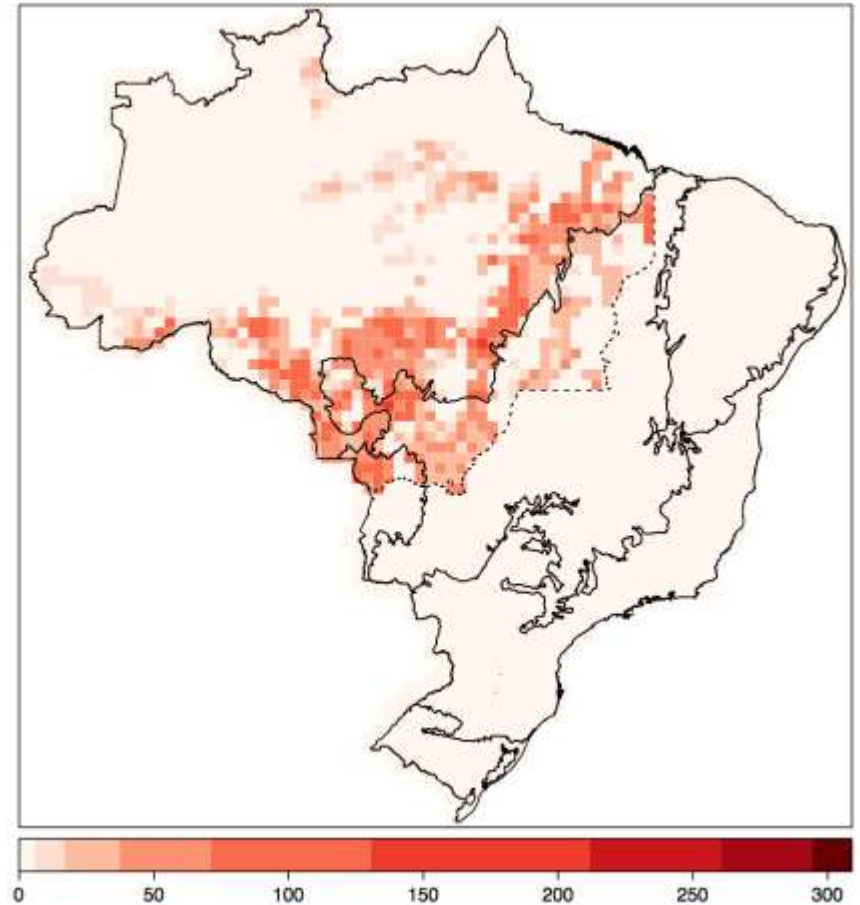
# Validation: GLOBIOM x IBGE for 2010



# *Validation: deforestation in Amazonia 2000-2010*



PRODES (16.5 Mha)



GLOBIOM (16.9 Mha)

