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<https://cutt.ly/AF-DegRest>

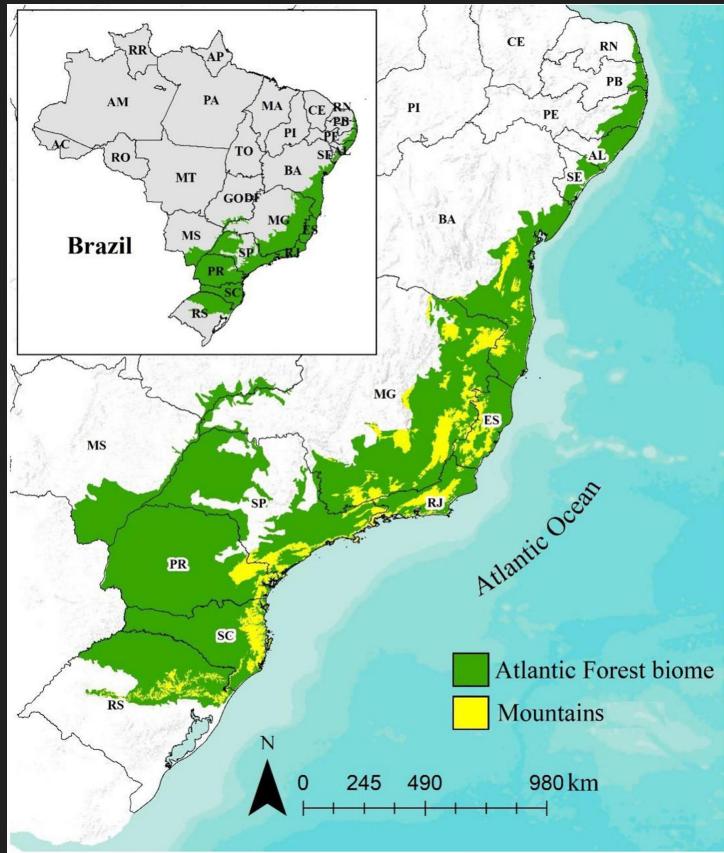
The Brazilian Atlantic Forest From Degradation to Restoration?

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

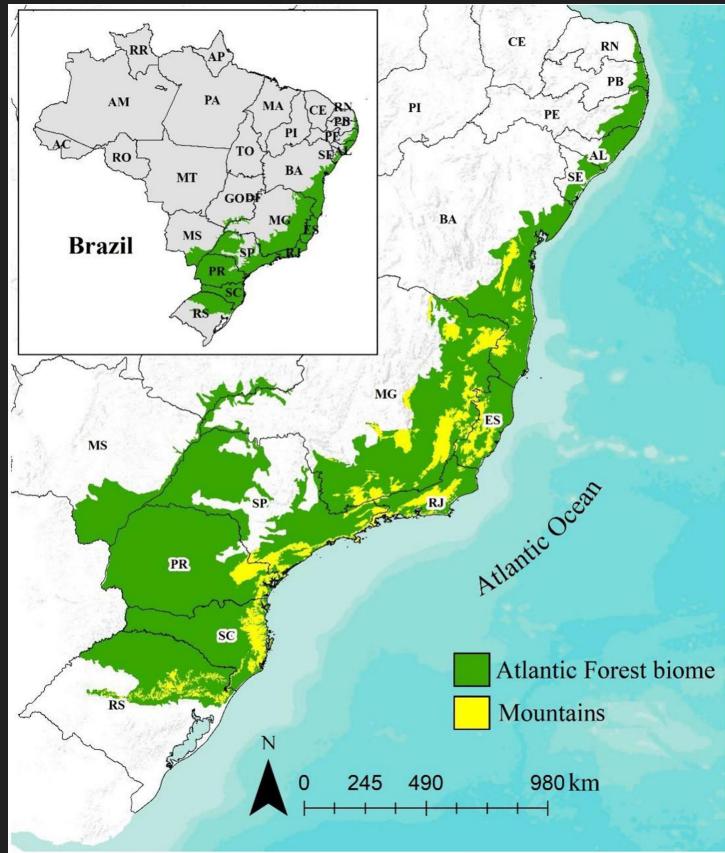
Multiple Ecosystem Types, incl:

- 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)



Multiple Ecosystem Types

- Tropical Moist
- Tropical Dry
- Subtropical Broadleaf



Marcelino Dias

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



Toward a forest transition across the Brazilian Atlantic Forest biome

frontiers | Frontiers in Forests and Global Change

Check for updates

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EDITED BY
Jess R. Zimmerman, University of Puerto Rico, Puerto Rico

