Chapter 3

Tree cover transitions in tropical landscapes: hypotheses and cross-continental synthesis

Meine van Noordwijk and Grace B. Villamor

The first phase of ASB Diagnostic studies articulated a perspective on what became known in the literature as 'forest transition theory'. Forest transition theory was primarily developed to explain the process of decline (deforestation) and recovery (regeneration) of forest area in both temperate and tropical areas. Most forest transition theory literature uses national statistics on forest cover, which refer to a diverse range of tree cover types. As qualitative change between tree cover types is a prominent aspect of the regeneration process, the term 'tree cover transition' may be a more appropriate and useful identification (Ekadinata et al 2010, PB 16) .

The term 'forest' is first of all an institutional marker; there are forests without trees and trees outside forests (van Noordwijk et al 2009, PB 15). Moreover, debates about forest transition have often tried to replace time as the primary X-axis with macroeconomic variables that indicate the changing roles of forest areas once economies develop. However, in the context of tropical countries, the existing hypotheses lack agency- and context-specific explanations. While the logarithm of human population density accounts for 70-80% of variation in the national forest cover fraction, forest transition points can occur at almost any population density and forest cover fraction (Figure 3.1). They seem to be more likely, however, in countries that already had above-average forest cover in relation to their population density. The identified limitations of forest transition theory include the loose definition of forests (combining primary, secondary and planted forest types), a lack of detail about the forest cover dynamics involved, including its spatial and (multi-)temporal scales, and few explanations of context-specific transitions (Perz 2008).

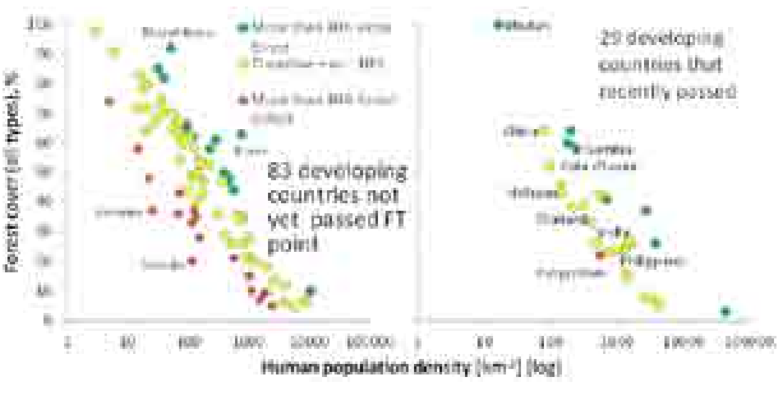

Figure 3.1. Relationship between human population density and percentage forest cover at the national scale, with indication of countries that are more than 10% above or below the average trend, and distinguishing between the countries before (left) and after (right) a reported increase in national forest cover (forest transition (FT) point); based on the dataset found in Kothke et al (2013). The graph on the left shows countries that have not (yet) reached the FT point; the graph on the right shows those that have, at the population density and forest cover shown

Tree cover transition and the underlying hypotheses

Tree cover in landscapes changes in quantity, quality and spatial pattern—and therefore in function—along the forest transition pattern of decline followed by return of trees in a non-linear fashion (Figure 3.2a). The same total amount of natural forest area, open field agriculture and tree (crop) plantations, respectively, can be arranged in an integrated or segregated spatial pattern (Figure 3.2b) using both land sparing and land sharing approaches to achieve the multifunctionality that local communities want and/or need. Tree cover is best described as a spatially and temporally dynamic continuum, with trees— established spontaneously or planted. Land use policies, however, dissect this continuum into a forest versus non-forest dichotomy; this tends to give undue weight to a forest definition, which is a major challenge to both the fairness and efficiency of policy implementation (van Noordwijk et al 2012a).

