

Understanding agricultural frontiers emergence in Southern and Eastern Africa:

an interdisciplinary approach combining ethnography, remote sensing and decision-making models

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Team

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Project

ERC MIDLAND (2016-2022) <https://erc-midland.earth>

“Developing middle-range theories linking land use displacement, intensification and transitions”

>> See Meyfroidt et al. 2018 GEC <https://doi.org/10.1016/j.gloenvcha.2018.08.006>



Roadmap

1. Frontiers

2. Understanding emerging frontiers in Mozambique, S/E Africa, and beyond

3. Challenges for governance in these emerging frontiers



1. Frontiers



Frontiers ?

Frederick Jackson Turner

*“The significance of
the frontier in
American history”
(1893)*

> > Foundation of
American history,
identity, values,
“Manifest destiny”



"American Progress" (John Gast, 1872)



Frontiers ?

A process of **pushing back “wilderness”**, to create a space for development by **taming the natural world**

(Fold and Hirsch 2009)

Spaces facing a **rapidly expanding force**, places of **opportunities**

(Imamura 2015)

Places of extraction or exploitation of **newly discovered or reinvented** natural resources; spaces of **“territorialization”**

(Rasmussen and Lund 2018)

Places of **interface and friction between different worlds**, e.g. subsistence and capitalist economies, different cultures, socio-political systems, mode of relations to nature

(Parker 2005, Tsing 2005)

(Meyfroidt et al. in preparation)



“Resource frontiers” : our working definition

places with imbalance between **abundant natural resources / land** and **comparative lack of production factors (capital, labor) to exploit these resources**, and **rapid expansion of resource / land use**

> > From this: *“Land use frontier”*; *“Deforestation frontier”* :

Contemporary: Commodity / commercial deforestation frontiers;
large-scale, capitalized actors



Abnormal rents drive frontiers

Resource frontiers are driven by "abnormal rents", created and captured by agents with heterogenous capacities

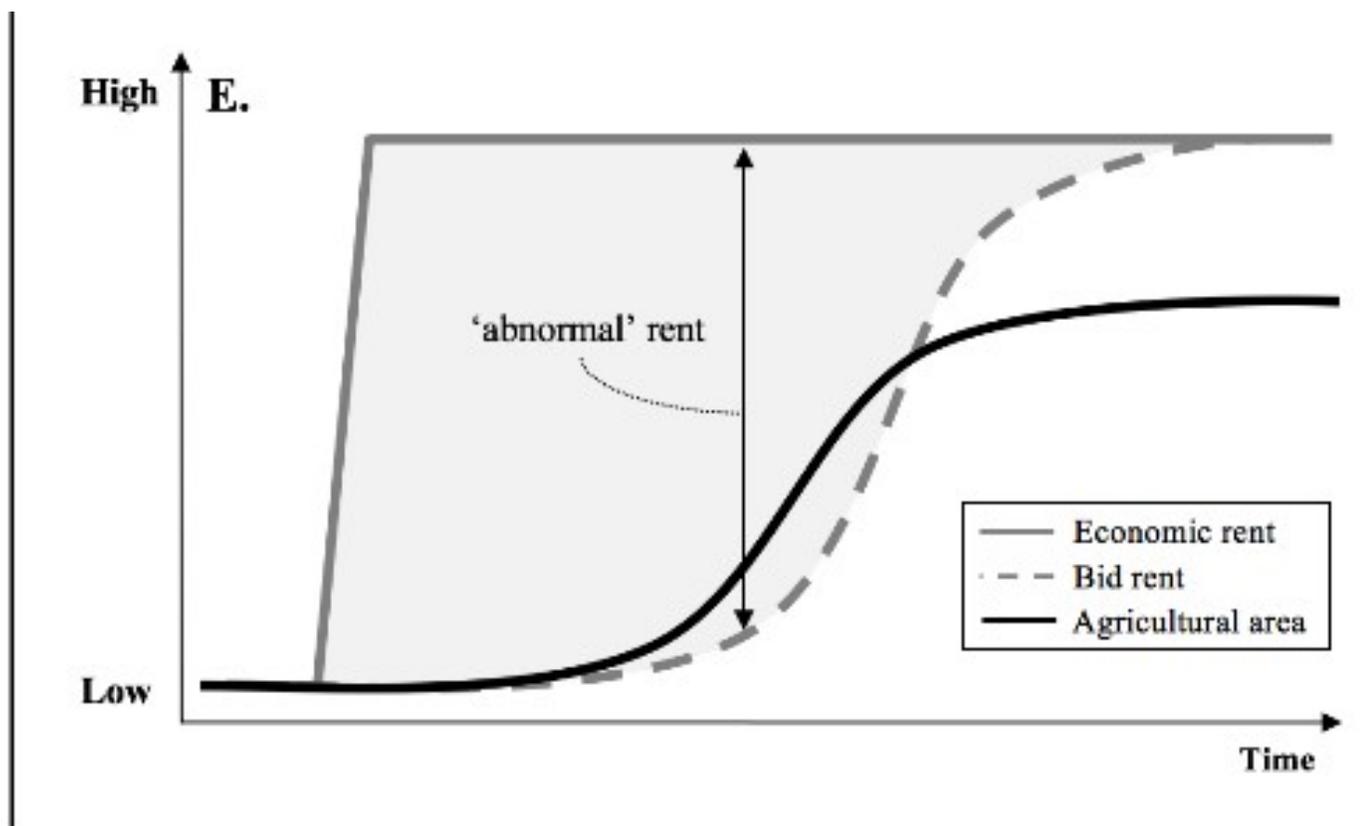


Figure 3

Sources of abnormal rent

- Change in accessibility
- Change in environmental conditions
- Change in technology
- Change in producer prices and/or demand
- Change in subsidies or other policies

X

Characteristics of actors

- Access
- Information
- Preferences
- Agency

=

FRONTIER EXPANSION

- Location
- Spatial patterns
- Temporal dynamics

*Le Polain de Waroux
et al. 2018 (AAAG)*

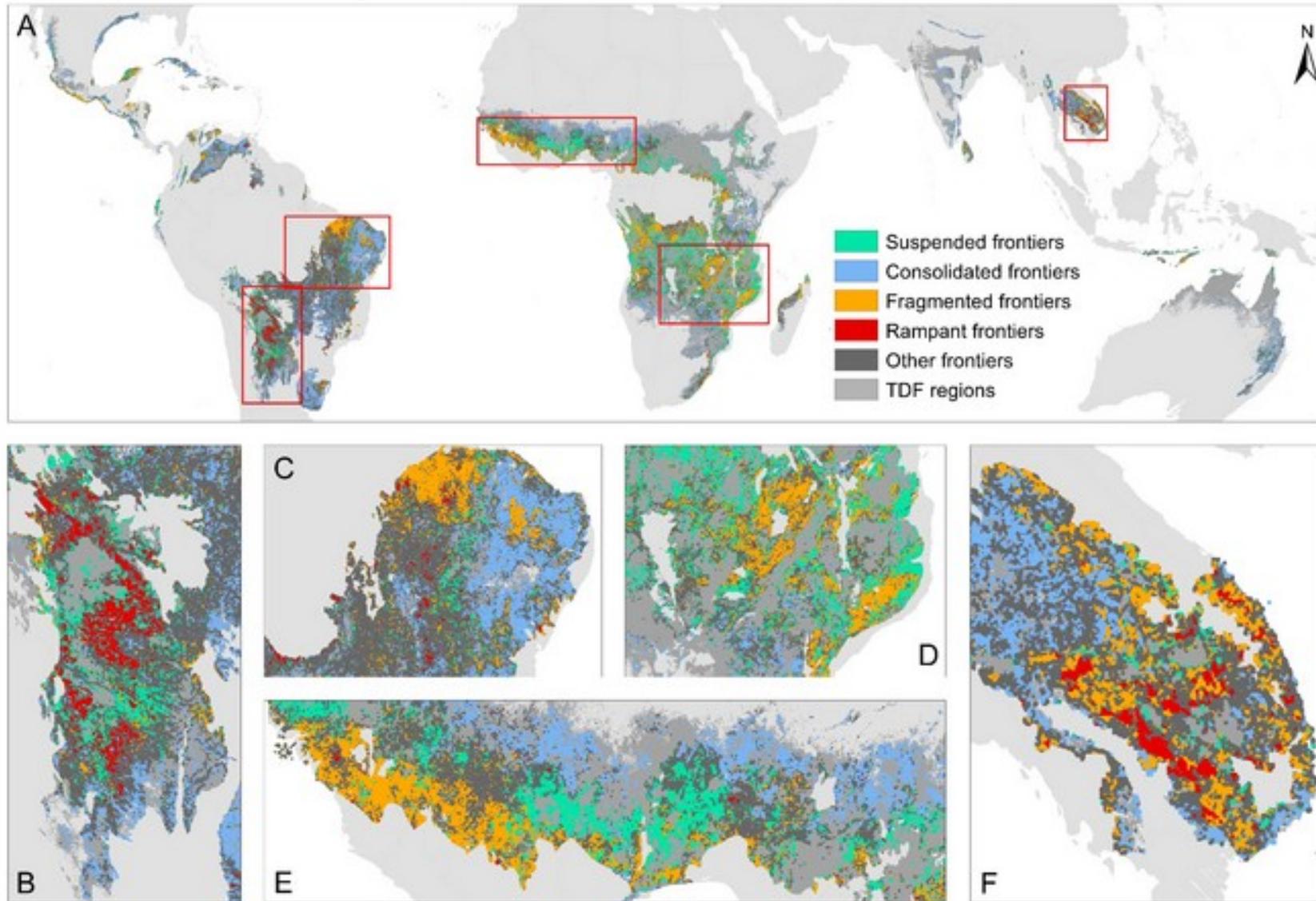


Why study commodity frontiers ?



Why study frontiers in tropical dry forests ?

