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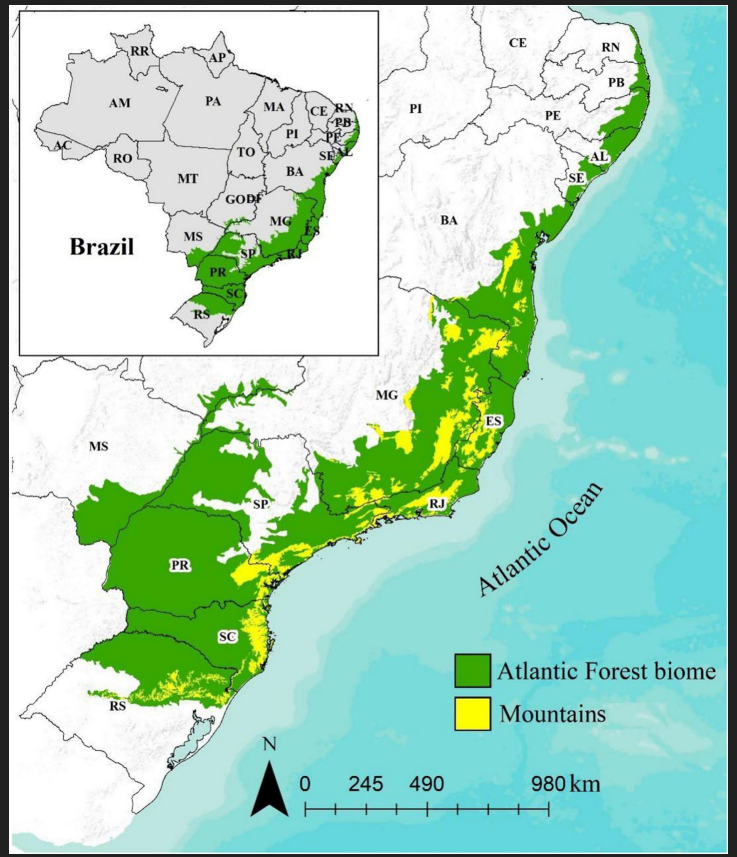
The Brazilian Atlantic Forest
From Degradation to Restoration?

James Millington

Physical & Environmental Geography Research Group Seminar
31 January 2024

The Brazilian Atlantic Forest (BAF)



Second Forest of South America

- 1.3m sq km (62x Wales!)
- >85% of original deforested

Multiple Ecosystem Types, incl:

- Tropical Moist
- Tropical Dry
- Subtropical Broadleaf

Global Biodiversity Hotspot

- 7000 tree & shrub species (50% endemic)
- 2000 epiphyte species (78% endemic)
- 990 birds species (25% endemic)
- 370 amphibian species (78% endemic)

The Brazilian Atlantic Forest (BAF)

500 years of colonization & economic exploitation

brazilwood, sugarcane, cassava flour, timber, cocoa, eucalyptus

- 1500: First Europeans arrive in Brazil (Bahia)
- 1800s: First investigation by European naturalists, Brazilian Independence
- 1980s: Re-democratization (end of dictatorship), launch of Landsat
- 1990s:
  - ‘SOS Mata Atlântica’, national decrees on deforestation
  - Human & agricultural census est., redefinition of municipalities
- 2000s: Atlantic Forest Law (2006) formalized previous decrees
- 2010s: *Projeto Conexão Mata Atlântica* established (2018)

Multi-project Collaboration

Ramon Felipe Bicudo da Silva

STATE UNIVERSITY OF CAMPINAS, Brazil

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Eco-certification protocols as mechanisms to foster sustainable environmental practices in telecoupled systems

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ABSTRACT

The international trade of forestry and agricultural commodities leads distant regions across the globe to become connected through flows of products, information and capital. To deal with the sustainability and socioeconomic challenges of these interconnections, the 'telecoupling' conceptual framework has emerged. The telecoupling framework takes a coupled human-natural system approach to understand connections between different systems, classifying them as 'sending', 'receiving' and 'spillover' systems. This paper uses the telecoupling framework to investigate how distant systems are connected through flows of eco-certified forestry products and demonstrates how these connections drive environmental law compliance at the rural property level. We identify rural properties with eucalyptus plantations in Paraíba Valley, São Paulo State, Brazil as a sending system, and trace the outgoing flows of cellulose pulp to receiving systems. China and the European Union are the receiving

