Understanding agricultural frontiers emergence in Southern and Eastern Africa:

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

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Project


“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
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)
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

(Barbier 2011, le Polain de Waroux et al. 2018, Meyfroidt et al. 2018, Meyfroidt et al. in preparation)
Abnormal rents drive frontiers

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

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.
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

*Eigenbrod et al. 2020 (One Earth)*
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
2. Understanding emerging frontiers in Mozambique and S/E Africa
Questions

* 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

Brazilian Amazon
Cerrado
Chaco
Miombo
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
Waves and legacies

Waves, legacies and frontier emergence

Tipping point?

Frontier emergence

Another trajectory?

Waves
1992 Missionary farmers
1996 White South African commercial farmers
2005 Large-scale forestry companies
2012 New wave

Legacies

Business approaches
Dealing with land conflicts
Institutions & policies
Legible land tenure
Brownfields
Financial capital
Social networks

Kronenburg-García et al. under review
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 futurolog 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

Abeygunawardane et al. under review
Taking a larger perspective
A Bayesian model of investment decisions

Abeygunawardane et al. under review
Logics of investment decisions in frontiers

Abeygunawardane et al. under review
Logics of investment decisions in frontiers

Abeygunawardane et al. under review
Semi-subsistence land uses (or “pre-frontier”) 

$L (= 1-S)$

Commodity / commercial land uses

$S$ (commercial crop area; agglomeration economies)

Rodriguez García et al. in preparation
Stylized model of frontiers as regime shifts

\[ Y = (L \times 1) + S \times \pi(S) - \left(\frac{1}{2y}\right) \times (S^2) \]

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

Rodriguez García et al. in preparation
Outcomes as depending on “history” (left) or “expectations” (right)

(Discounted future farmers’ profits)


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

* Bey et al. in preparation
Matching analysis of land use policies effects on large-scale tree plantations expansion

* 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

Global challenges in land use in frontier regions
- Commodity crop expansion and intensification of commercial plantations
- Transnational land deals
  - Land scarcity
  - Land competition
- Poverty traps and land degradation spirals in smallholder production systems
- Institutional fragility hindering the development of a commercial agriculture that contributes to sustainable development

Steps of a SSP process in land-use frontiers
1. Designing visions of alternative development
2. Defining short-term actions, projects or programs
3. Focused on strategic key issues supporting plan implementation
4. Bringing political agents to support the defined vision
5. Multi-level and transcalar governance arrangements
6. Civic participation in scenario building
7. Integrating a spatial dimensions in SSP
8. Designing strategic frameworks for action
9. Defining funding schemes supporting the strategy

Structural factors hindering Mozambique’s long-term development
- Lack of a strategic vision
- Short-termism of political cycles
- Non-legal recognition of local-rural communities
- Weak land rights registration and community land delimitation system
- Pronounced dependency of donors’ agendas, programs and their funding schemes

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/
Email: patrick.meyfroidt@uclouvain.be
Rebound-effects of intensification

Rodriguez García et al. 2020 ERL
Why study frontiers?

>50% of tropical deforestation in 24 frontiers

Pacheco et al. 2021 (WWF)