1/3 of tropical dry forests are in deforestation frontiers

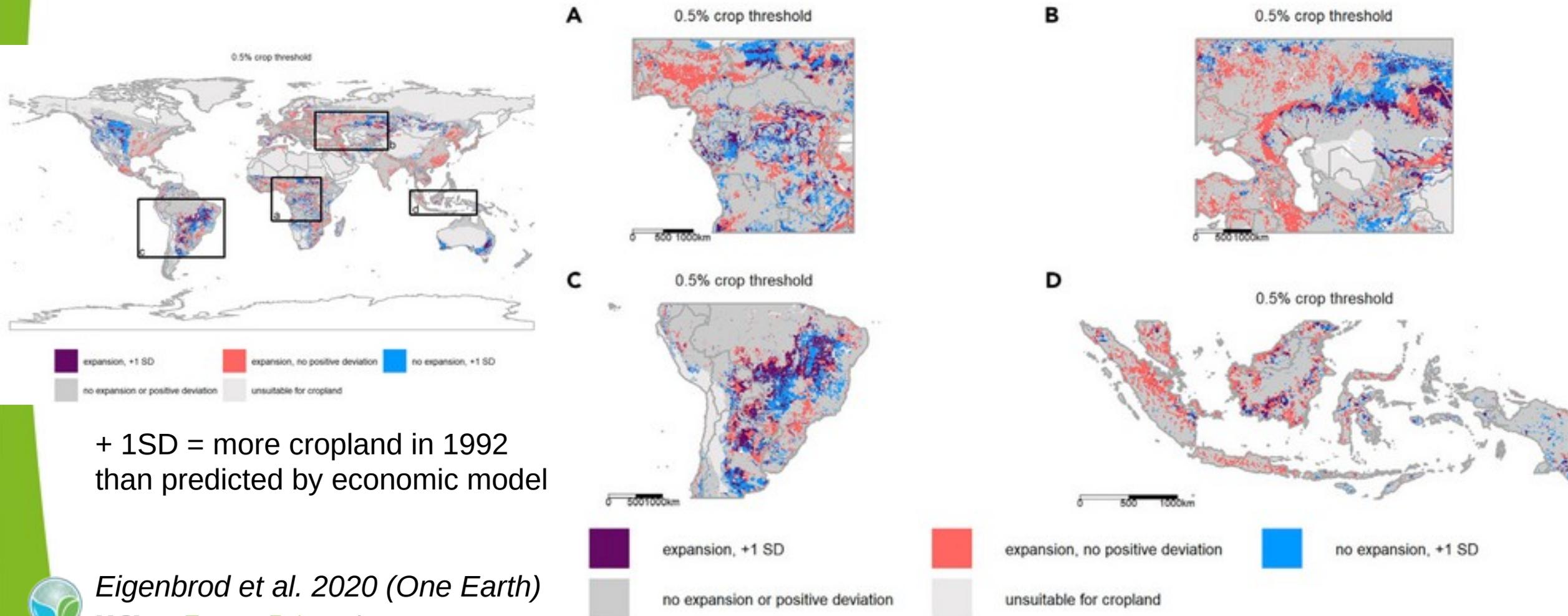


*Buchadas et al.
in preparation*



Why do we need an interdisciplinary approach ?

Standard economic rent theories (von Thünen, Ricardo) explain cropland *extent* better than *expansion*; but past frontier dynamics partly explain recent dynamics



+ 1SD = more cropland in 1992 than predicted by economic model



Why study frontiers emergence ?

> > From reactive to **proactive governance**



*Strong feedbacks,
economic and political
interests make it hard
to steer active frontiers*

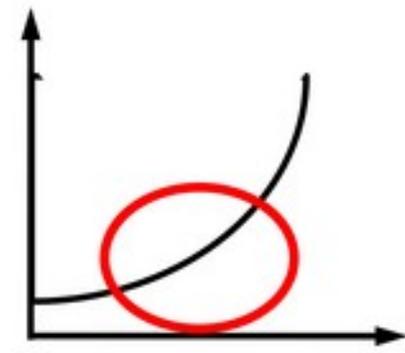
-
*e.g. here in Mato
Grosso, Brazil*

Photo :
Mainpac

2. Understanding emerging frontiers in Mozambique and S/E Africa



Questions



Frontier emergence

- * How do frontiers emerge?
- * Why do investors go where there is no commercial agriculture ?
- * What are the actors that contribute to it, their logics and decision-making process?
- * How does this shape land use patterns and dynamics ?
- * What is the role of policies in steering and shaping frontiers?

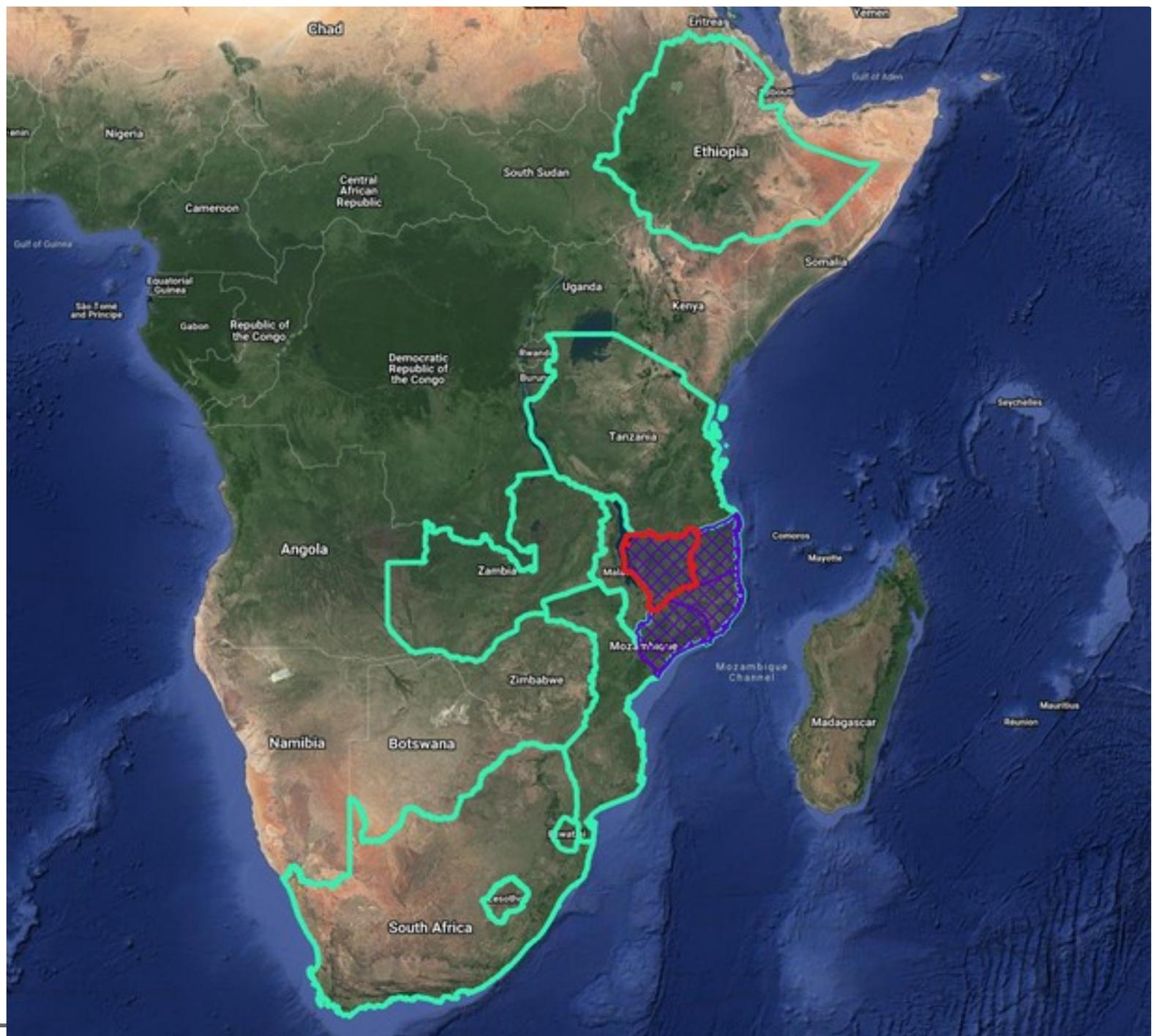


Southern and Eastern Africa

- * “Abundant land”
- * Connections with external actors
- * Tradeoffs

(Gasparri et al. 2016,
Searchinger et al. 2015)