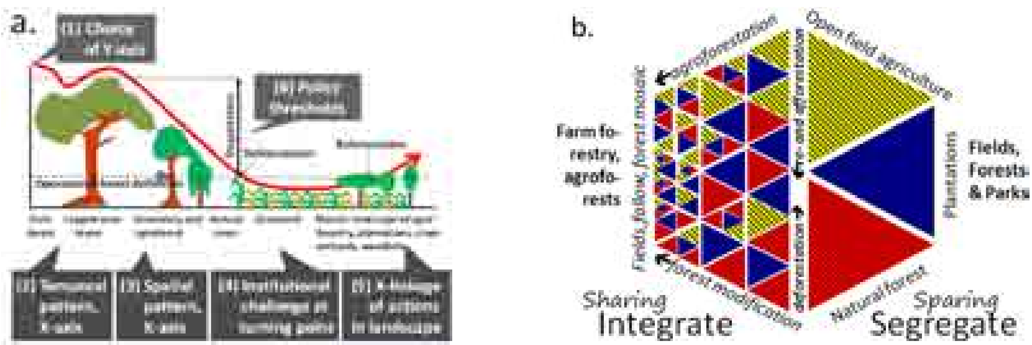

Figure 3.2 (a and b) Tree cover transition in the landscape (a), and spatial pattern of different land use types associated with the sharing versus sparing approaches, respectively (b)

In a global comparative study of the dynamics of forests, trees and agroforestry (FTA) by the CGIAR research program, we framed 12 hypotheses related to the multiple versions of a tree cover transition to test under the FTA program. The hypotheses span a full circle that connects actors, underlying drivers and leverage points, as well as consequences, stakeholder evaluations and opportunities to manipulate points of leverage (Figure 3.3).

Figure 3.3. Logical loop linking patterns of tree cover change to consequences, stakeholder feedback, leverage points, influencing drivers, actors and, ultimately, tree cover change

Table 3.1 Main hypotheses

Hypotheses		
1.	Basic forest transition hypothesis	Tree cover in landscapes shows a forest transition pattern of decline followed by recovery.
2.	Population density and welfare hypothesis	Tree cover transitions in time show that an increase in human population density is linked to a decrease in natural forest cover.
3.	Spatial forest transition hypothesis	The spatial pattern of tree cover expanding outwards from centres of human habitation show more than a coincidental resemblance to the temporal dynamics of hypothesis 2 (Dewi et al 2013). (On the often misunderstood "agroforestation" phase, see Fairhead and Leach 1995).
4.	Agroforestation or tenurial reform hypothesis	Institutional change from a forest focus to an agrarian regime of tenure and control is essential for supporting the transition from decline towards increase and recovery of tree cover (Akiefnawati et al 2010).
5.	The '*sparing*' hypothesis	What happens in one part of the tree cover transition is linked at the driver and/or actor level to other parts of the landscape (leakages). (Lusiana et al 2012; van Noordwijk et al 2012b). Sparing can be a positive opportunity to protect trees.
6.	The driver change hypothesis	Drivers of tree cover transition are space/time dependent and knowledge of past drivers in a particular landscape cannot be directly extrapolated to predict future changes; there may, however, be more predictability in the succession of drivers.
7.	Trade-off hypothesis	Land use types that are part of the tree cover transition differ in their effectiveness in provisioning and environmental goods and services (Santos-Martin and van Noordwijk 2011; Villamor et al 2011).
8.	Integration, buffer and resiliency hypothesis	Tree cover of all types and at all stages is positively associated with buffer functions in an ecological, social and economic sense, with the spatial pattern and degree of integration linked to human resilience and adaptive capacity in the face of climate and market variability (Figure 1b) (Nguyen et al 2013; van Noordwijk et al 2013).
9.	Diversity of stakes hypothesis (including gender specificity)	Appreciation of tree cover and its associated ecosystem services varies according to gender and ecological knowledge (Villamor et al 2013; Villamor and van Noordwijk 2011).
10.	'No silver bullet' hypothesis	Feedback mechanisms from beneficiaries of (certain types of) tree cover to drivers/agents can take multiple forms and produce various outcomes (rules, incentives, suasion, investment in value chains and technology, and so on) (Jackson et al 2012; Lopa et al 2012; van Noordwijk et al 2012a). Context-specific feedback is most effective.
11.	Negotiation support hypothesis (including gender specificity)	The dynamics of tree cover changes can be influenced by multi-stakeholder negotiation support processes that recognize the diversity of knowledge, perceptions, stakes, power and influence (Villamor et al 2013).
12.	Impact pathway hypothesis	Public discourse on aspects of tree cover transition and the relevance of interventions follows a policy issue cycle (Clark et al 2011; Minang and van Noordwijk 2013).