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Toward a forest transition across the Brazilian Atlantic Forest biome

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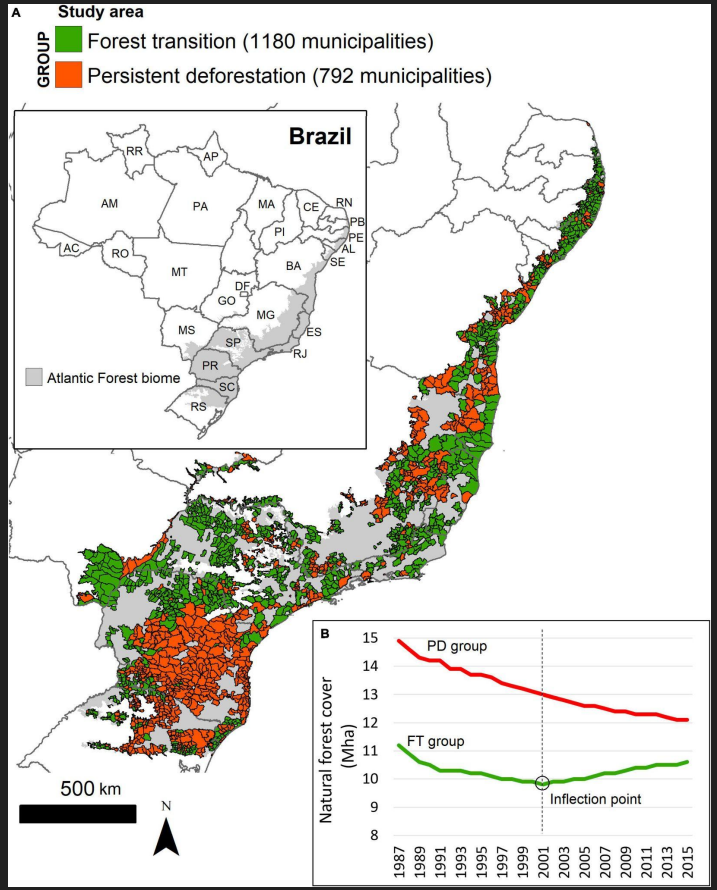
The world has entered the United Nations Decade on Ecosystem Restoration (2021–2030), yet many regions of the world still face environmental degradation. In this context a question arises: under what conditions may a given

Belmont Forum Collaborative Research Action (UKRI NERC)

Young Investigator Grant (JP FAPESP)

Toward a Forest Transition across BAF



"a shift from net deforestation to net reforestation"

Meyfroidt & Lambin (2011)

1,972 municipalities with deforestation 1987-2001

Examined change over 2001-2018

- PD: Persistent Deforestation
- FT: Forest Transition

Fig. 2, Silva *et al.* (2023)