- * Multi-scale



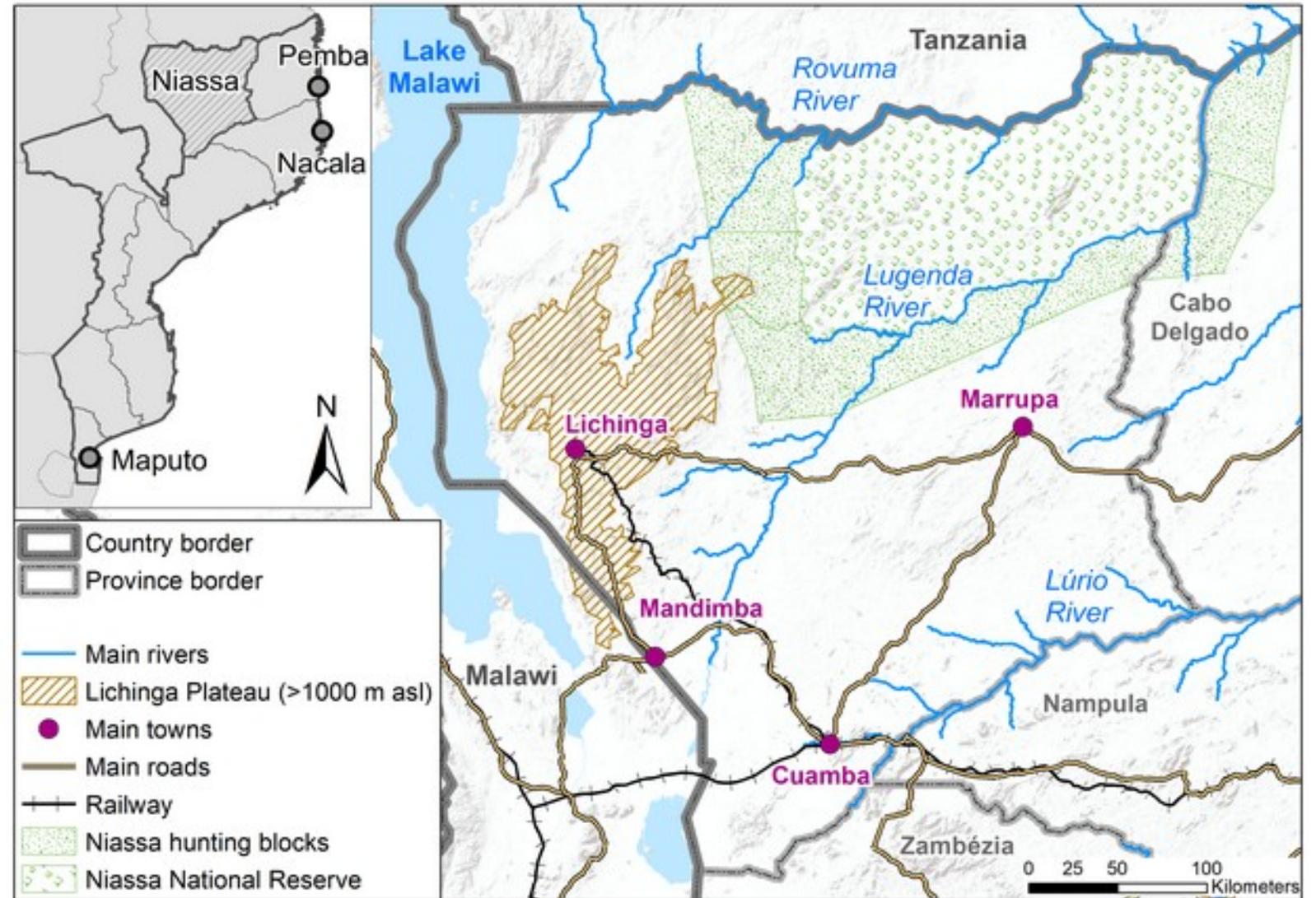
Leakage and distant connections



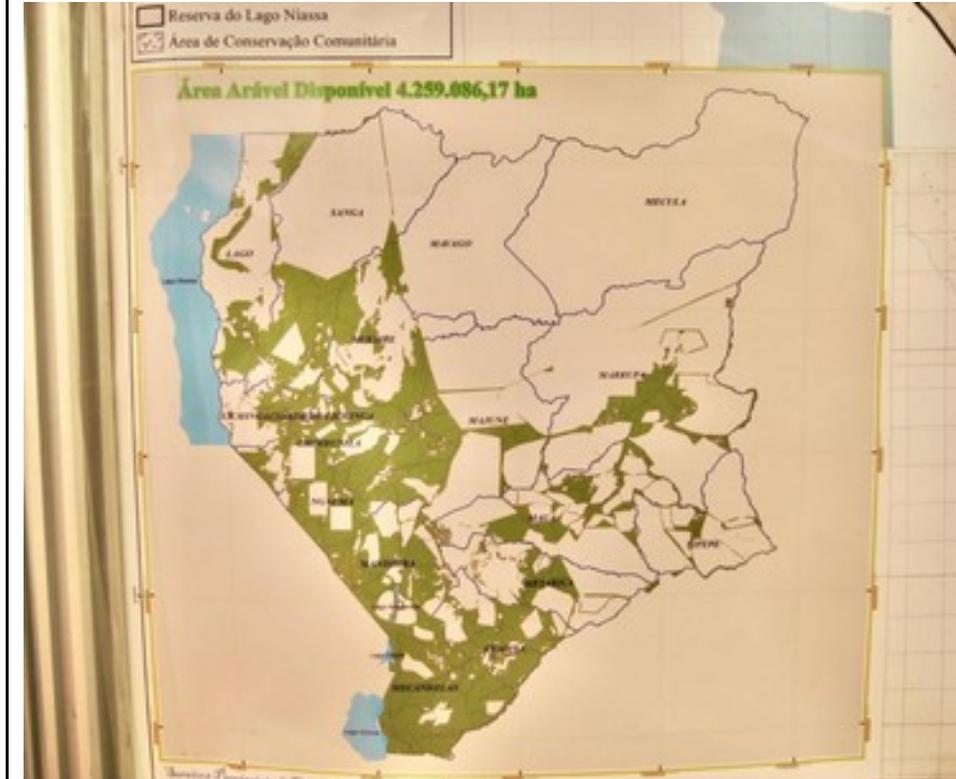
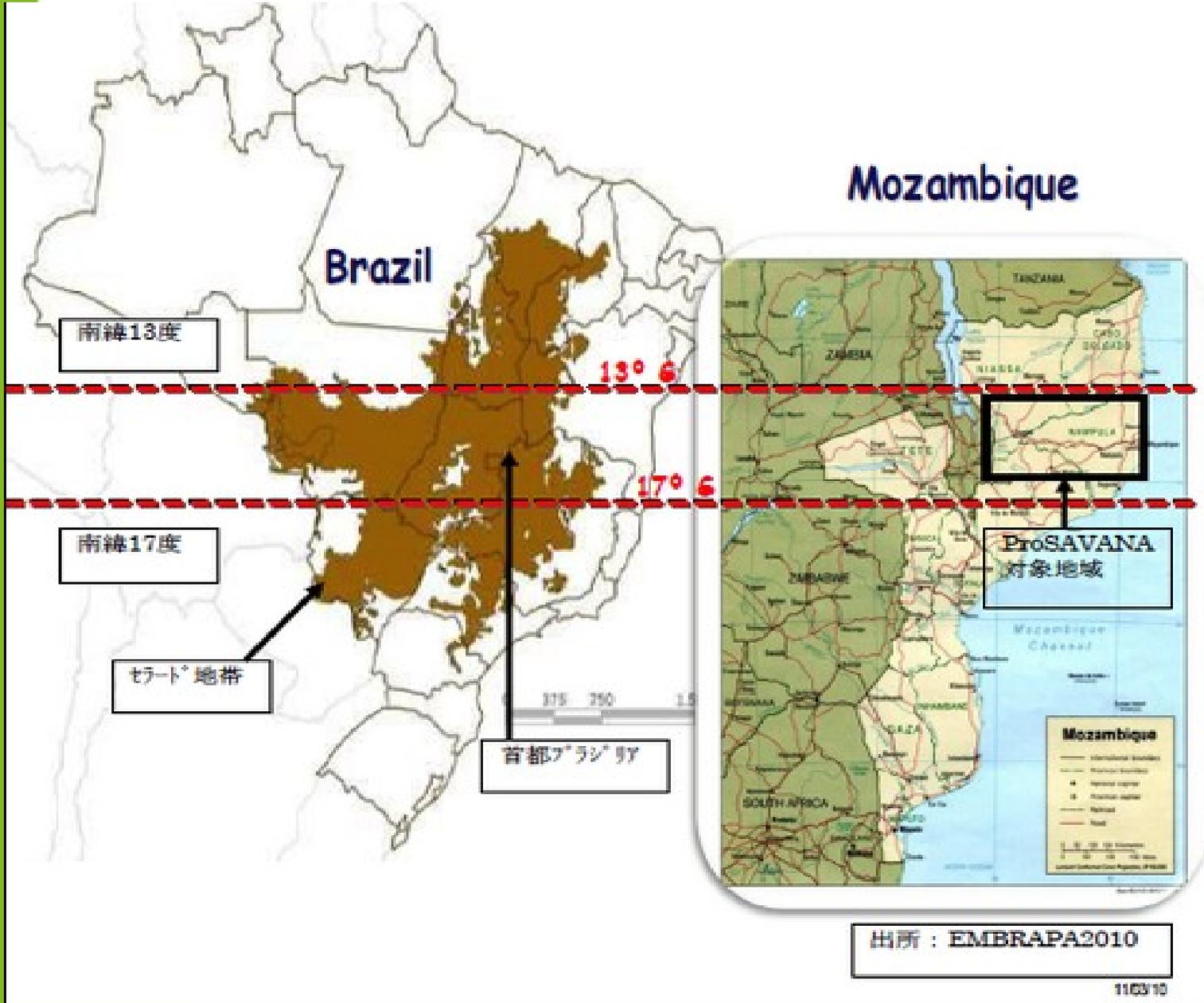
Miombo woodlands



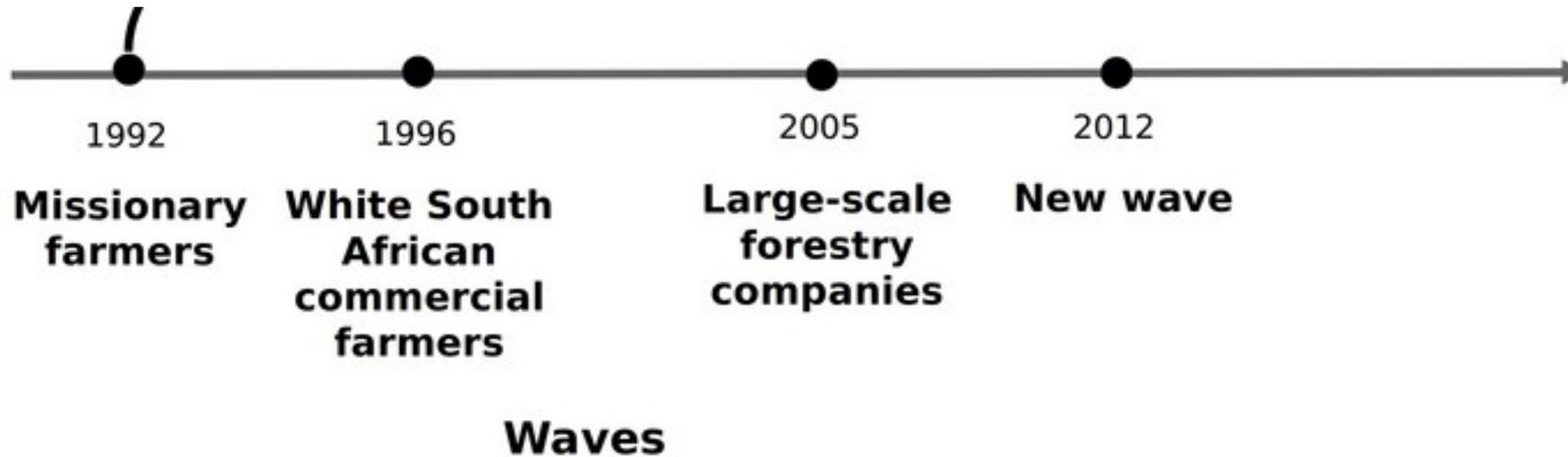
Ethnographic approach in Niassa : The pioneers ?