REVIEWED BY
Celerino J. Silva-Júnior, University of California, Los Angeles, United States; Yael Gado, Universidad Nacional Autónoma de México, Mexico

RESPONSIBILITY
Ramon Felipe Bicudo da Silva, rbicudo@uniceam.br

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ABSTRACT

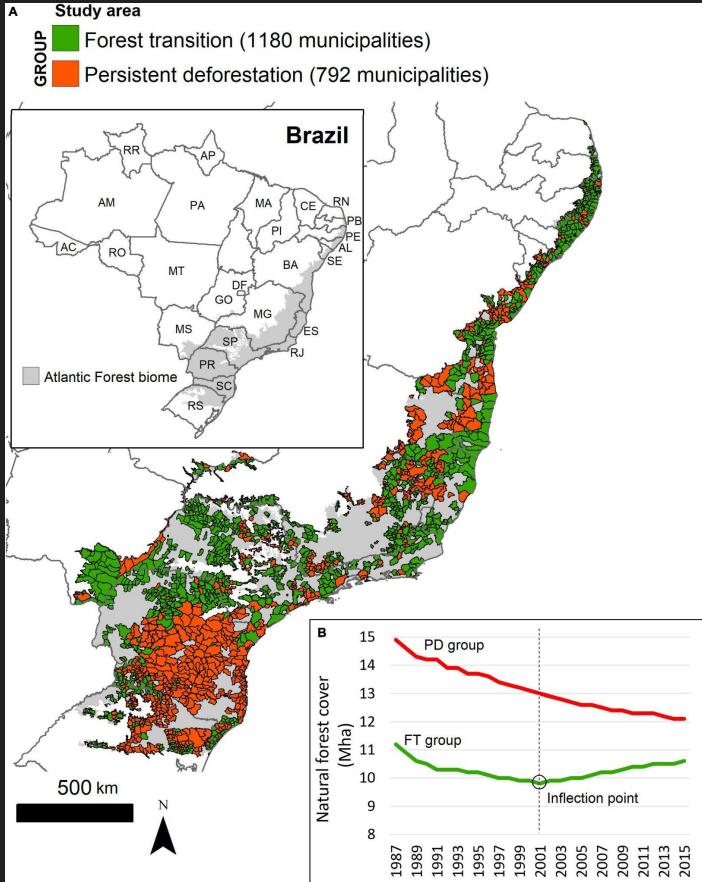
The international trade of forestry and agricultural commodities links distant regions across the globe to become connected through flows of products, information and capital. To deal with the sustainability and socioecological challenges of these interconnections, the “telecoupling” conceptual framework has emerged. The telecoupling framework takes a “central human–natural systems” approach to understand connections between different systems, classifying them as “welling,” “reciprocal” and “spillover” systems. This paper uses the telecoupling framework to investigate how distant systems are connected through flows of ecocertified forest products, and demonstrates how these connections drive environmental compliance at the property level. We identify rural properties with eucalyptus plantations in Parába 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

**TYPE Original Research
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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