Toward a Forest Transition across BAF

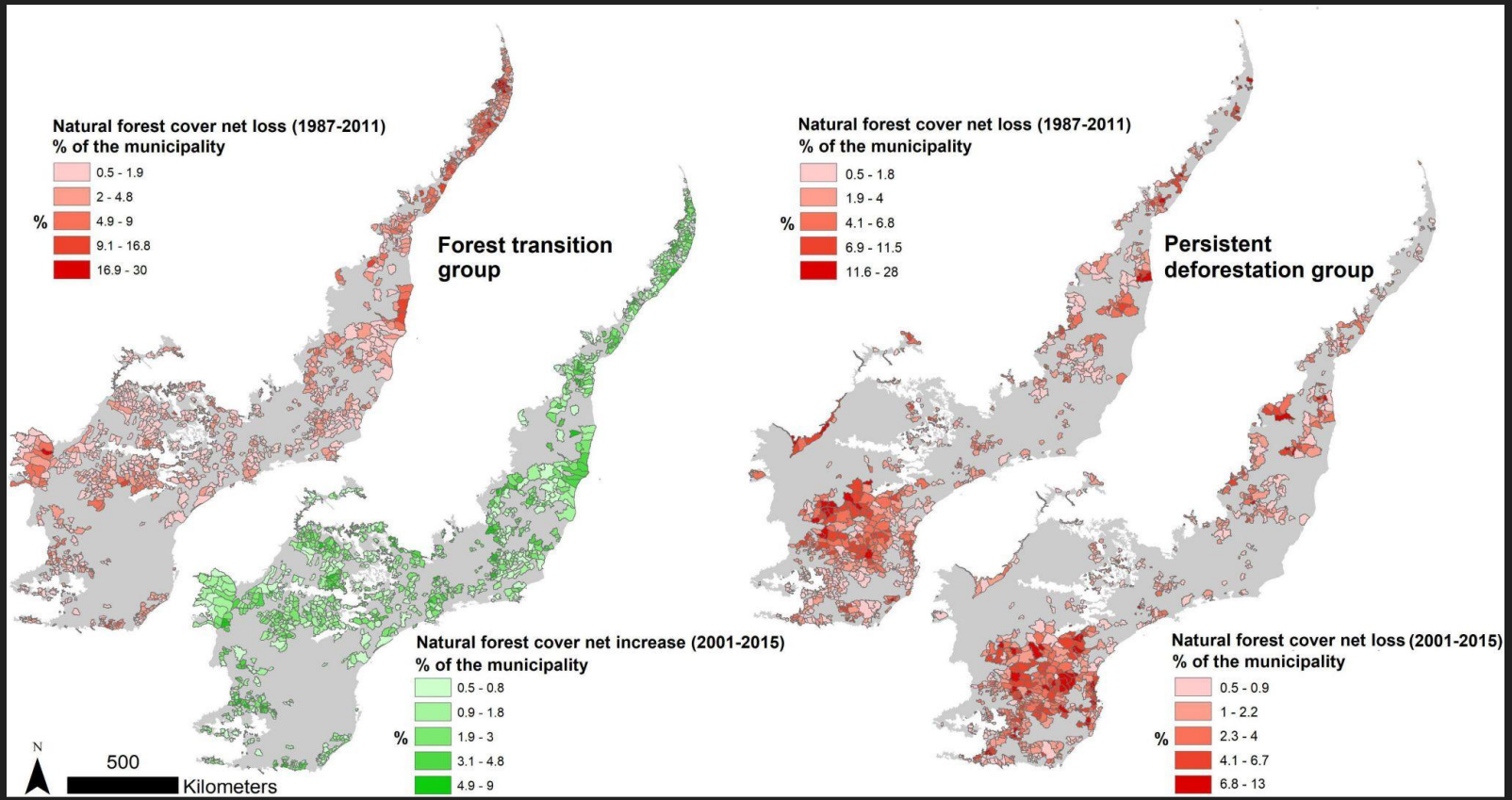


Fig. 5, Silva *et al.* (2023)

Spatial Regression with Municipality Data

- Land Cover data derived from Landsat by MapBiomas (v.5)
- Agricultural, Social and Economic Data available from Brazilian Institute of Geography and Statistics (IBGE)
- Account for spatial autocorrelation (clustering) in change using a spatial error model:

$$\Delta y = \Delta X\beta + \lambda W\xi + \varepsilon$$

Δ is 29 years for PD (1987-2015)
Δ is 15 years for FT (1987-2001 & 2001-2015)