# Scenarios for land use policies

## BAU BUSINESS AS USUAL

Extrapolation  
of 2000-2010  
trends

No forest  
regrowth

Mata  
Atlântica Law  
enforced

## FC Forest Code

No illegal  
deforestation

Legal reserve  
recovery

CRA + SFA

Mata Atlântica  
Law enforced

## FC CRA in croplands

Forest Code  
rules +

Use of CRA  
by crop  
farmers only

## FC without SFA

Forest Code  
rules +

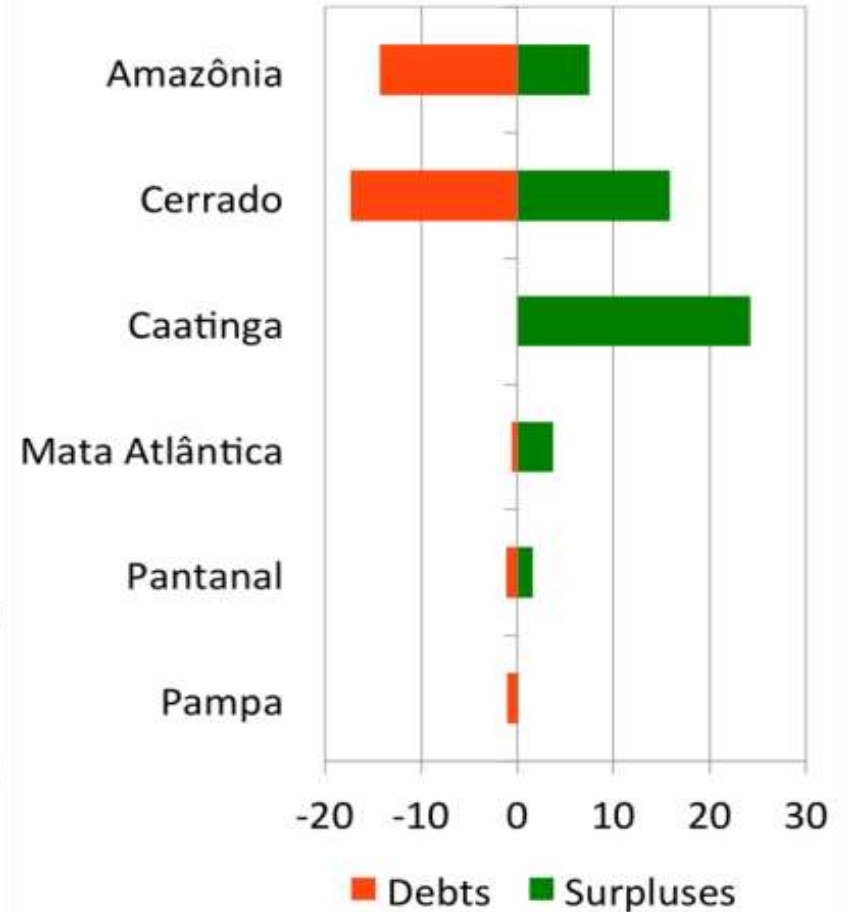
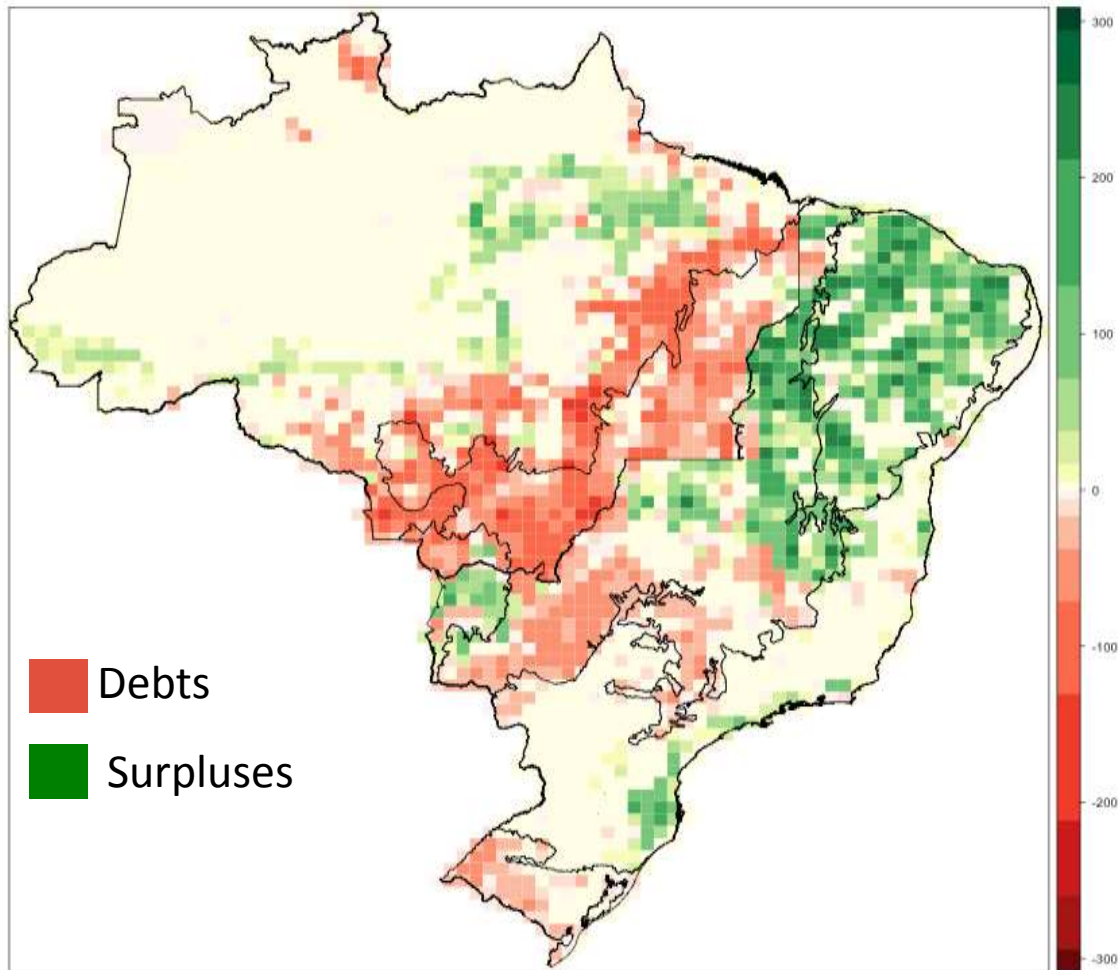
Legal reserve  
recovery in  
small farms