Narratives : “abundant land”, “the forgotten province”



Waves of investors



Missionary farmers: *"Life is hard on a family here"*

White South African commercial farmers: *"They left us like a rotten potato"*

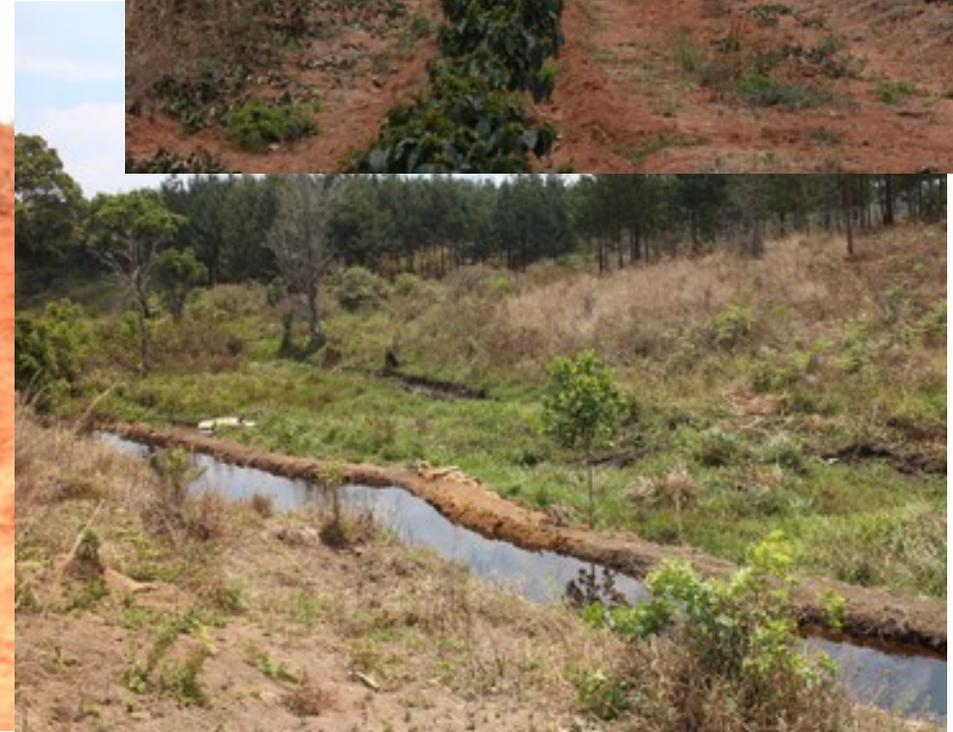
Large-scale forestry companies: *"You want to plant? We have the land!"*



New wave of investors

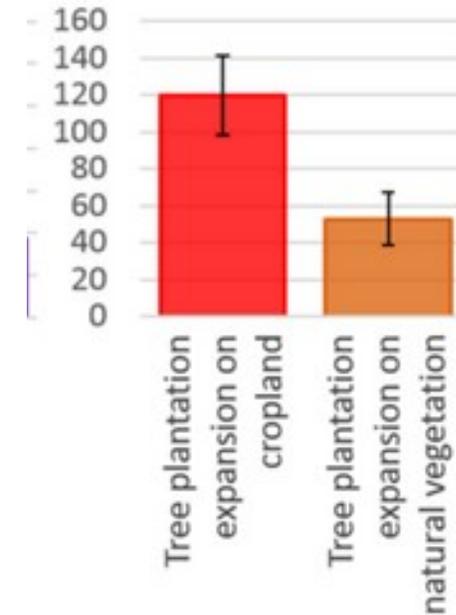
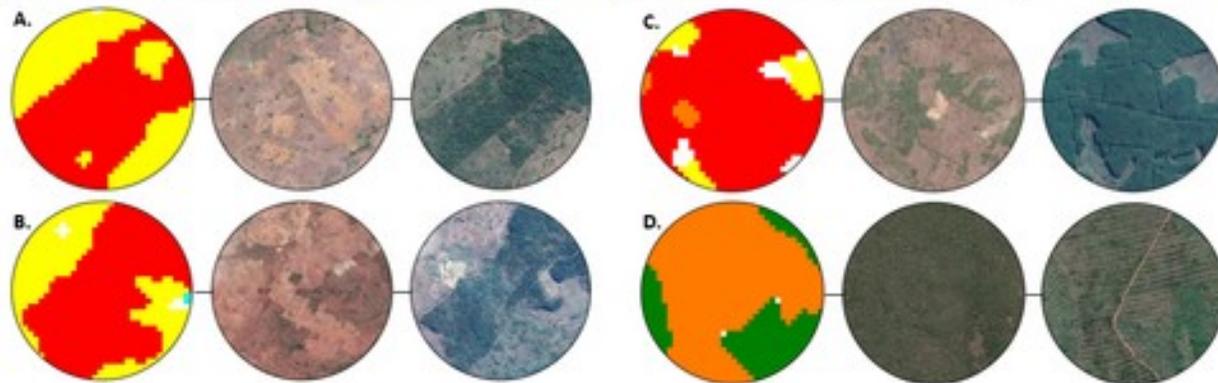
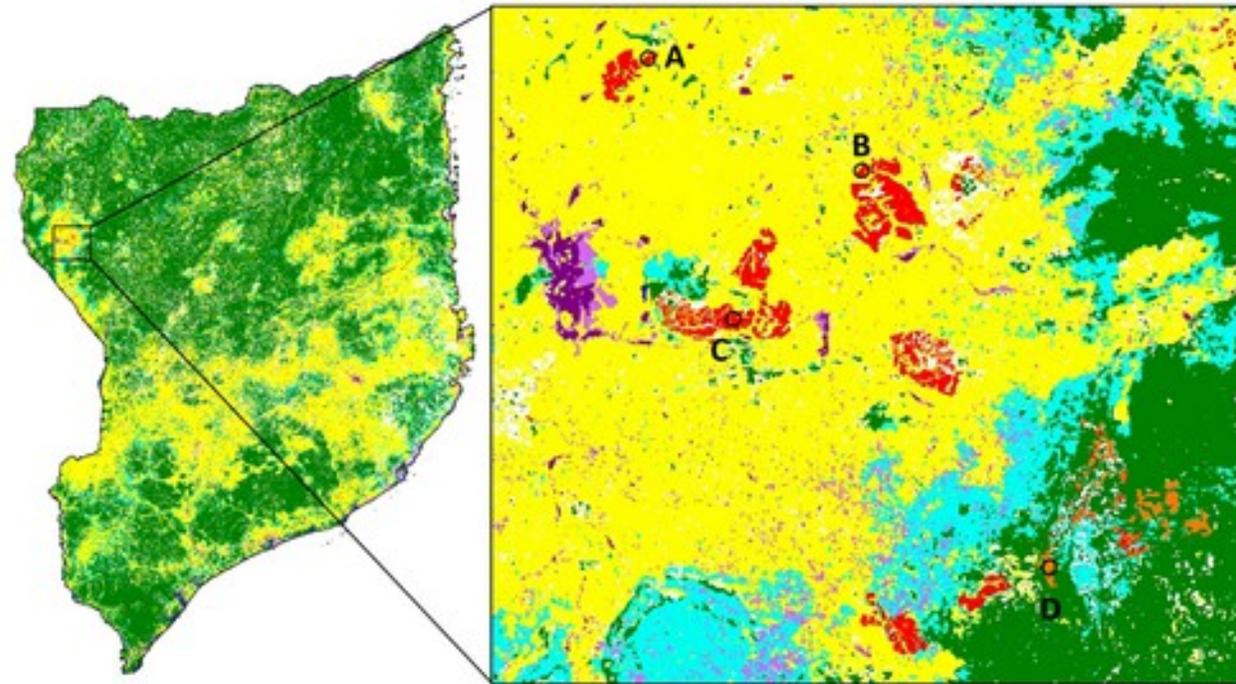


2012
New wave



Mapping and spatial analyses of tree plantation expansion in Northern Mozambique

0.5 % of landscape
 2001-2017 : ~175 km² expansion
 70 % expansion on cropland

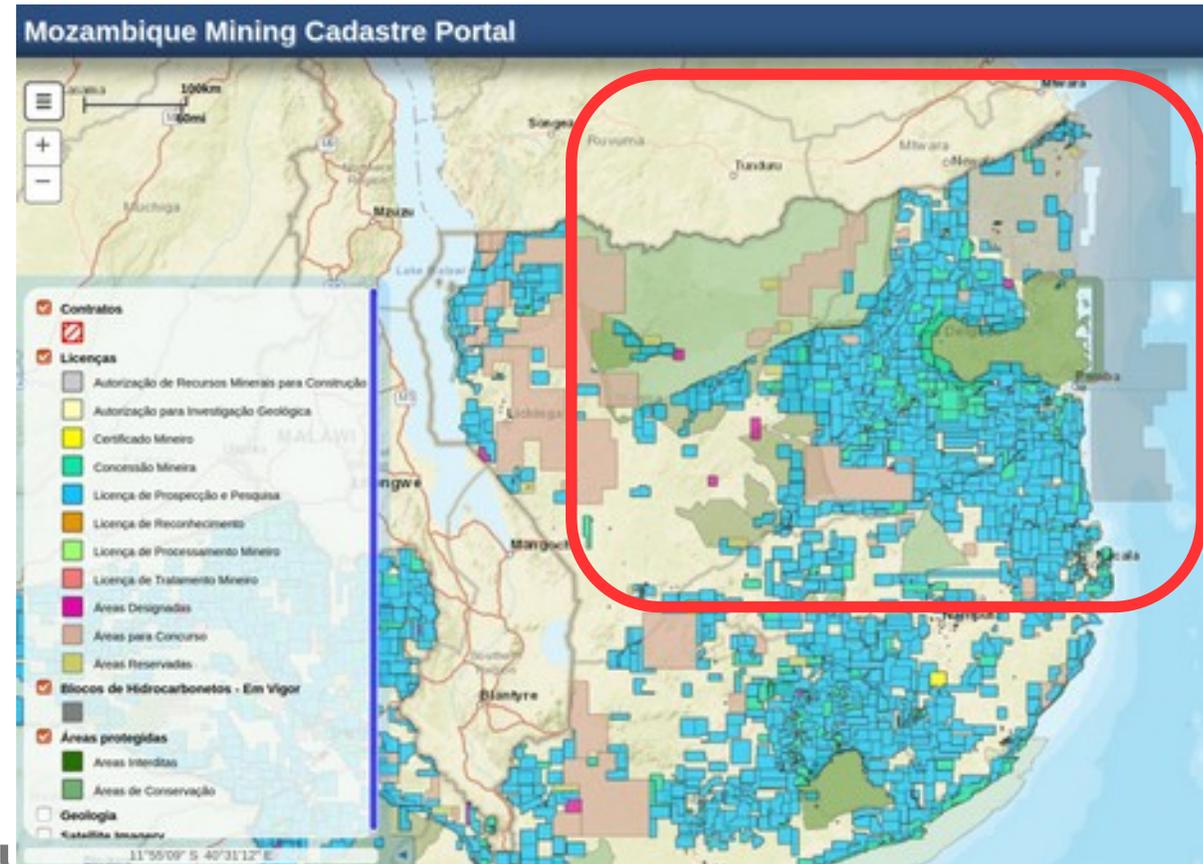


Bey et al. under review

“Economies of anticipation”

How futural orientations (speculation, dreams, visions, hope, etc.) influence land-use decisions and practices (acting on these expectations, hopes, dreams, fears, etc.)?