Spatial Regression Results

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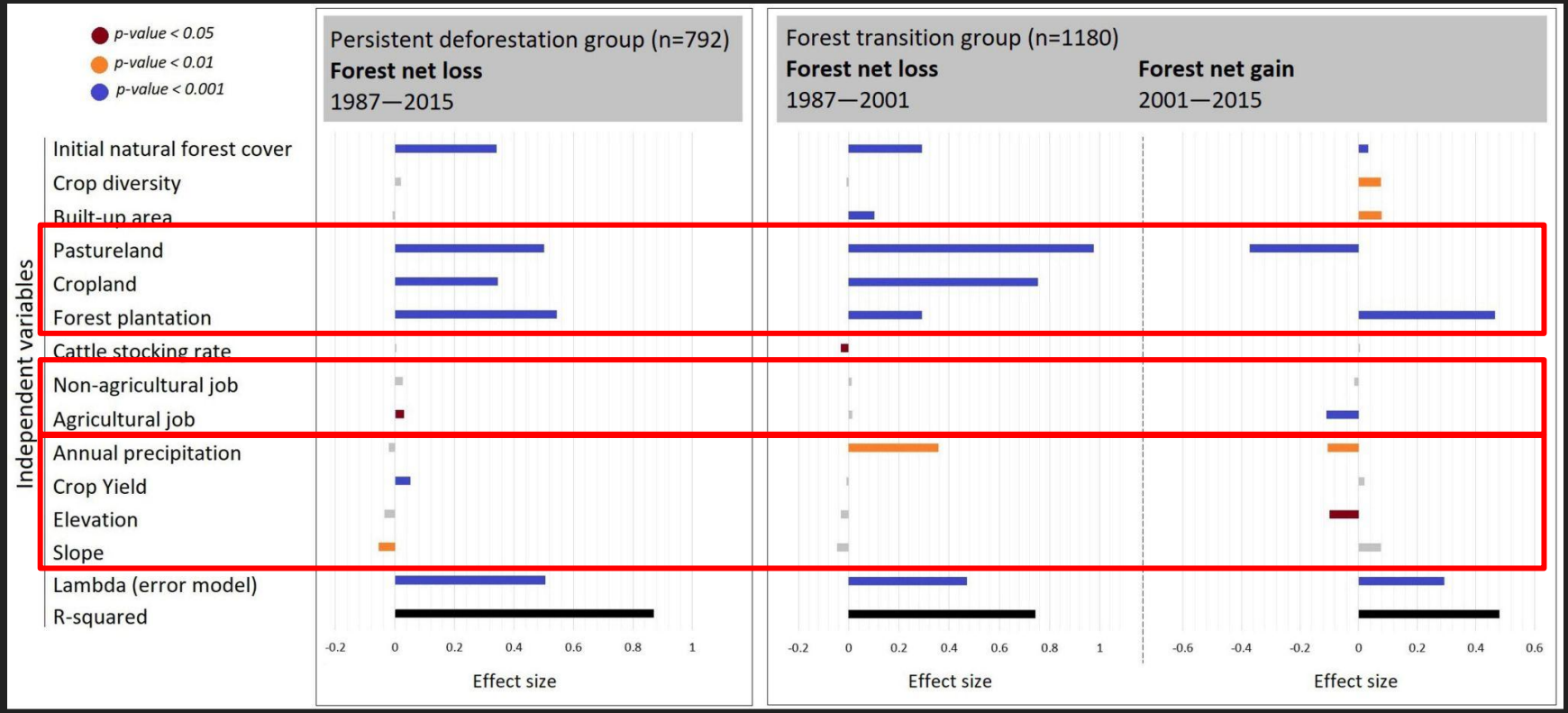

Fig. 3, Silva *et al.* (2023)

Spatial Regression Results

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- Lower demand for pasture beneficial for natural forest gain
- Reflected in agricultural employment and cattle stocking rates
- Physical variables drive priority of change?
- Spatial effect is evident but cause (social *vs* physical) is unclear

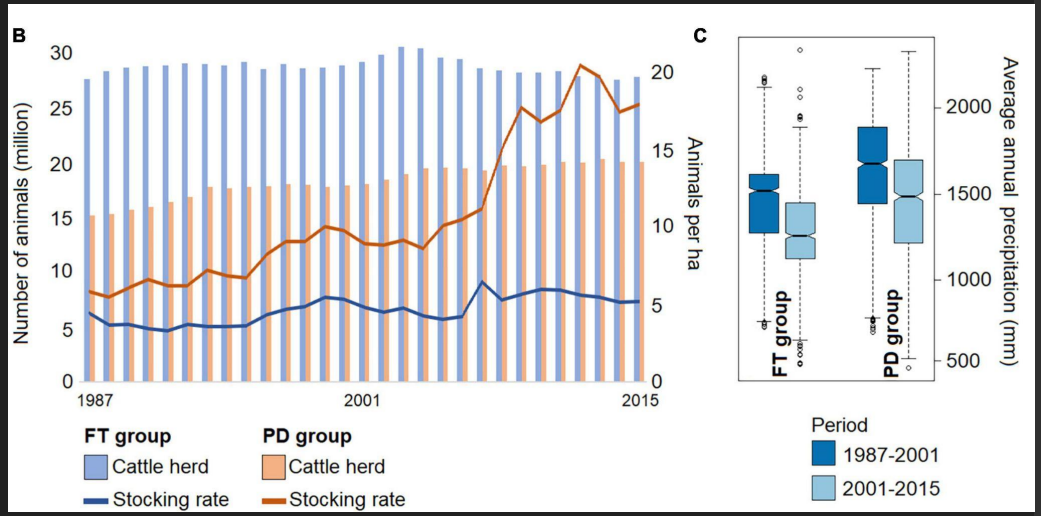

Fig. 4, Silva *et al.* (2023)

Spatial Regression Results

However…although FT is occurring, the scale of change is small compared to other changes!