## FC without CRA

Forest Code  
rules –

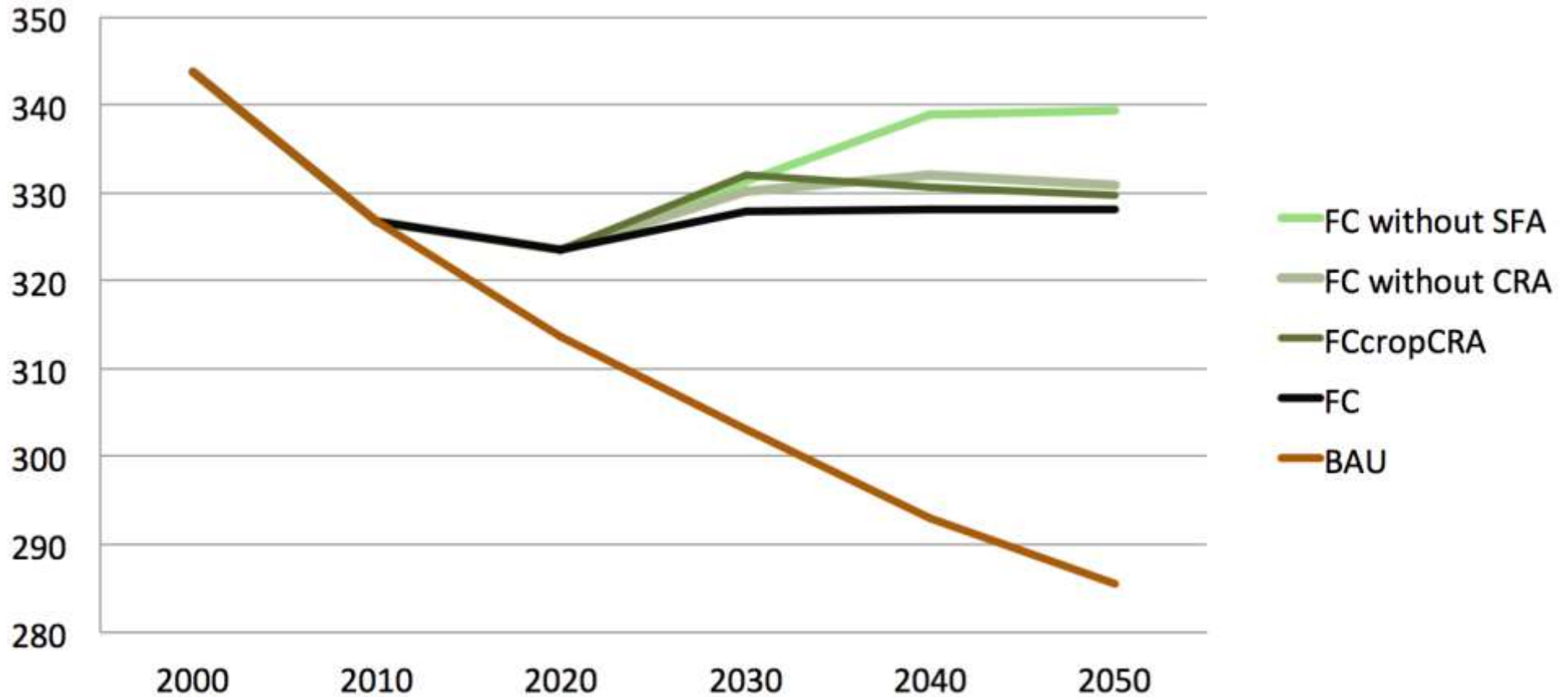
Environment  
reserve  
quotas

# Environmental Debts and Surpluses (2010)



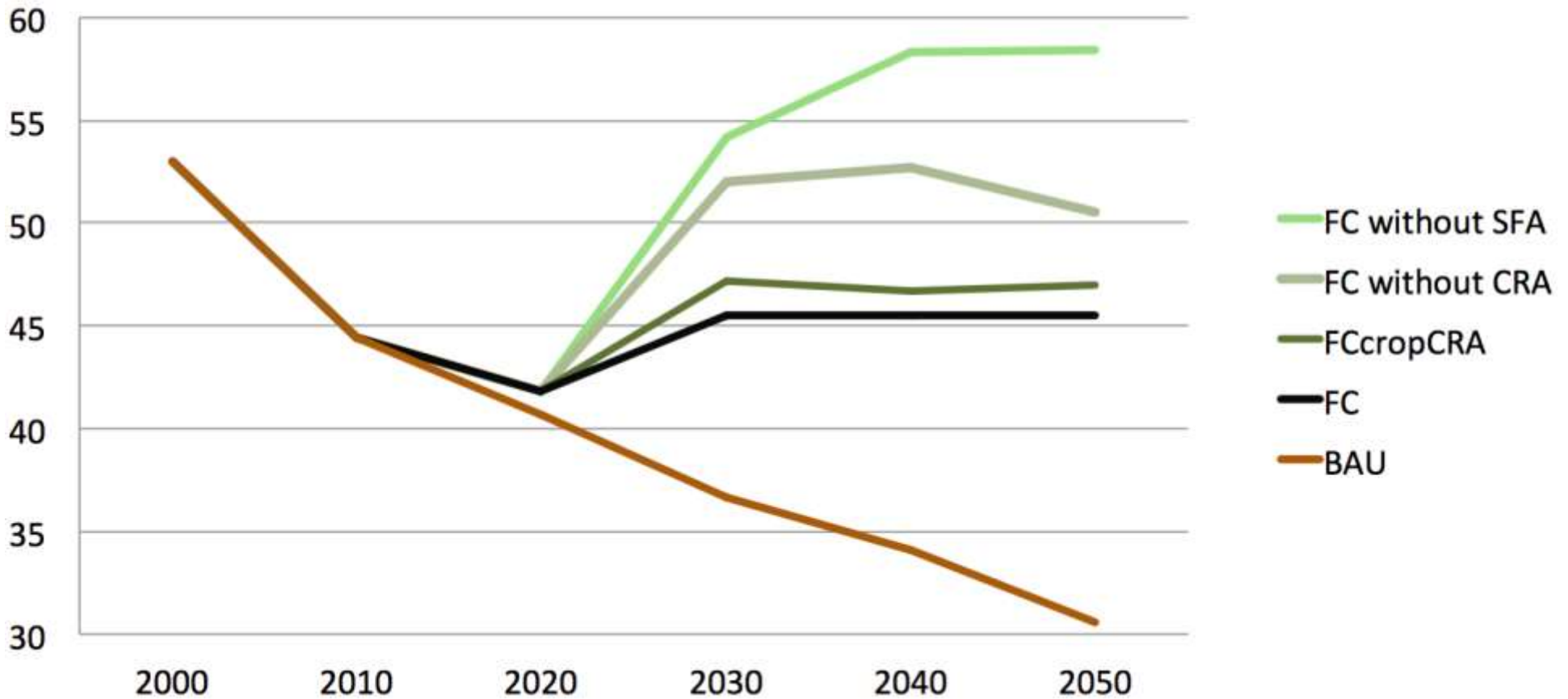
# Projections for total forest in Amazonia

Forest area in Amazonia (Mha)