Cabo Delgado: Oil and natural gas (2010), graphite (electric vehicles), gold, ruby,...

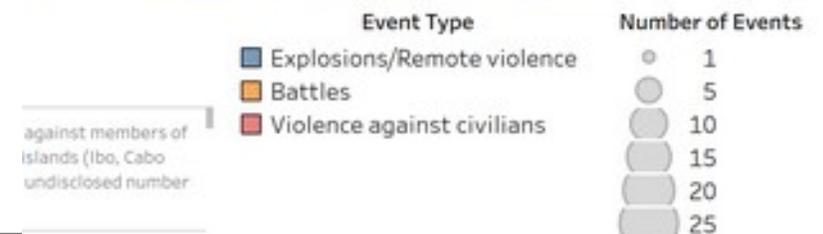


<https://portals.landfolio.com/mozambique/en/>

*Kronenburg-García et al.
In preparation*

“Economies of anticipation”

- * Fear and uncertainty about the future, but also hopes for better life and jobs
 - > Resettlement & land use displacement
- * Expectation of an expat community
 - > Investing in high-value agricultural products (meat, fruits, coffee)
- * Ambivalence, strategies, but also lots of uncertainties (insurgency 2017; 2020>)



Kronenburg-García et al.
In preparation



Taking a larger perspective

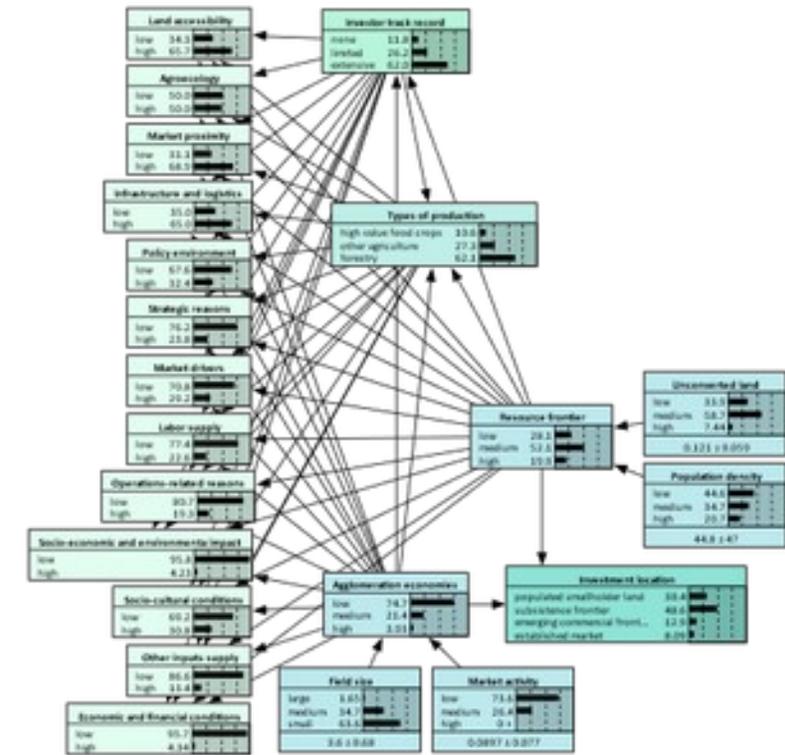
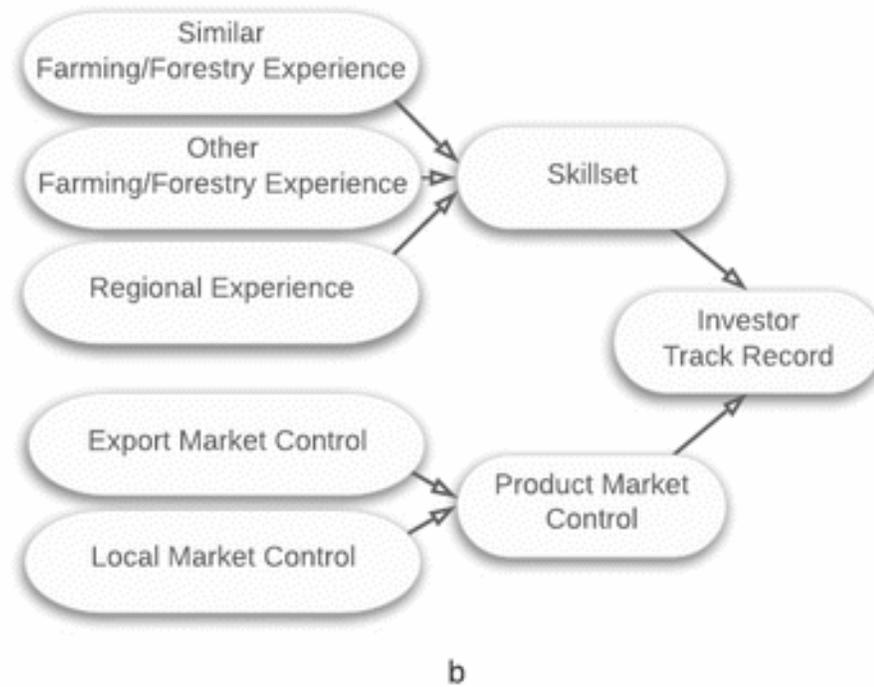
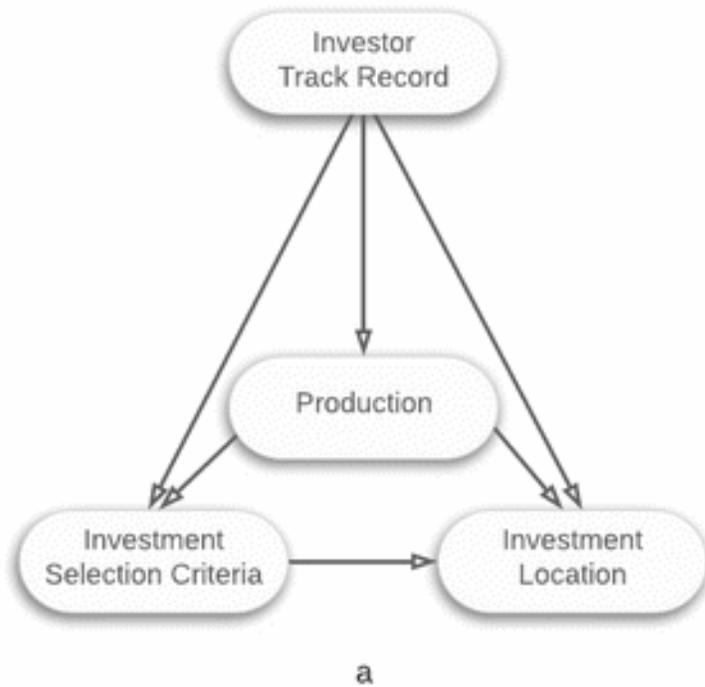
- * Transnational forestry and agriculture companies and investors;
- * Mixed methods, semi-structured interviews with qualitative and quantitative data
- * The chain of managers - local farm managers, country managers, regional managers, CIOs, and CEOs
- * 94 interviews over 37 investments operated by 29 investors across 121 farm and plantation locations, covering 11% of the total transnational agricultural and forestry investments made between 2000 and 2016 in Mozambique, Zambia, Tanzania, and Ethiopia
- * Bayesian Network model



Taking a larger perspective

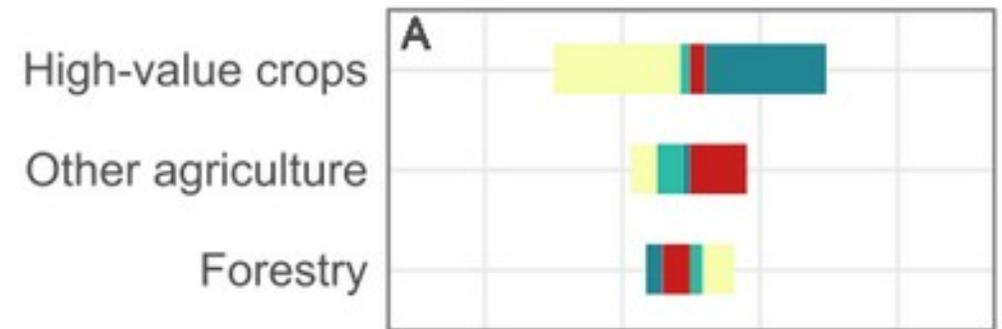
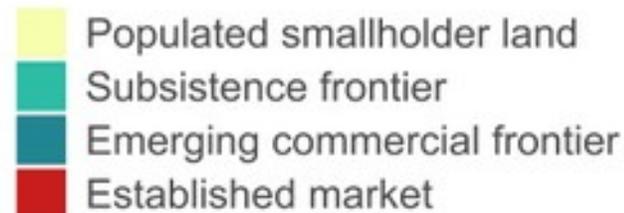
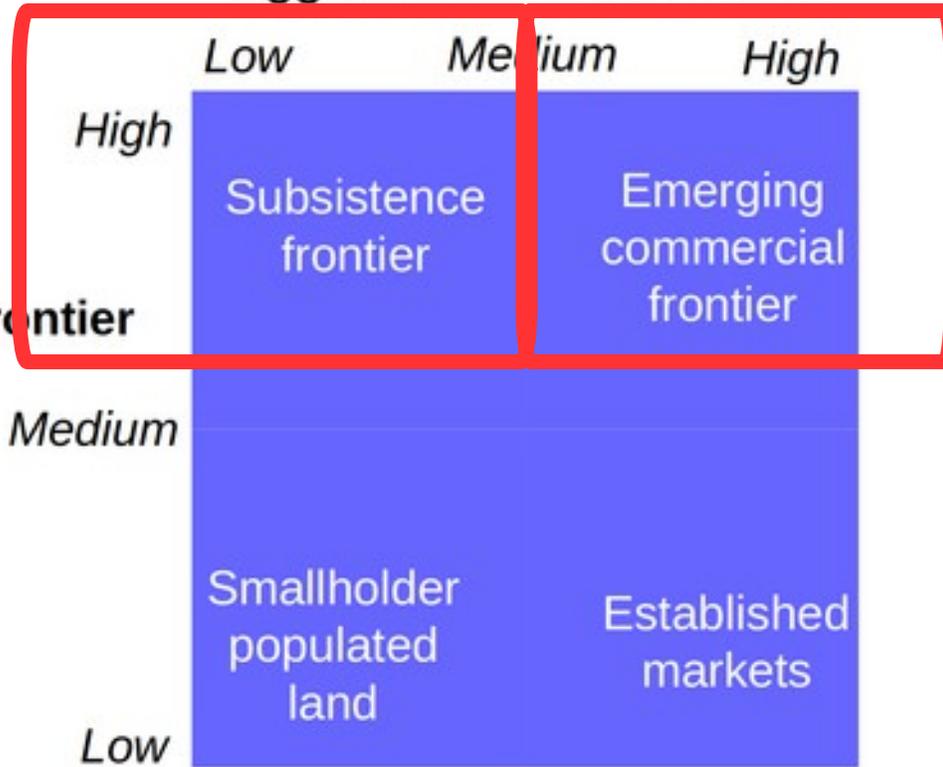