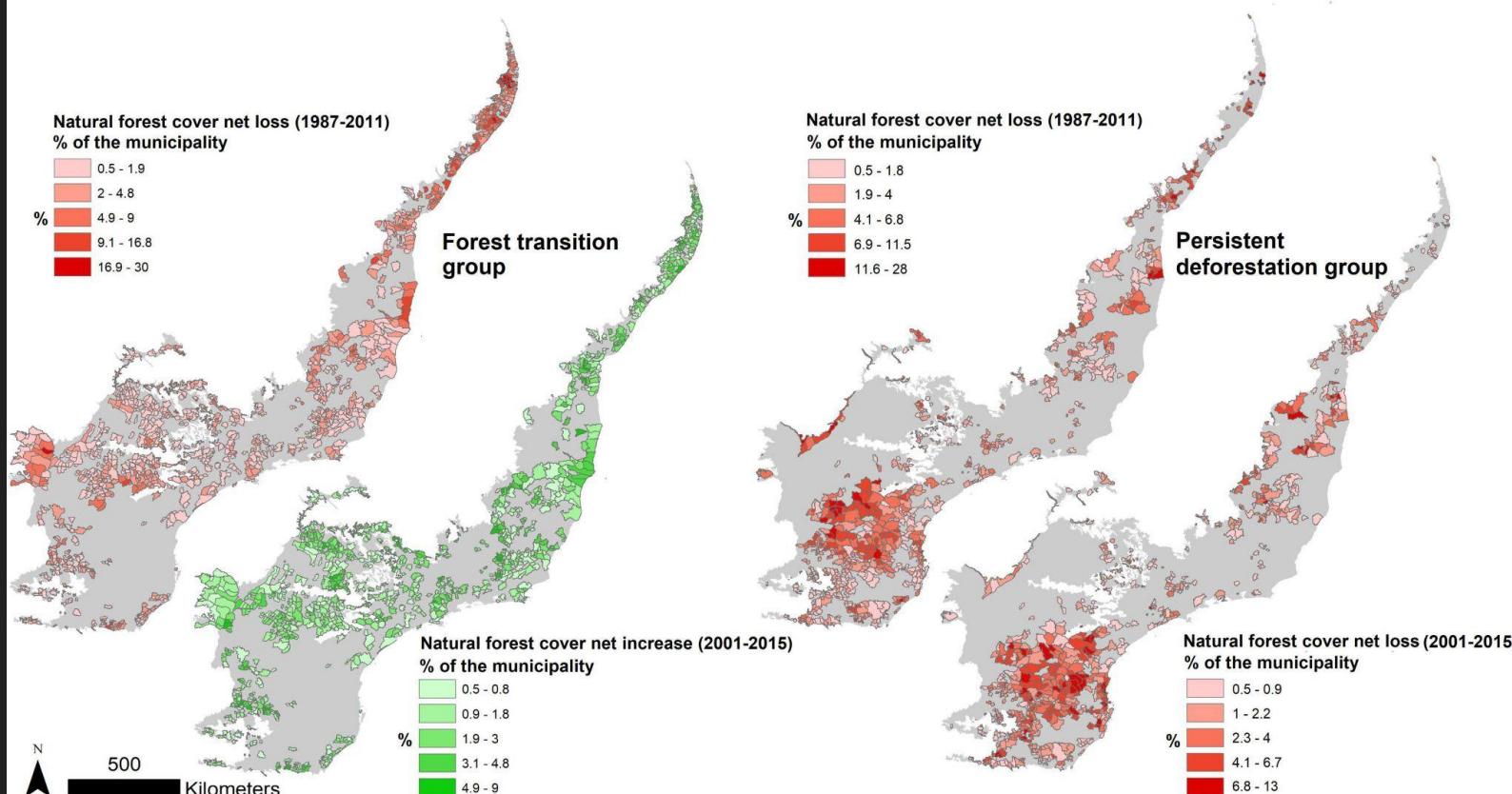


Fig. 5, Silva et al. (2023)

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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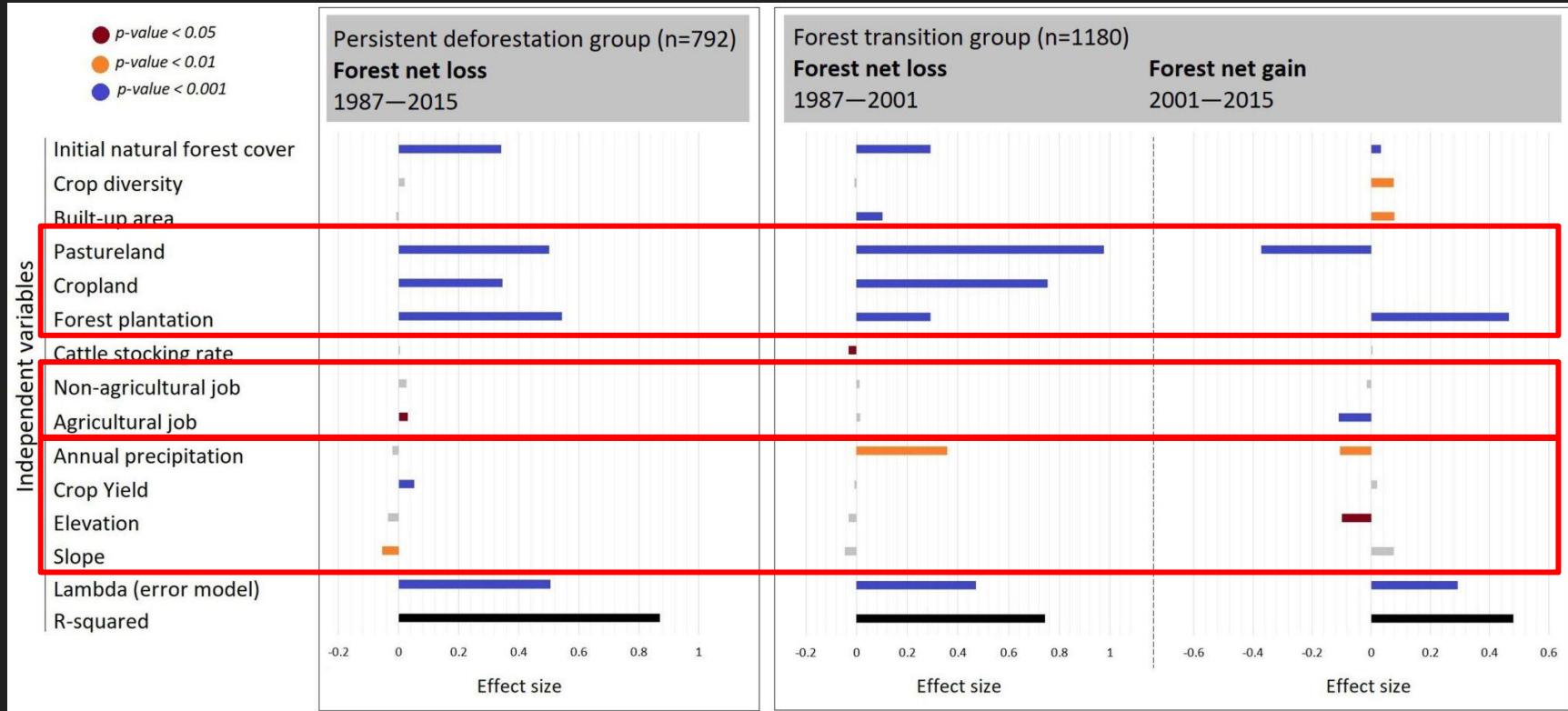