As specified in hypothesis 4, an increase in desirable types of tree cover is often triggered by a transition from forest to agrarian rules of land tenure, due either to generic policy reform or to location-specific reclassification of land. Until recently European Union rules assumed that trees and agricultural land use were incompatible, but changes that allow and encourage trees and crops to be combined on the same land unit, are now forthcoming.

'Resilience' (to certain environmental risks and events) has become a popular concept, but it remains difficult to quantify and study. It may be more fruitful to focus on the related concept of 'buffering' (for example, are insurance premiums being paid? Are wetlands and overflows that buffer river flow retained?) as this can be assessed continuously, while resilience is only expressed in response to calamities. Trees have always been valued for their microclimatic buffering roles and, more contentiously, they are often considered to have a positive meso-climatic role as well (van Noordwijk et al 2013).

The analysis of tree cover change in current landscapes is often part of negotiation support, rather than decision support science (Clark et al 2011), as multiple stakeholders have different claims to the legitimacy of their knowledge and interpretation of a complex reality. Rather than having a single 'footprint' value, many commodity value chains have a wide management swing potential (Davis et al 2013). An 'issue cycle' is occurring, in which new issues are constantly being framed and proposed, with only some reaching the level of wider public and policy concern and fewer still reaching the stage of policy solutions. The role of scientists varies with the phase of the cycle. While 'impact pathways' are more easily framed for mature issues with imminent solutions, science plays at least an equally important role in the early sifting of new concerns, and in recognising which issues merit further exploration.

ASB as part of a wider global comparative landscape networks

Tree cover transition is considered to be a unifying concept encompassing issues related to livelihoods, landscapes and governance. A global comparative network of landscapes where the socio-ecological, economic, political and institutional aspects of tree cover change are closely monitored can help to produce a salient, credible and legitimate perspective on issues at all stages of the policy cycle. The ASB learning landscapes have become part of a global network of landscapes in the on-going research programs of the various institutions involved in the CGIAR's research program on Forests, Trees and Agroforestry (CRP-FTA) with its Sentinel Landscapes effort (Figure 3.4).

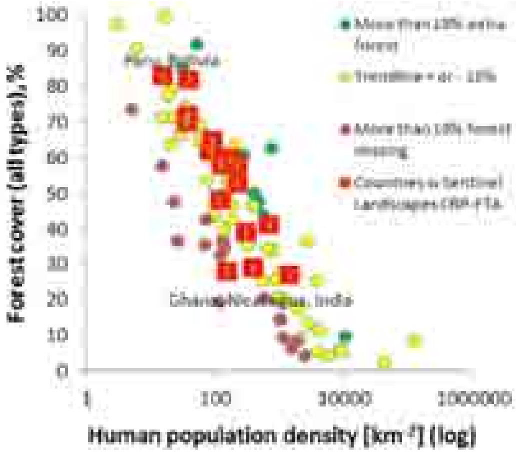

Figure 3.4. Countries included in the network of Sentinel Landscapes studies by the CGIAR research program on forest, trees and agroforestry (CRP-FTA)

The early ASB efforts have helped to frame a wider effort to combine local, national and international science and stakeholder concerns seeking solutions based on the functions of tree cover in multifunctional landscapes, with an opportunity to transcend the usual emphasis on form and formal forest definitions by emphasizing functions and ecosystem services.