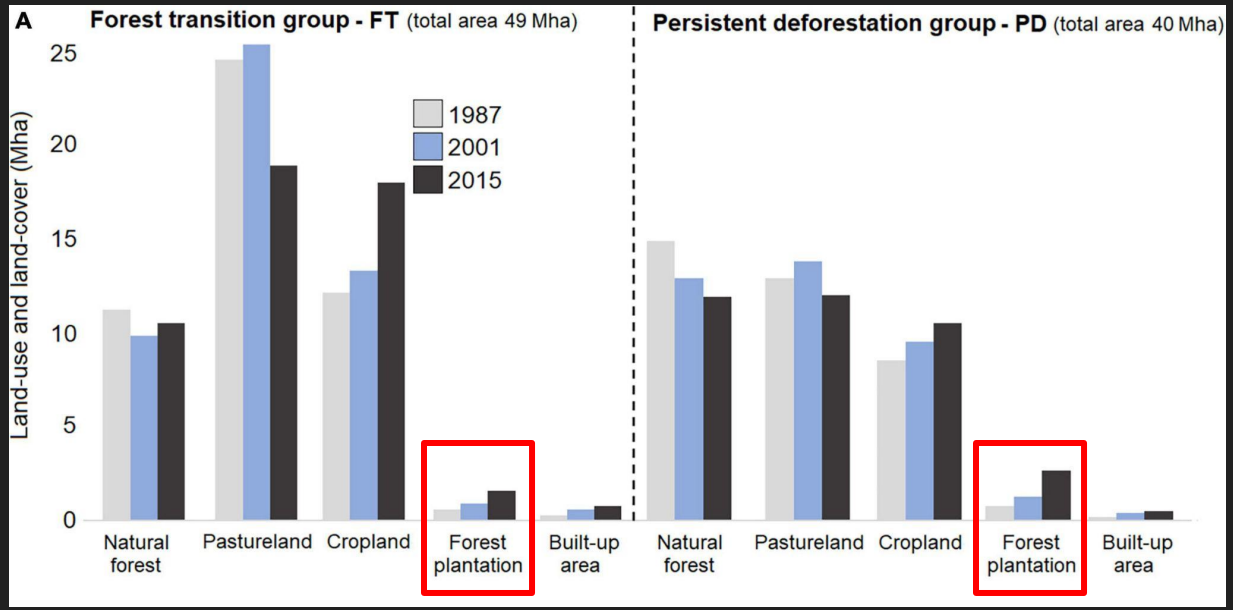

Fig. 4, Silva *et al.* (2023)

Forest Plantations

PD group plantations dom. by *Pine*

- charcoal production
- local markets
- less regulated

FT group plants. dom. by *Eucalyptus*

- cellulose pulp for paper and cardboard
- international markets
- Forest Stewardship Council certification