Fig. 3, Silva *et al.* (2023)

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

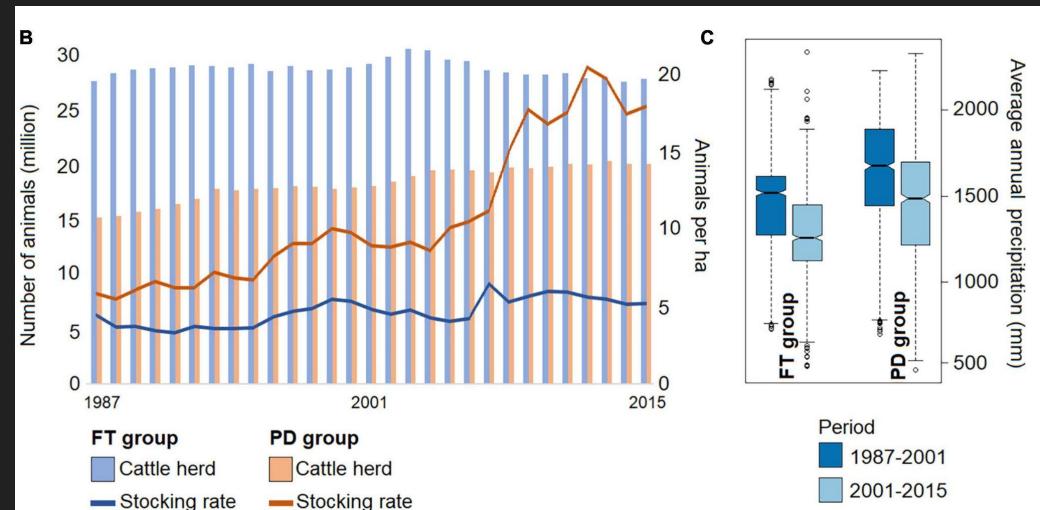


Fig. 4, Silva *et al.* (2023)