ASB Partnership for the Tropical Forest Margins

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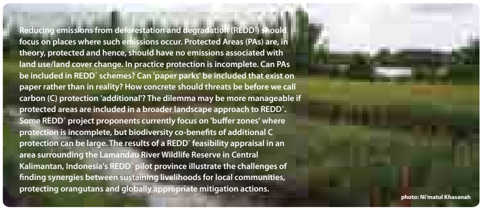
Recognizing traditional tree tenure as part of conservation and REDD$^+$ strategy

Feasibility study for a buffer zone between a wildlife reserve and the Lamandau river in Indonesia's REDD$^+$ Pilot Province



Reducing emissions from deforestation and degradation (REDD$^+$) should focus on places where such emissions occur. Protected Areas (PAs) are, in theory, protected and hence, should have no emissions associated with land use/land cover change. In practice protection is incomplete. Can PAs be included in REDD$^+$ schemes? Can 'paper parks' be included that exist on paper rather than in reality? How concrete should threats be before we call carbon (C) protection 'additional'? The dilemma may be more manageable if protected areas are included in a broader landscape approach to REDD$^+$. Some REDD$^+$ project proponents currently focus on 'buffer zones' where protection is incomplete, but biodiversity co-benefits of additional C protection can be large. The results of a REDD$^+$ feasibility appraisal in an area surrounding the Lamandau River Wildlife Reserve in Central Kalimantan, Indonesia's REDD$^+$ pilot province illustrate the challenges of finding synergies between sustaining livelihoods for local communities, protecting orangutans and globally appropriate mitigation actions.

photo: Ni'matul Khasanah

Main findings

1. Protection of remaining forest and buffer zones means that there are limited sources of local income

2. Tree and land tenure rules don't match, with local tree tenure rules on valuable trees not recognized by government agencies

3. Remaining aboveground carbon stock is 1/3 of pre-human influence value. Peat contains ten times the aboveground C stock

4. Additonality of protection: Small-scale threat in the buffer zone is shown by guard post effectiveness. Large-scale threats stem from plans to expand oil palm production

5. Drainage of peatlands has resulted in saltwater intrusion in farmlands south-east and south of the PA: business-as-usual scenarios increase vulnerability to sea level rise

Implications

- New sources of environmentally sustainable employment are needed. Planting more of the peat-compatible *jelutung (Dyera costulata)* and rubber trees can increase carbon storage but also provide income for people.
- Customary tree tenure arrangements remain a basis to build a co-management regime in the buffer zone between forest authorities (focused on land) and people (focused on *jelutung* trees)
- Local government's land use planning is key to success, but requires tangible solutions to local employment and income before conservation objectives can be assured. Salvage logging is currently one fall-back option for local communities.
- Guard posts are fairly effective but expensive to maintain; more integrated livelihood and conservation options through co-,management regimes may give higher returns on potential REDD$^+$ investment

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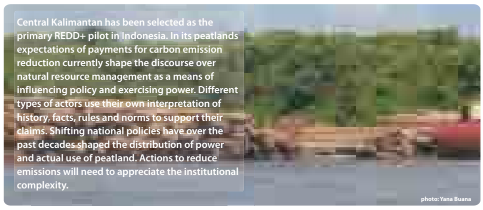
Hot spots of confusion: contested policies and competing carbon claims in the peatlands of Central Kalimantan, Indonesia



Central Kalimantan has been selected as the primary REDD+ pilot in Indonesia. In its peatlands expectations of payments for carbon emission reduction currently shape the discourse over natural resource management as a means of influencing policy and exercising power. Different types of actors use their own interpretation of history, facts, rules and norms to support their claims. Shifting national policies have over the past decades shaped the distribution of power and actual use of peatland. Actions to reduce emissions will need to appreciate the institutional complexity.

photo: Yana Buana

Main findings

1. Contesting claimants were found to use current contradictions and inconsistencies of Indonesian laws, multi-sector policies and the articulation of local property rights and customary rights.