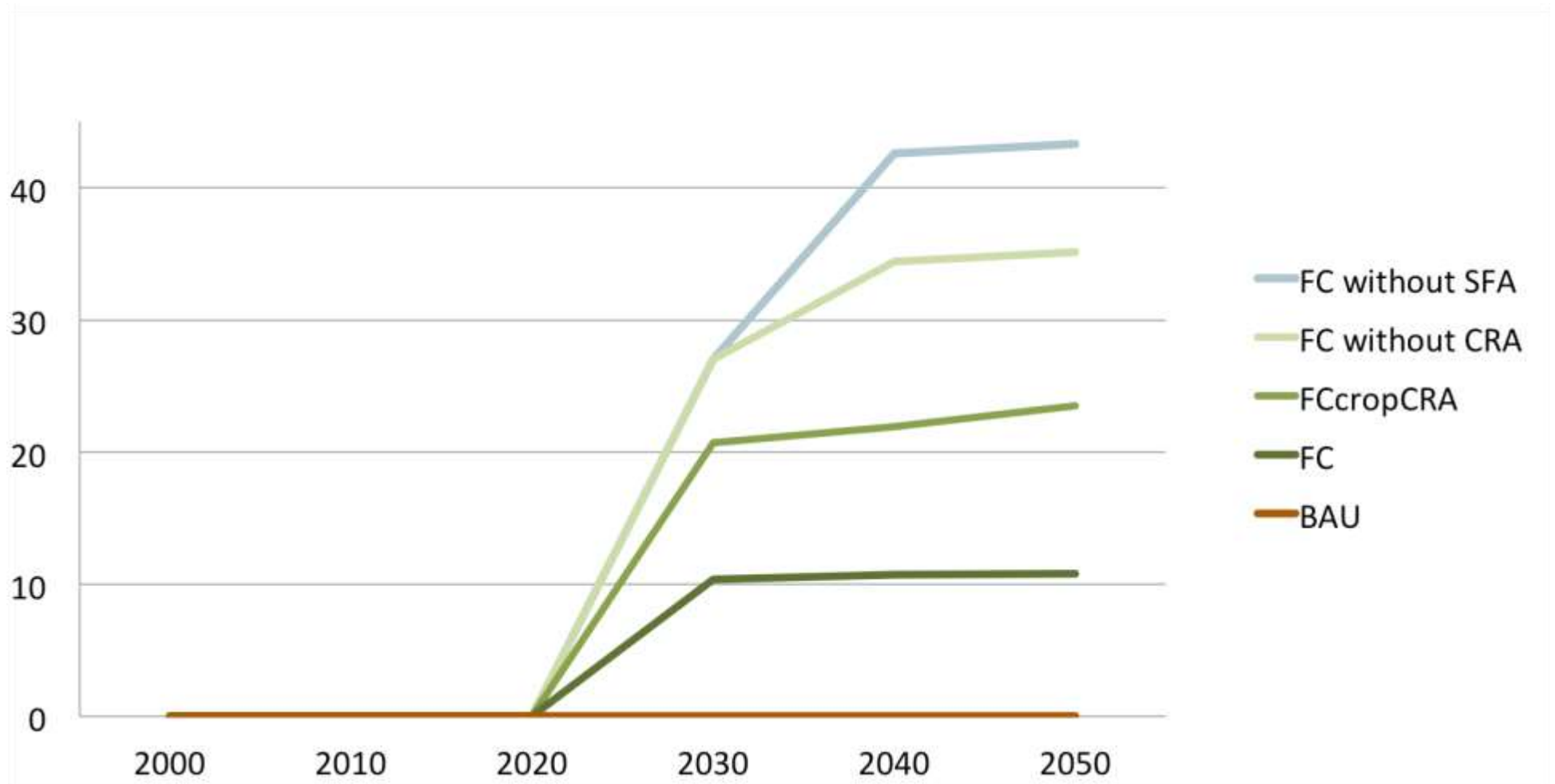
# Projections for total forest in Cerrado

Forest area in Cerrado (Mha)