Spatial Regression Results

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

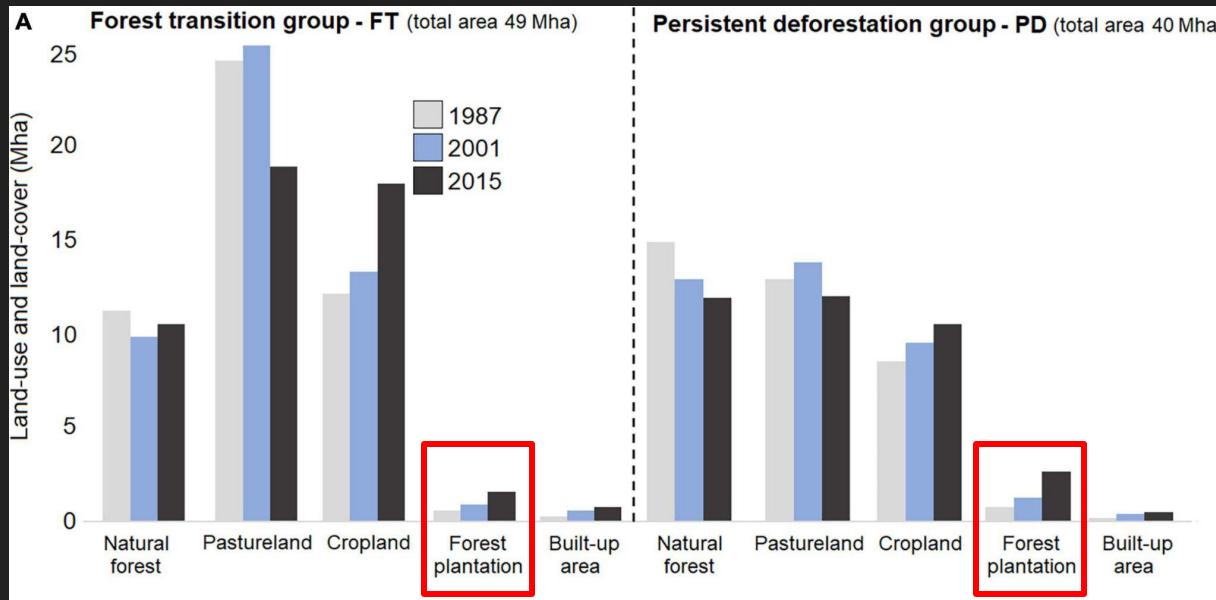


Fig. 4, Silva *et al.* (2023)