Eucalyptus Plantation in Espírito Santo

International Drivers of Change

São Paulo Cellulose Pulp Destinations

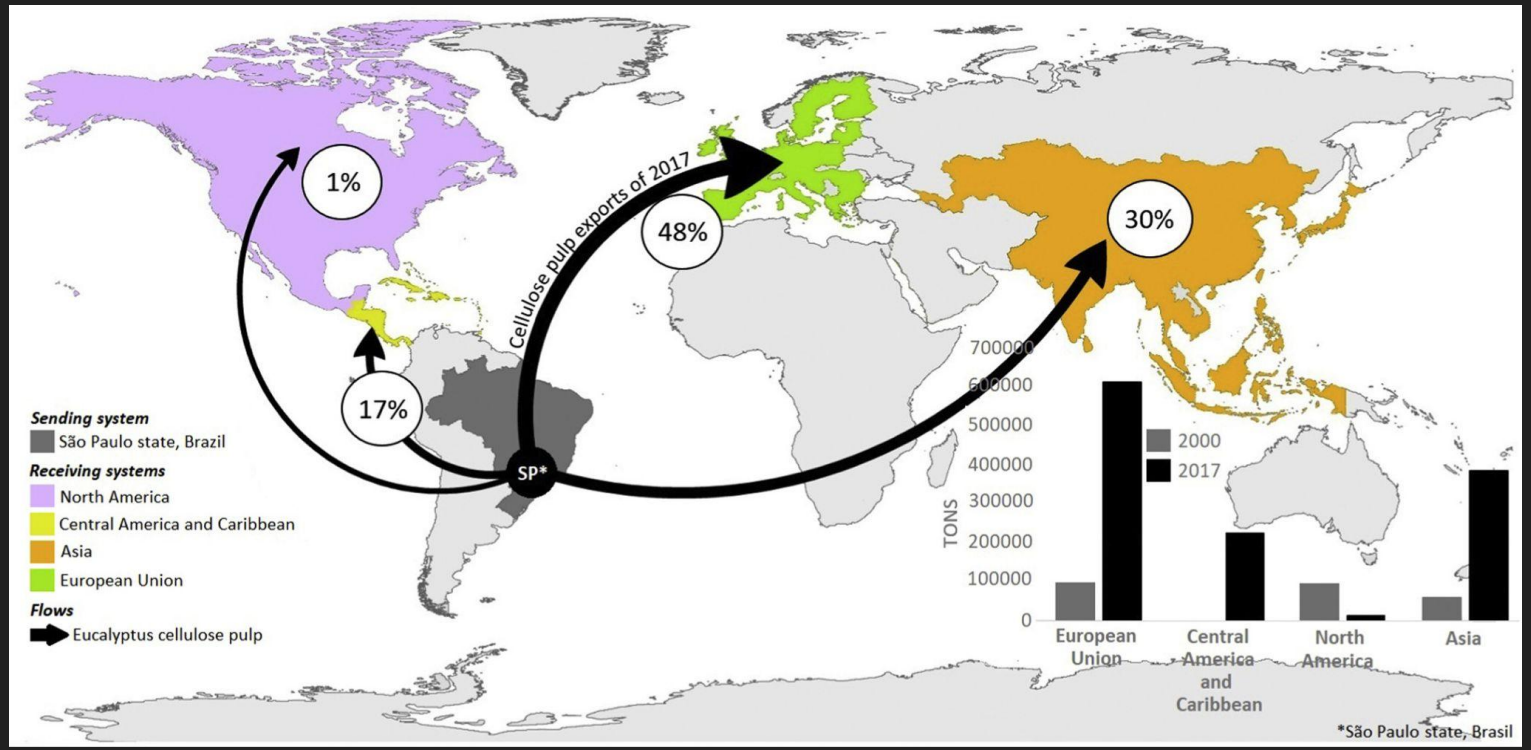

Fig. 3, Silva *et al.* (2019)

Eco-Certification for Sustainable Practices?

- Forest Stewardship Council (FSC) certification demanded by many markets
  - Criticism of assessment and monitoring standards
- Forest Code compliance needed for FSC certification
  - *Legal Reserve (LR)*: in BAF, 20% of property remain as native forest
  - *Permanent Preservation Areas (APP)*: native vegetation <30m from rivers and <50m from springs (additional to LR)

Do eucalyptus plantations encourage conservation of native vegetation?

Paraíba Valley, São Paulo

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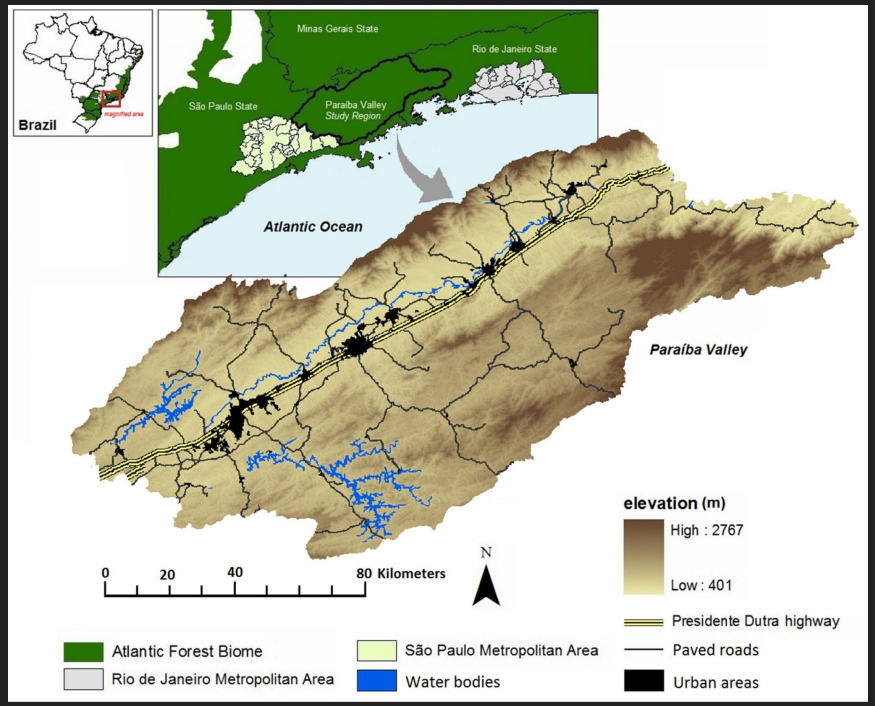