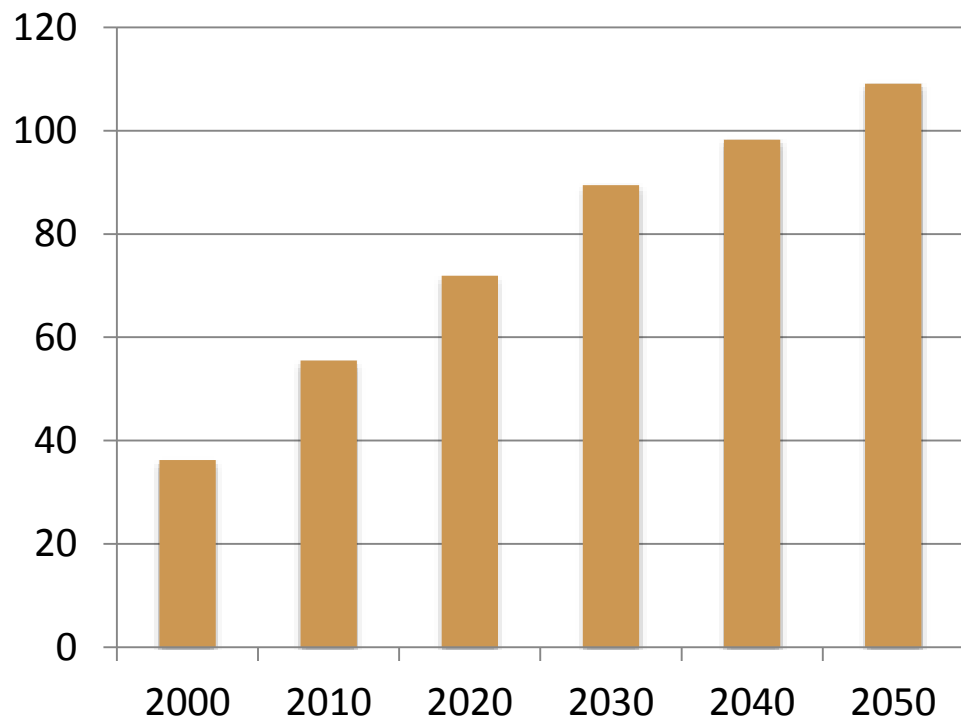




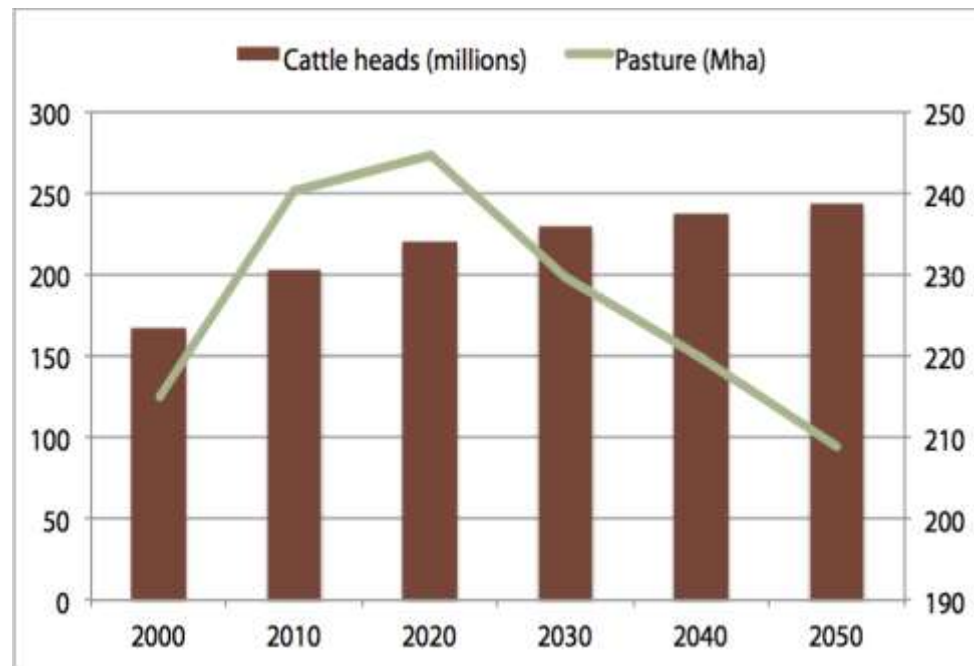
# Projections for forest regrowth



# *Crop production grows, grassland decreases*



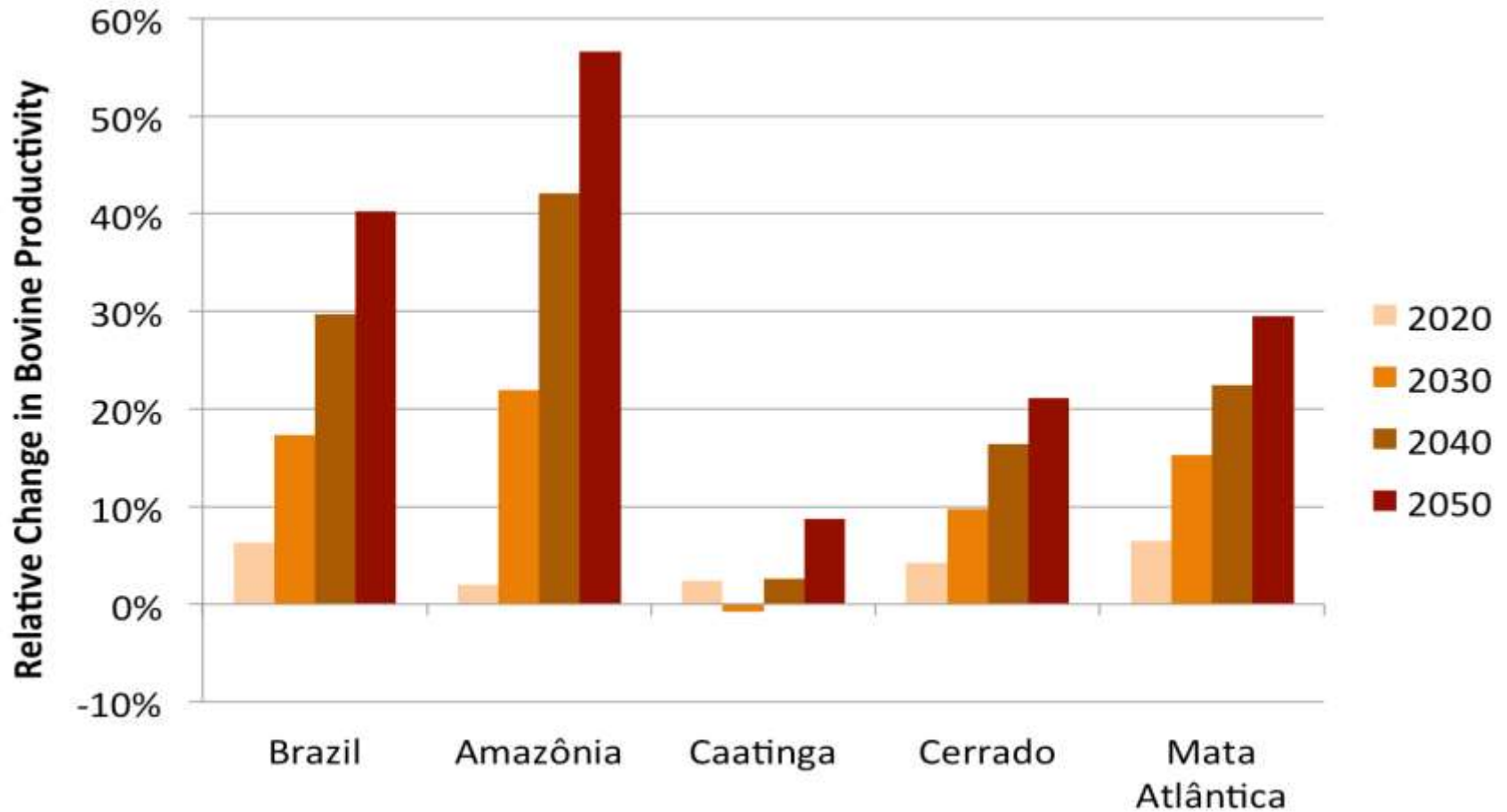
Croplands (Mha)