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

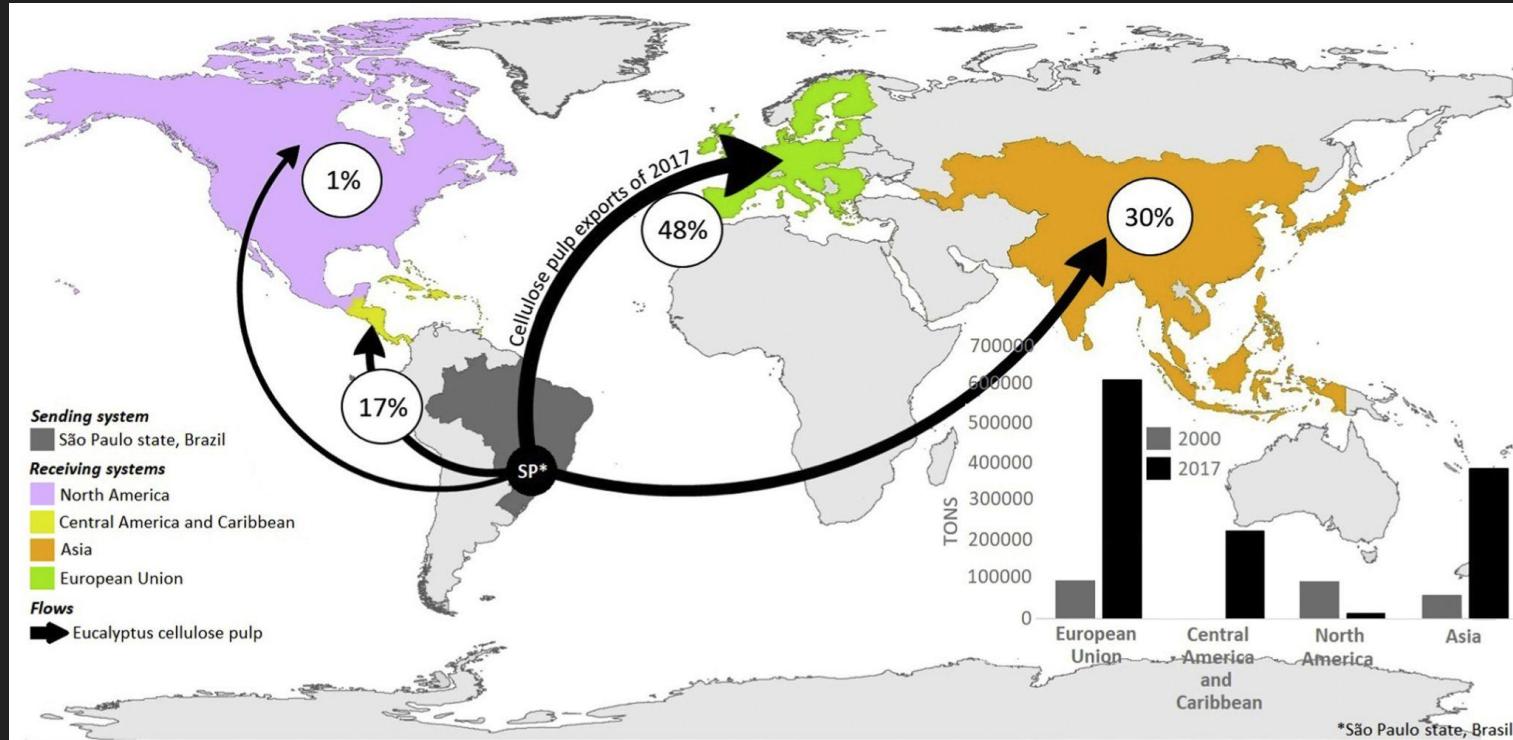


Fig. 3, Silva *et al.* (2019)

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)

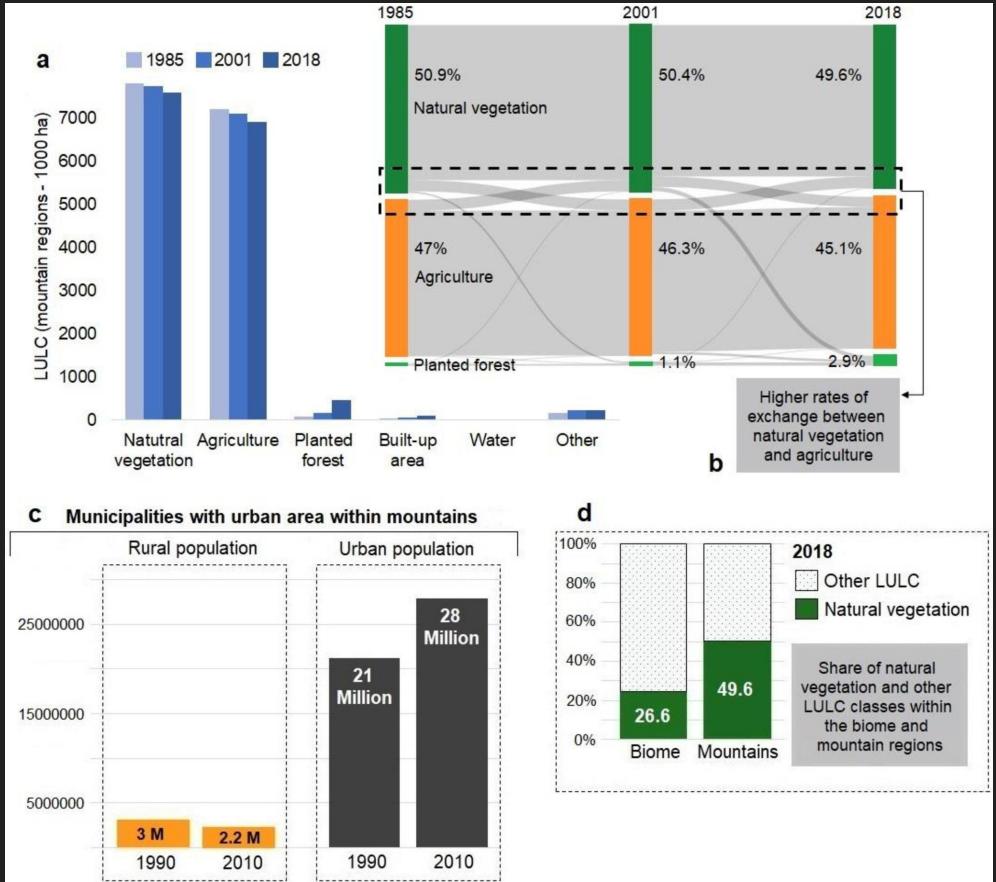
Do eucalyptus plantations encourage conservation of native vegetation?