A Bayesian model of investment decisions



Logics of investment decisions in frontiers

Agglomeration economies

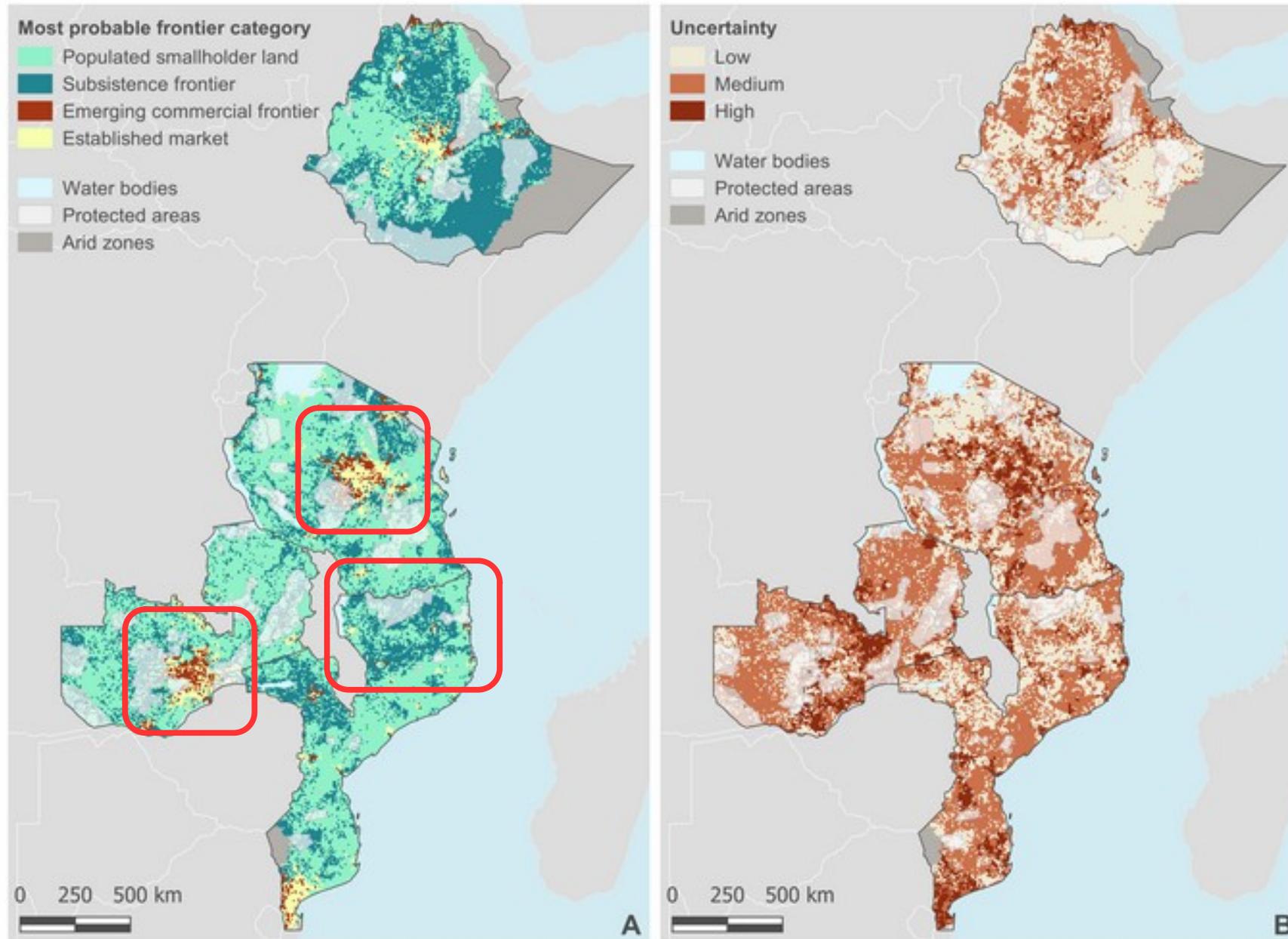


-20 -10 0 10 20

Shift %



Logics of investment decisions in frontiers



*Abeygunawardane
et al. under review*

Stylized model of frontiers as regime shifts



Semi-subsistence land uses (or “pre-frontier”)

$L (= 1-S)$



Commodity / commercial land uses

S (commercial crop area ; agglomeration economies)



Stylized model of frontiers as regime shifts

$$Y = (L * 1) + S * \pi(S) - \left(\frac{1}{2\gamma}\right) * (S \cdot)^2$$

*Profit from
semi-
subsistence
basket of
crops*

*Profit from
commercial crop, w.
agglomeration
economies
(profit per unit
depends on S)*

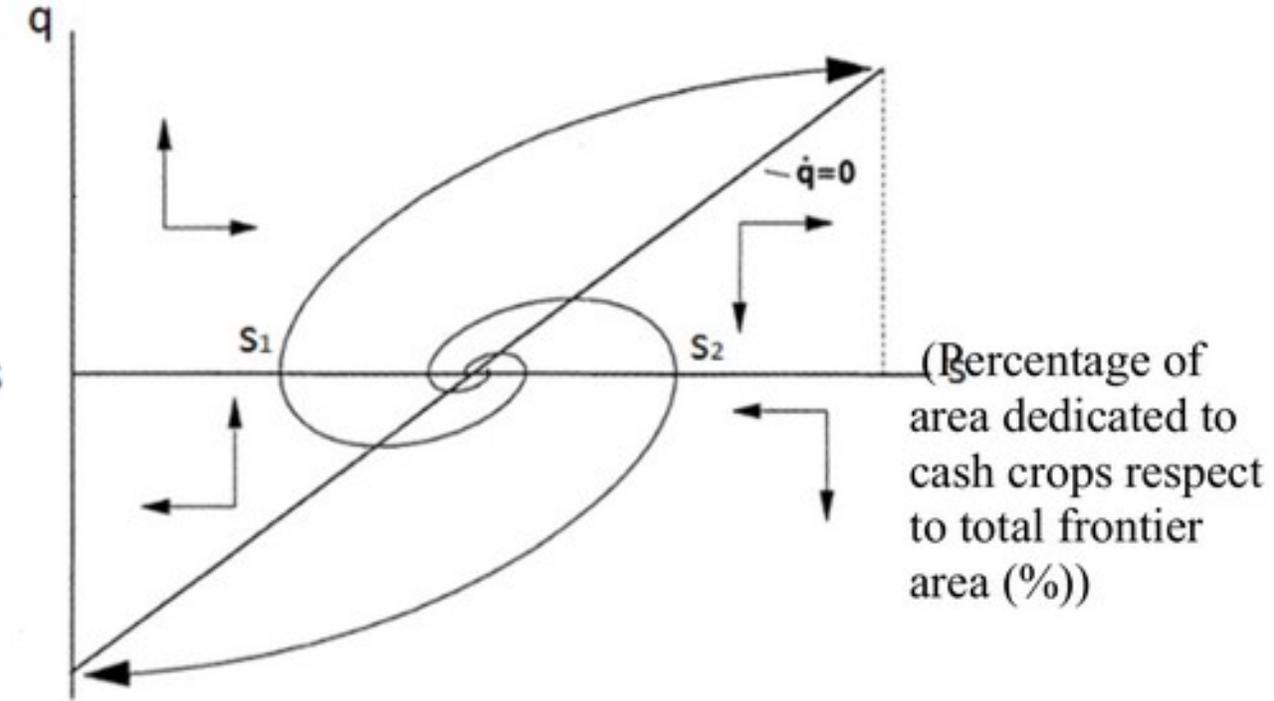
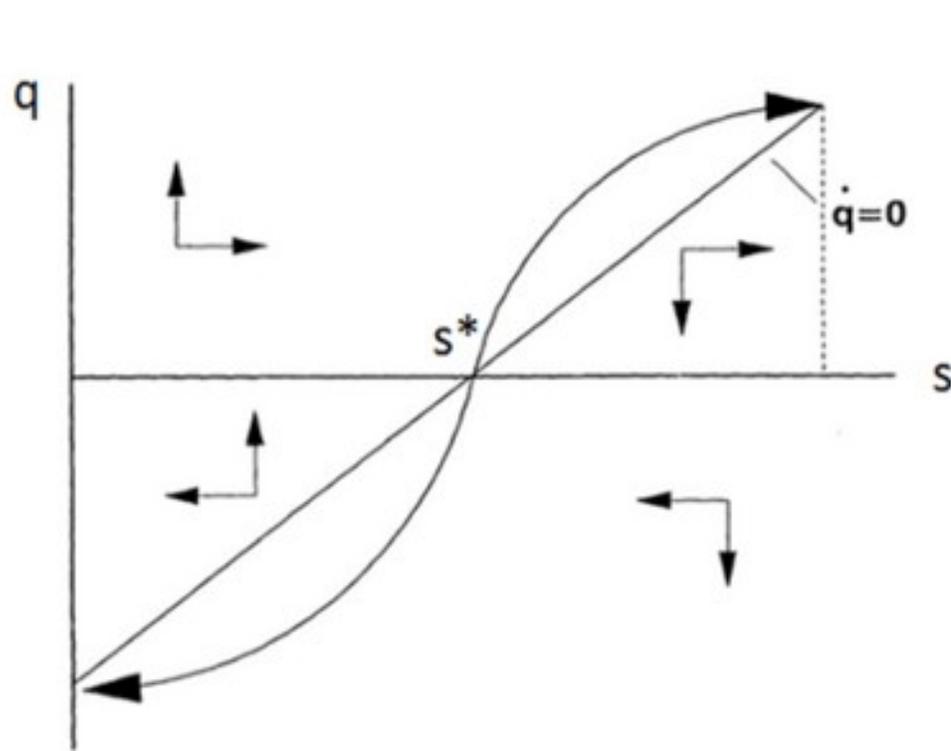
*Adjustment
costs
(investment)*