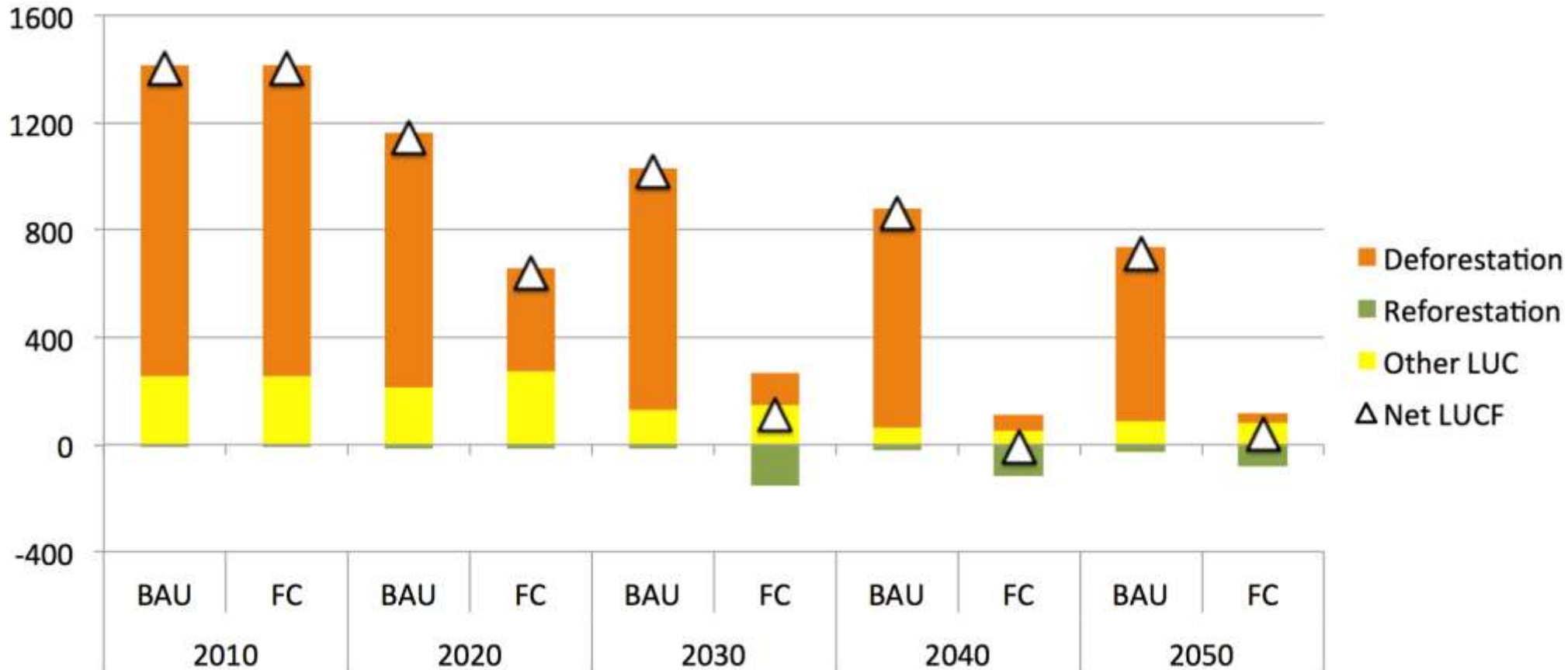
Cattle and pasture (heads and Mha)