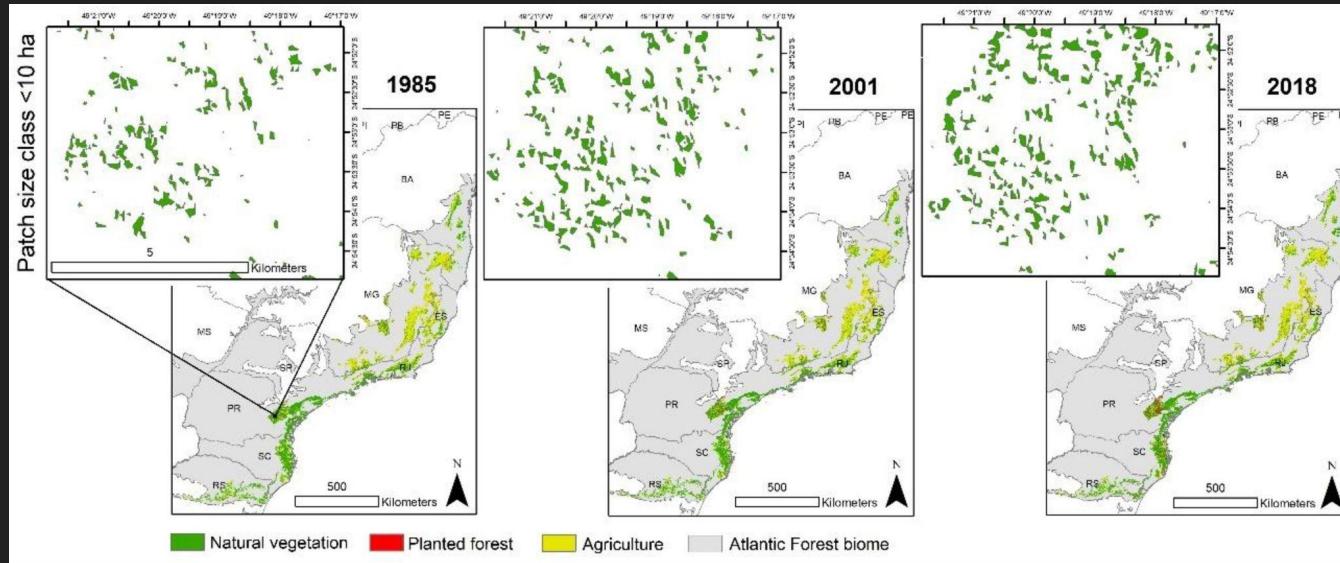
BAF Mountains

Three decades of land-use and land-cover change in mountain regions of the Brazilian Atlantic Forest



BAF Mountains

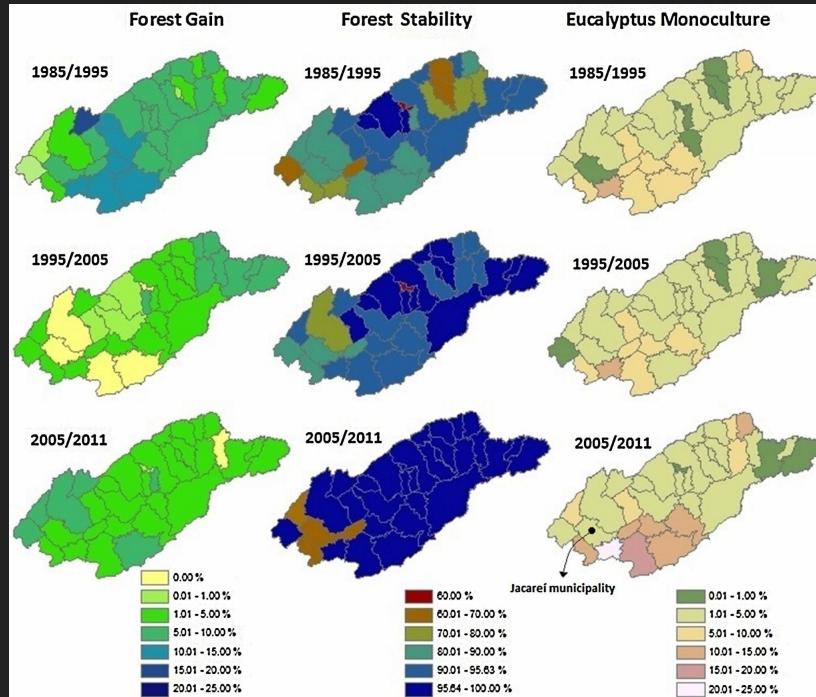
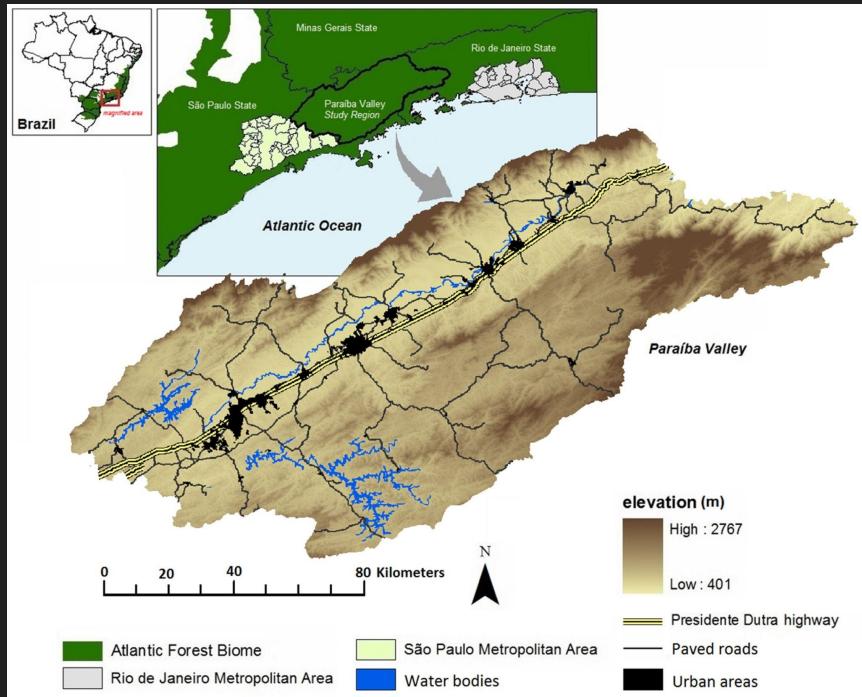