Fig. 1, Silva *et al.* (2016)

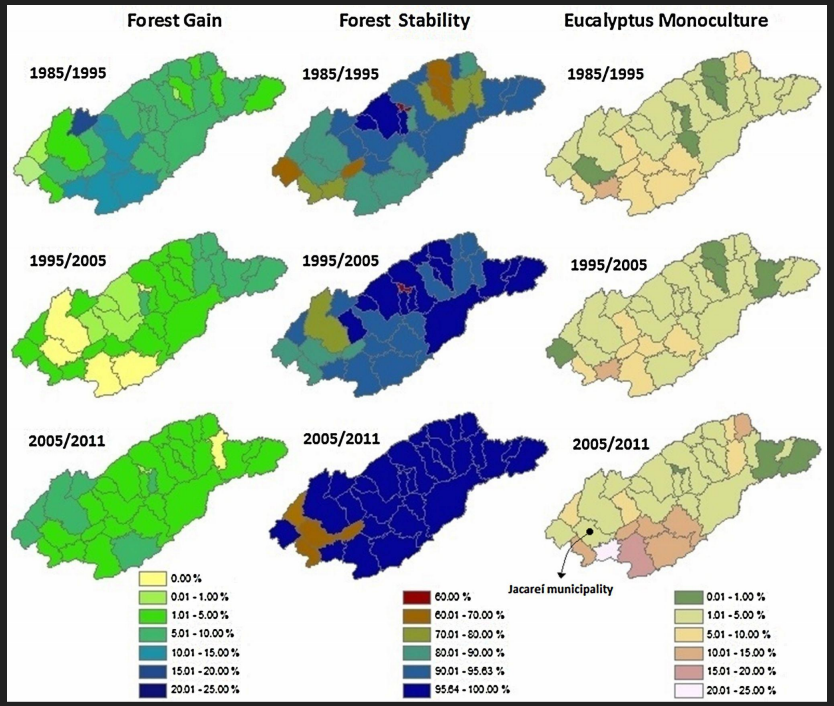
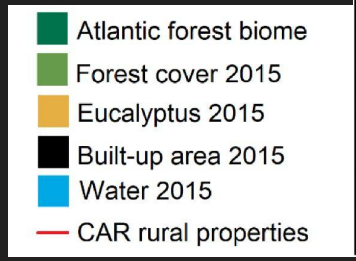


Fig. 4, Silva *et al.* (2016)

Paraíba Valley eco-certification effect

- CAR: Rural Environmental Cadastre
  - Self-declared land-owner info on location of LR and APP on their land
  - 6 million geo-referenced polygons

- Effect of FSC on native forest: within properties with eucalyptus Plantations (EP) *vs.* those without