Projections of GLOBIOM-Brasil model

# *Relative change in bovine productivity*

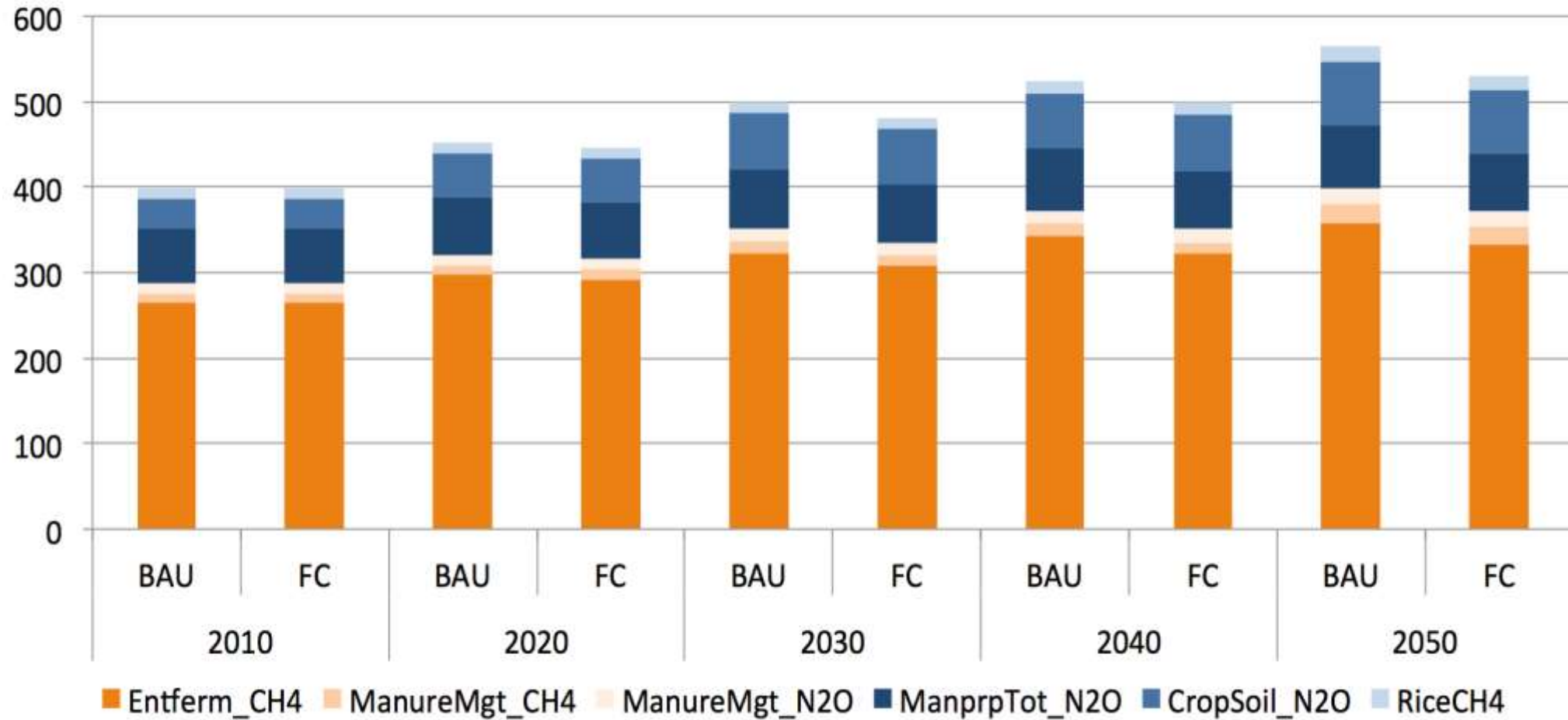


# Brazil's new Forest Code: zero net emissions from deforestation after 2030

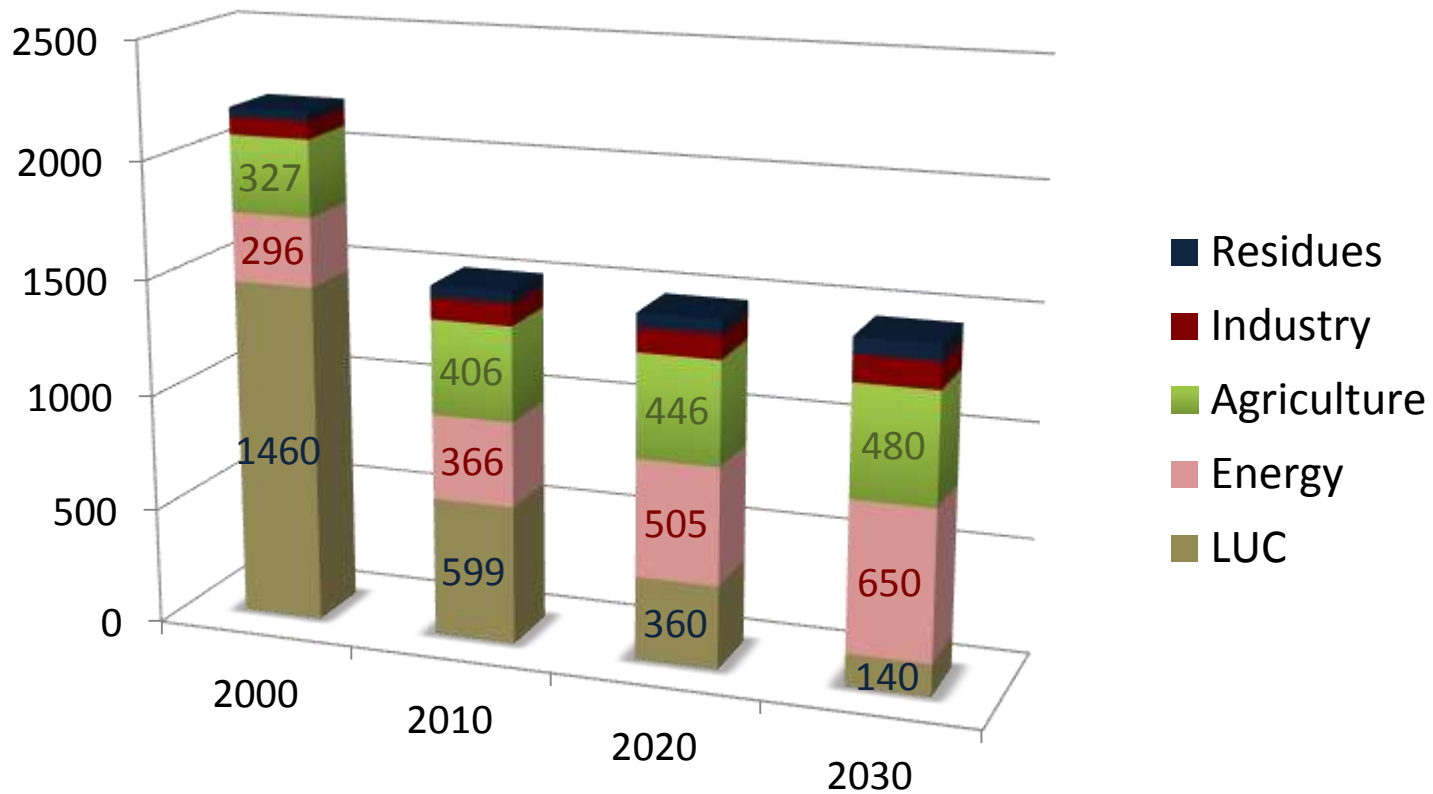


Projections of GLOBIOM-Brasil model  