Based on Krugman 1991



Outcomes as depending on “history” (left) or “expectations” (right)

(Discounted future farmers' profits)

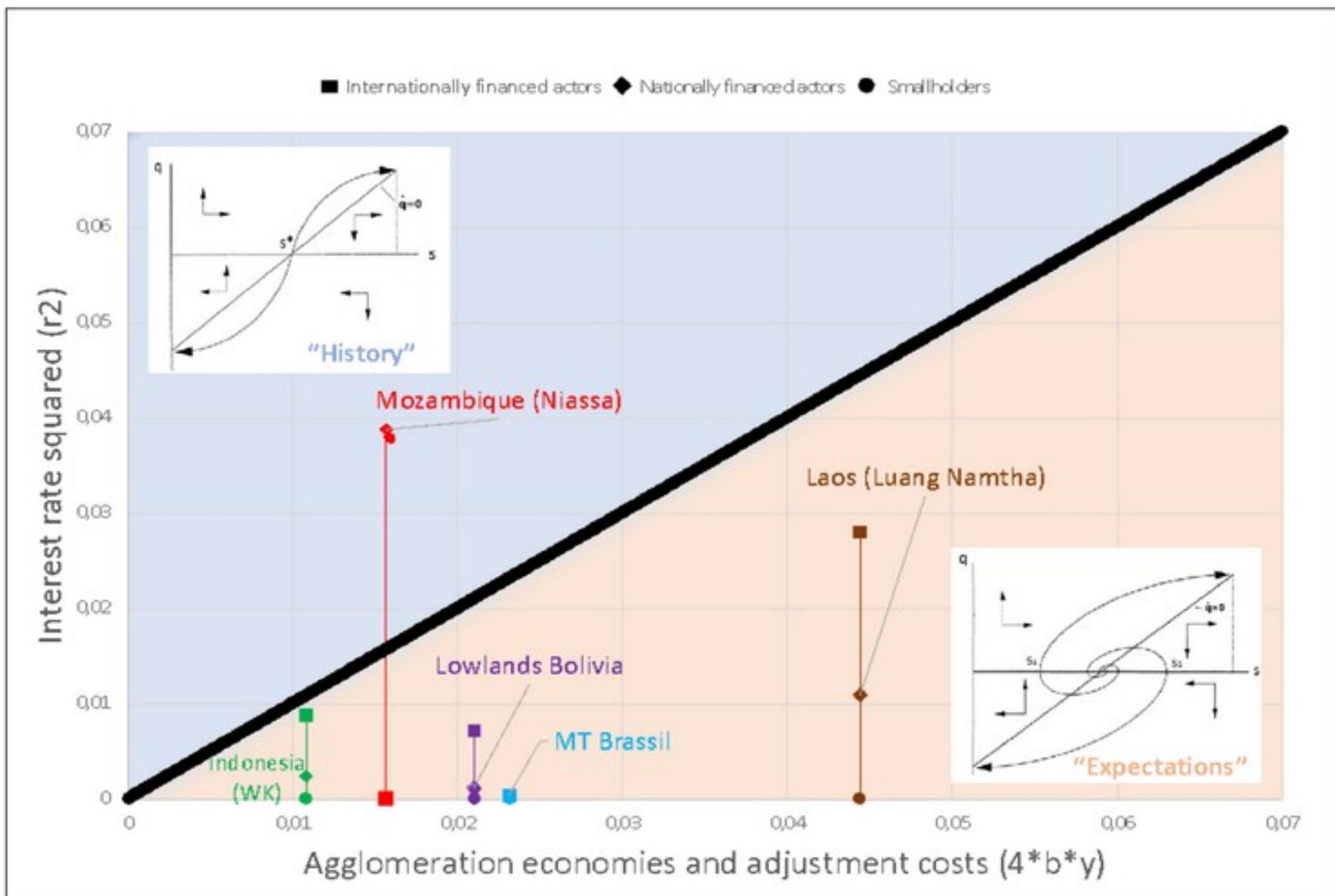


Source: Modified from Krugman, 1991.

Rodriguez García et al. in preparation



Stylized model of frontiers as regime shifts



Rodriguez
García et al. in
preparation

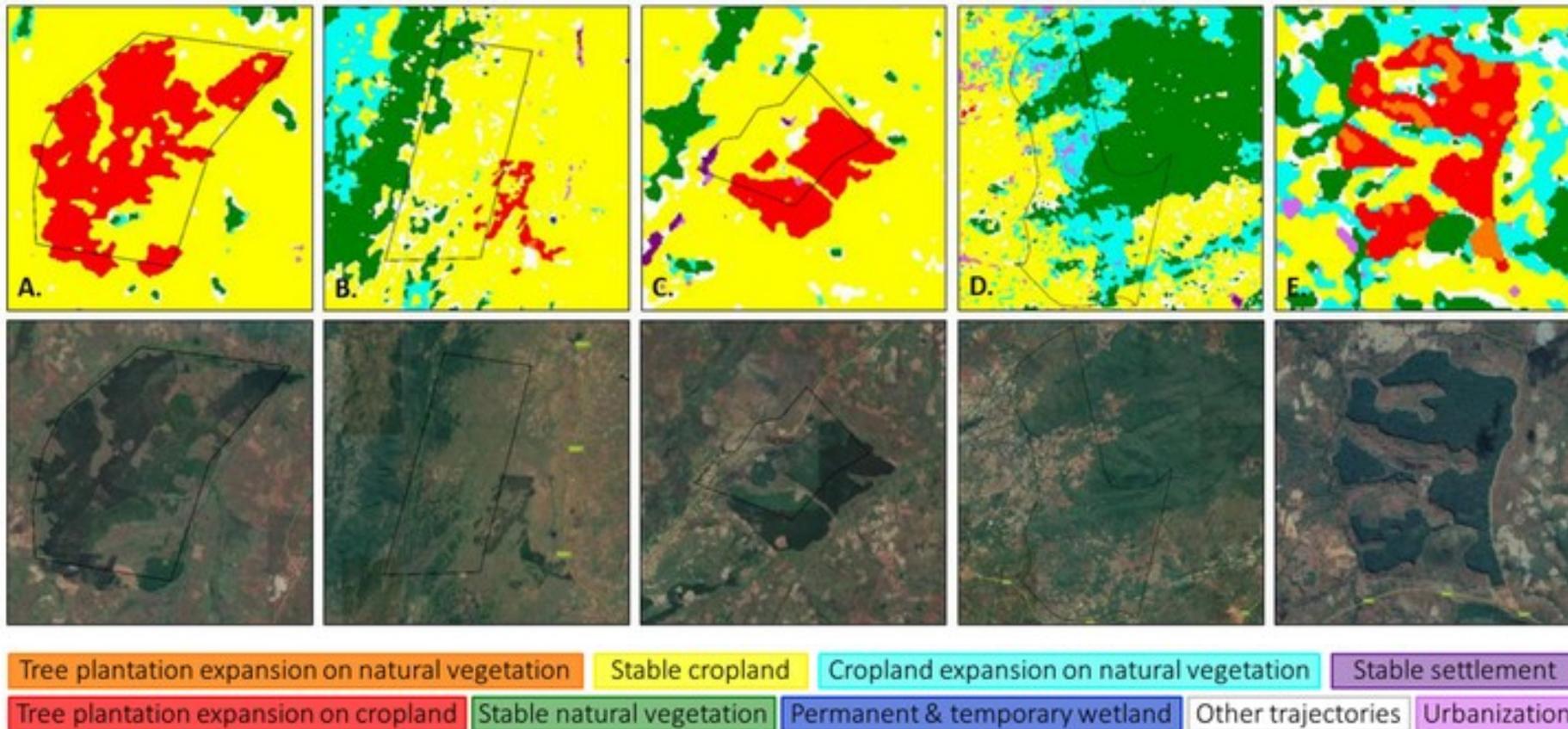


3. Challenges for governance in emerging frontiers in Northern Mozambique



1) Monitoring gaps: Relying on cadastral data is inadequate

Cadastral records can be inaccurate, imprecise, out of date, or simply non-existent
Only **59%** of 137 the 17,500 hectares of tree plantations identified in 2017 fall within land title boundaries.



2) Unclear effectiveness of existing land use policy instruments

* **DUATS** (*Direito do Uso e Aproveitamento da Terra*, land use rights titles ; for distinct purposes (agriculture, forestry plantations)

* **Protected areas**

* **Community lands (as part of the Land Law)**

>> To empower local communities, but could also attract investments (make the communities' lands "legible")

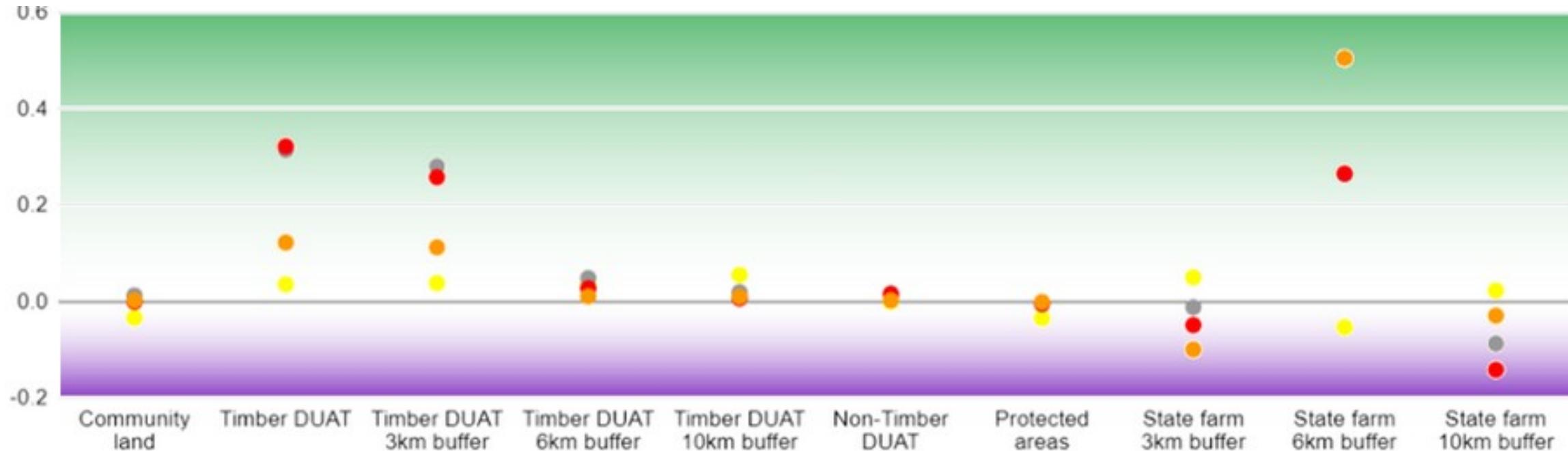
* **Former state farms (brownfields)**

>> Not a policy per se but a key legacy



Matching analysis of land use policies effects on large-scale tree plantations expansion

Change in proportion of expansion



Field crop exp.