2.7% net loss of natural vegetation cover within the mountain regions in the 34 years
Thirteen times lower than what has been observed in areas outside mountains

Paraíba Valley, São Paulo

These slides with links:
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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

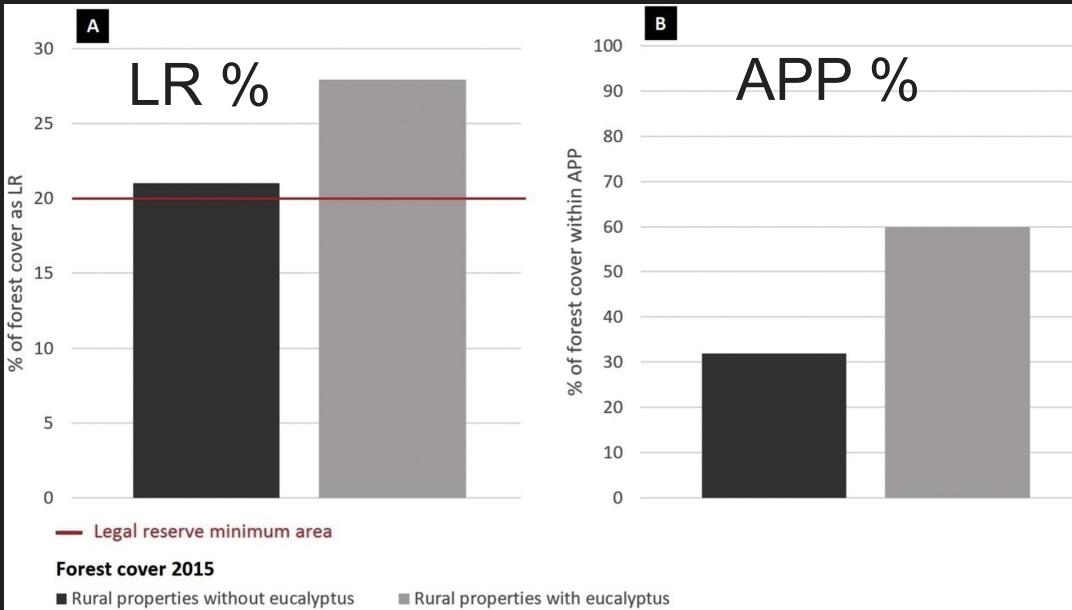
Fig. 2, Silva *et al.* (2019)



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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Silva *et al.* (2020) Three decades of land-use and land-cover change in mountain regions of the Brazilian Atlantic Forest, *Landscape and Urban Planning* 204 10394.

<https://doi.org/10.1016/j.landurbplan.2020.103948>

Silva *et al.* (2023b) Slow-down of deforestation following a Brazilian forest policy was less effective on private lands than in all conservation areas, *Communications Earth & Environment* 4:111 <https://doi.org/10.1038/s43247-023-00783-9>

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