(BAU = "business as usual", FC = Forest Code)

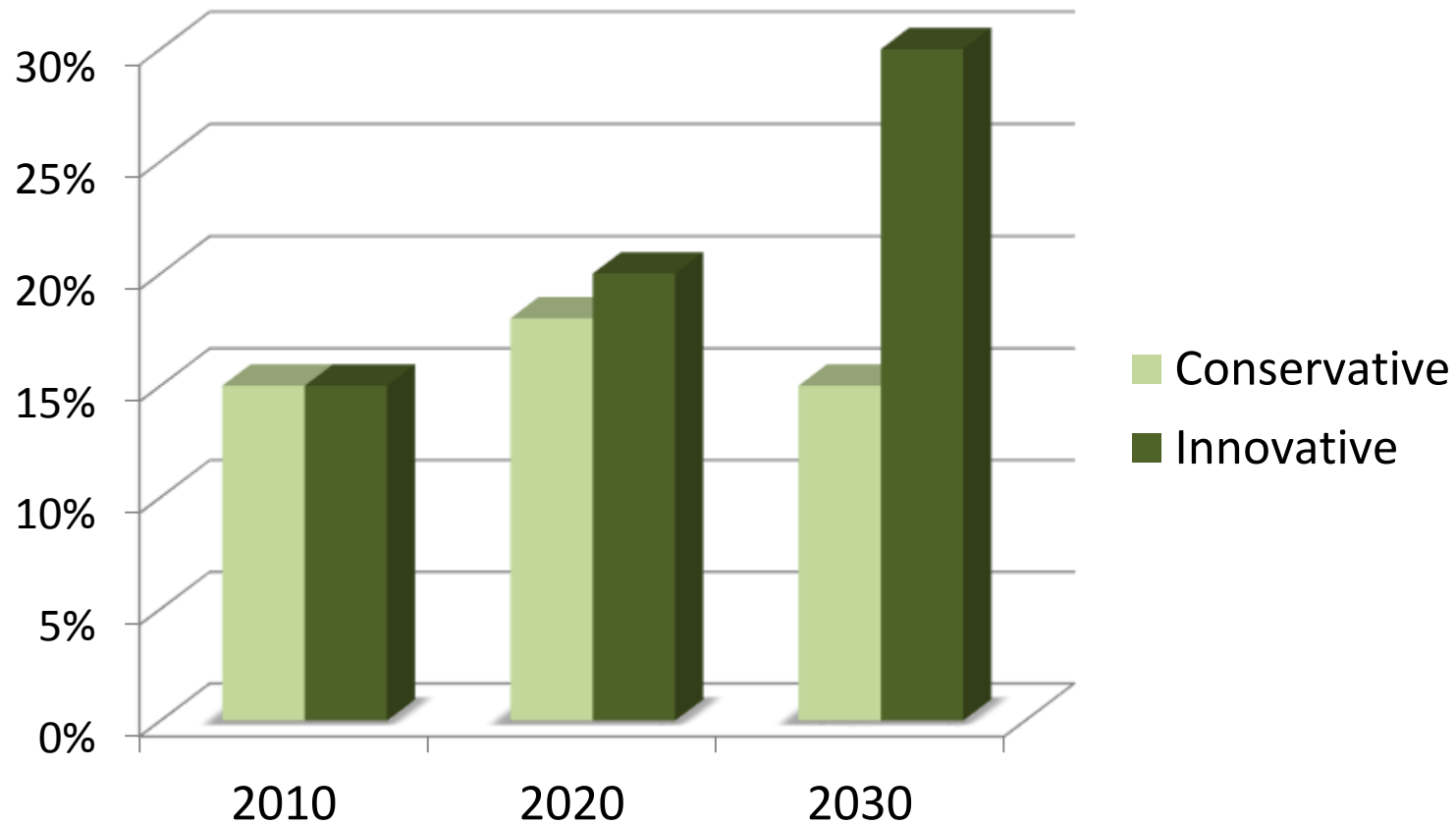
## Brazil's emissions from crops and cattle



# *Energy policy is crucial for our future emissions*



# *Innovation + policies = low carbon economy*



With the right carbon tax, biofuels can be 30% of energy matrix