Tree plantation exp. (all)

Tree plantation exp. on field crop

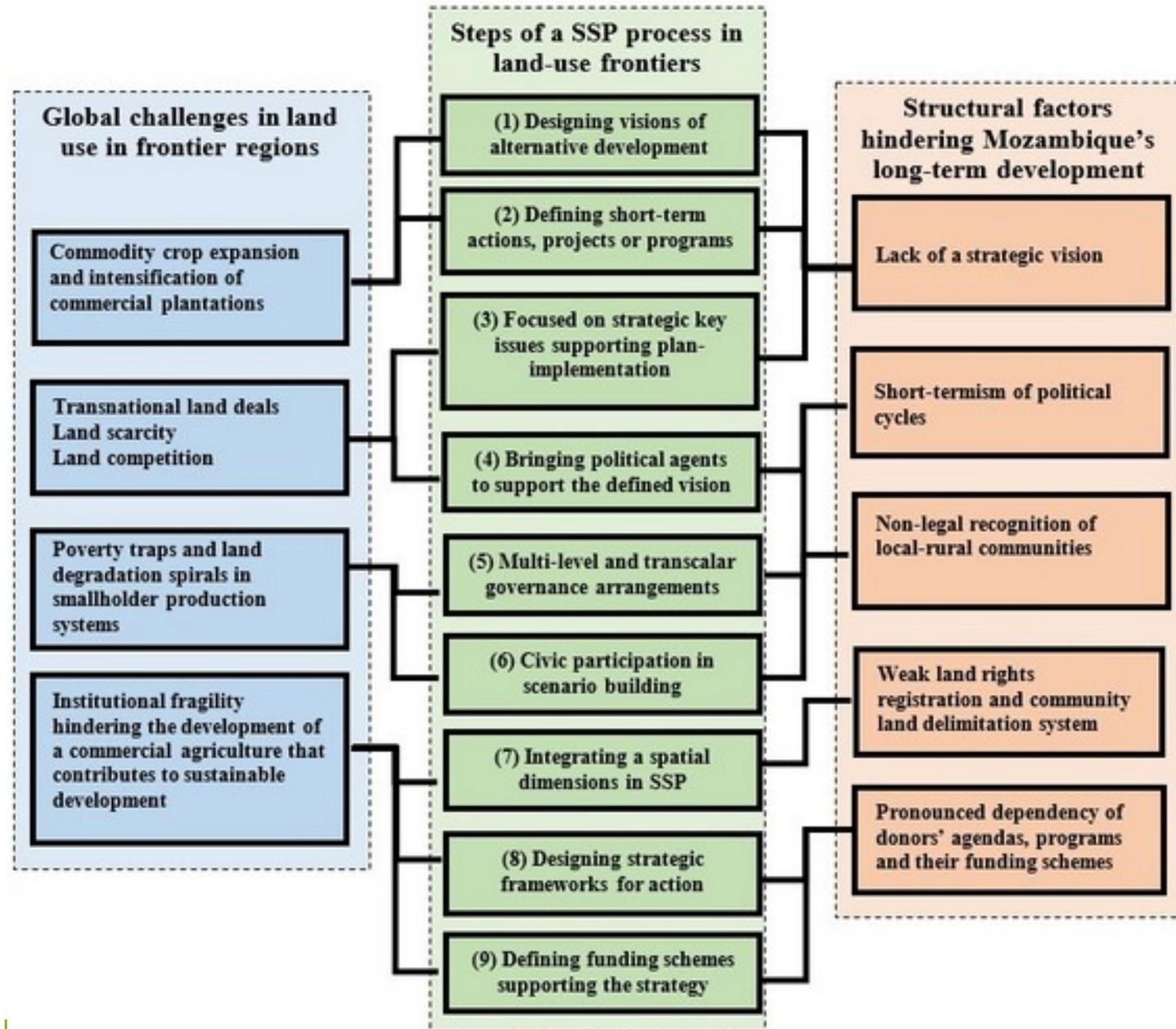
Tree plantation exp. on natural vegetation

- * Unclear / ambiguous effects of community lands
- * Forestry DUATs encourages tree plantations on smallholder fields
- * Proximity of former state farms (not too close, not too far away) attracts forestry investments

Bey et al. in preparation



3) Need for a more strategic spatial planning of frontiers



*Oliveira et al.
under review*



Conclusion

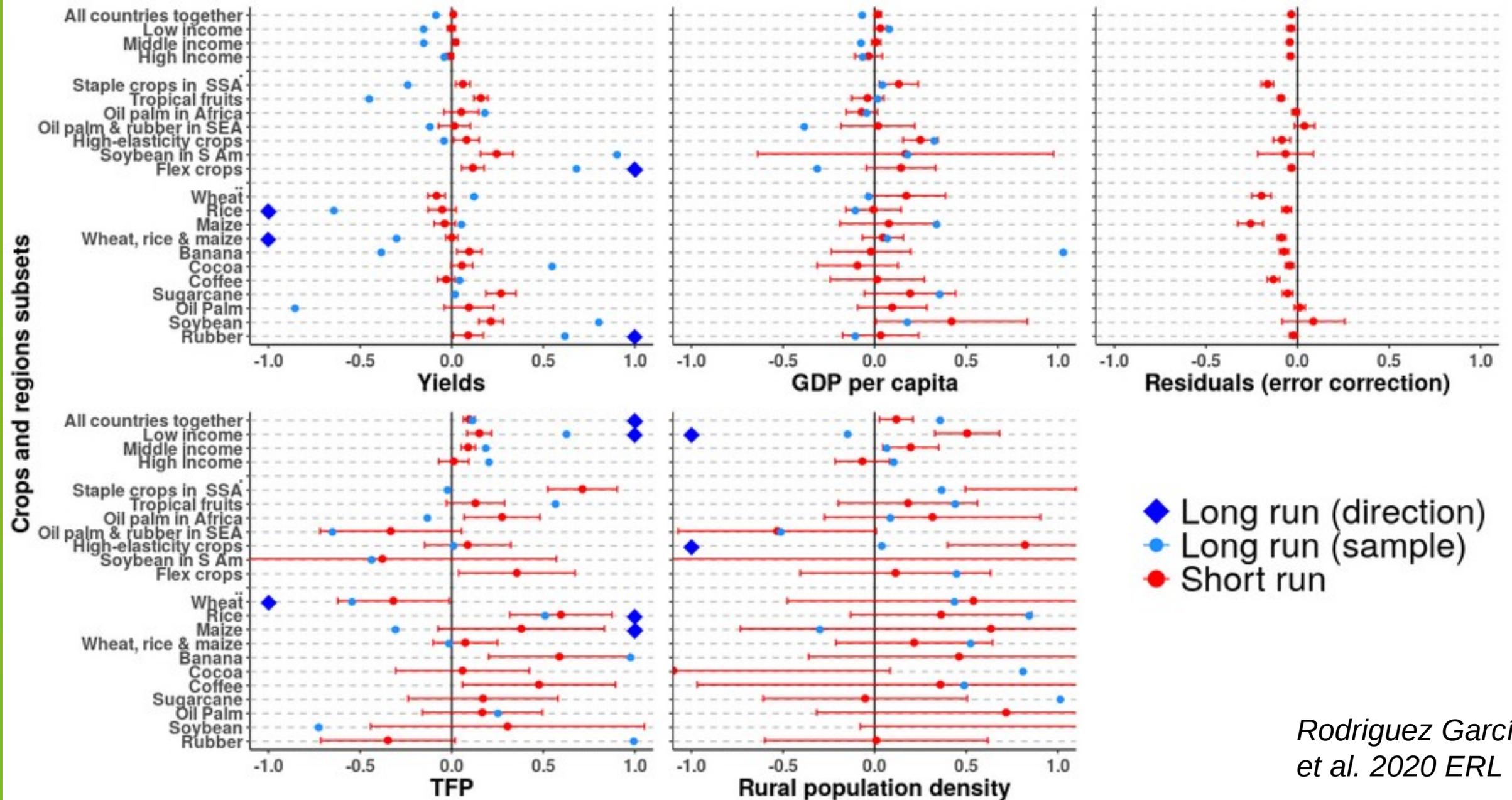
- * Blind spots: dry forests, frontier emergence (proactive governance)
- * Importance of the past (waves and legacies) and future (people's expectations and anticipation behaviors) to explain "abrupt" or "surprising" (non-linear) frontier emergence & land use dynamics >> people's agency shapes abnormal rents
- * Very dynamic and various trajectories in S/E Africa (emerging frontiers, waves...). Diversity of investors in S/E Africa frontiers; beyond the usual "speculators / land grabbers" story – Need to attract the “right” investors and investments
- * A strategic spatial planning approach and land tenure and zoning policies can contribute to steer frontiers development
- * Steps ongoing; mapping field/farm size and understanding its relation with tradeoffs between land and labor productivity and labor demand
- * Lots of work to do in this region, all good will is needed

All papers there : <https://erc-midland.earth/publications/>

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Rebound-effects of intensification



Rodríguez García
et al. 2020 ERL

Why study frontiers ?

>50 % of tropical deforestation in 24 frontiers