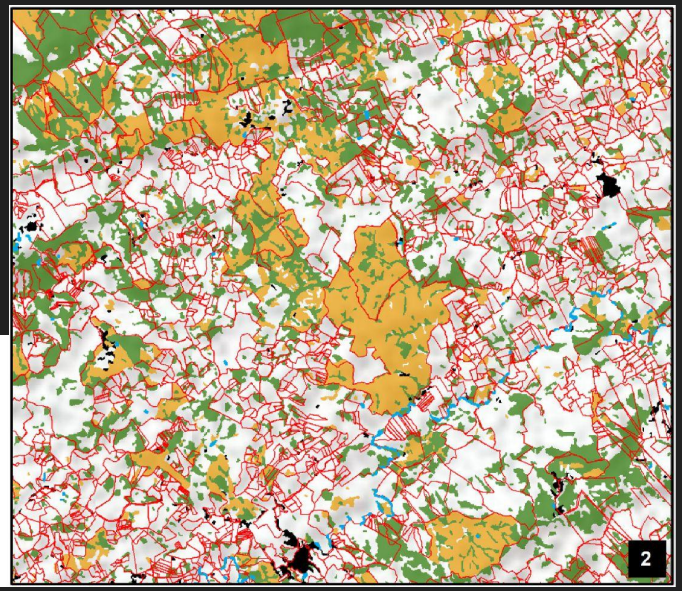


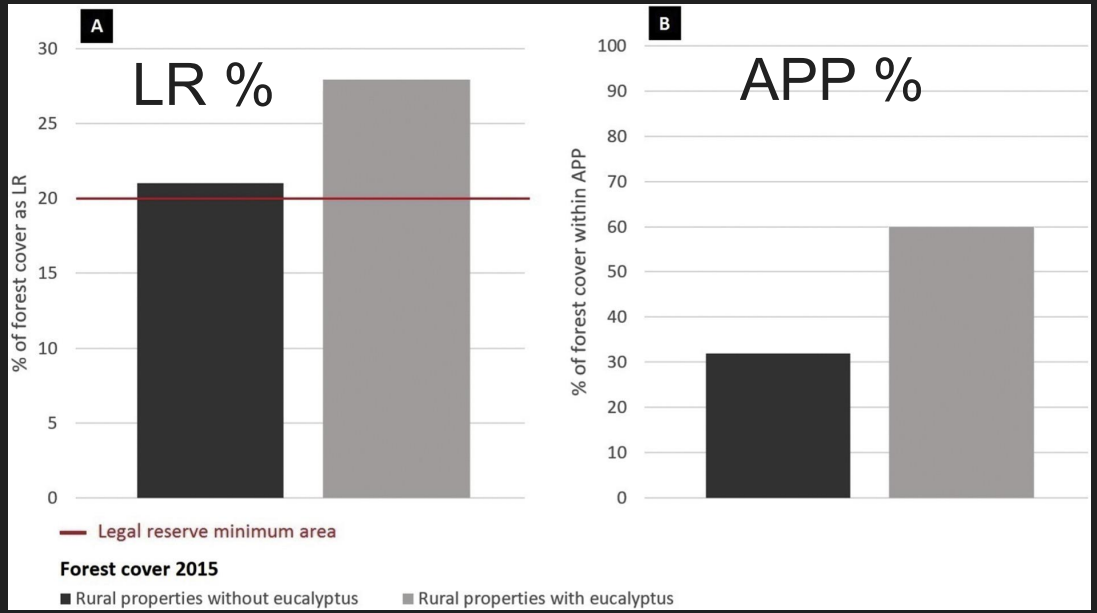
Fig. 2, Silva *et al.* (2019)

Paraíba Valley eco-certification effect

1995-2005: NFC increased 105% with EP, 65% without EP

Native Forest

Fig. 4, Silva *et al.* (2019)



*However…*after 2005 NCF increased 0% with EP, 25% without!

New Work: Env. Change & Management

Multi-scale analysis of environmental changes and management practices in rural properties in the Atlantic Forest:

exploring conditions needed to shift a region from a trajectory of environmental degradation to one characterized by restoration

Projeto Conexão Mata Atlântica

- Project for the recovery & protection of climate services and biodiversity in the southeast Brazilian Atlantic Forest
- Since 2018 >R$100 million for >4,000 farmers providing environmental services

New Work: Env. Change & Management

IsmaelSilva

- *Atlantic Forest* Land Use and Land Cover Dynamics
  - Carbon Stocks and Biodiversity via statistical and spatial analysis
- *Paraíba Valley* Rural Properties Analysis
  - Evaluating effects of PES via surveys and interviews (and ABM?)

Refs and Reading

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Silva *et al.* (2019) Eco-certification protocols as mechanisms to foster sustainable environmental practices in telecoupled systems, *Forest Policy and Economics* 105 52–63 https://doi.org/10.1016/j.forpol.2019.05.016

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