2. The ambivalence of the forest definition and associated property rights has 'path dependence', reflecting historical change of government laws, paradigms and public administration.

3. Legal arguments are not necessarily decisive in settling disputes, but the lack of respect for legality contributes to confusion, undermining authority.

4. Carbon rights in this area are not clear yet. They are at least as complex as the set of actors and agents who interact during the process that starts with a natural forest and ends with a landscape with few trees, high emissions but still high carbon stock.

Implications

- The state at national and provincial levels are two among several claimants and negotiated cooperation among stakeholders will be needed, rather than asserting a single legal authority.
- Market-based REDD+ implementation will add confusion as unresolved carbon rights come as an addition to the already complex layers of unresolved property rights.
- A co-investment paradigm of REDD+ can contribute to resolving disputes on property rights and seek more transparent use of state authority and power.

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ASB Partnership for the Tropical Forest Margins

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Stewardship Agreements to Reduce Emissions from Deforestation and Degradation (REDD) in Indonesia

Conflicts over who controls the forests and forest margins is now widely recognized as a key issue that needs to be addressed if the world wants to see a reduction of emissions from deforestation and degradation. Indonesia, the country with the highest carbon emissions from change in its forest cover, is now expressing global leadership in commitments to Nationally Appropriate Mitigation Actions (NAMA) that include forests, peatland and an increasing attention for the 'trees outside forest', in the form of agroforests and trees in agricultural landscapes. Agreements on stewardship in the forest margin are key to the success of such programs, but rules need to be simplified for wider application.

photo by Jasnari

Main findings

1. The recent designation of Lubuk Beringin as the first 'Hutan Desa' or 'Village Forest' came 10 years after the legal instrument was created, but offers prospects for wider use in conflict resolution on forest margins.

2. The procedures for application and approval of Hutan Desa status involve local, provincial and national levels of government and consequently only cases will pass that provide a net benefit at each level.

3. Expectations that resolving tenure conflict would facilitate flow of REDD investment to Indonesia facilitated approval of the first Hutan Desa case.

4. Lubuk Beringin was 'predisposed' to pioneer the Hutan Desa concept in Indonesia due to long term involvement with external agents building local social capital and aided by an informal forest discussion forum at the district capital.

Implications

- Increased tenure security for agroforests and community-managed forests is feasible within existing legal instruments in Indonesia and does not require new legislation.
- Wider application of the Hutan Desa concept will depend on a streamlining of procedures, learning from the first approval cases.
- Wider application of the Hutan Desa agreements can be a low-cost way for local people to benefit from REDD efforts, without requiring cash transfers.
- Impacts in governance and policy reform are unpredictable and carry over multiple project cycles with their often over-ambitious goals to finally achieve success in ways unforeseen.

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PUTTING COMMUNITY-BASED FOREST MANAGEMENT ON THE MAP

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JULY 2001

CREATING fair and effective policies and institutions to govern land and tree tenure is a prerequisite for eradicating poverty and protecting the environment in the humid tropics.

HIGHLIGHTS

The Krui agroforests

Community under threat

Ground-breaking reform

Lessons learned and South-South ex-change

H de Foresta

A natural forest? No, an example of a complex agroforest dominated by damar trees in Krui,West Lampung.

A natural forest? No, an example of a complex agroforest dominated by damar trees in Krui,West Lampung.

The agroforestry system developed by the Krui people of southwest Sumatra is a model of productive and sustainable community-based management. Indonesia has taken a bold first step along the path of tenure reform—one that offers lessons for other countries facing similar opportunities to devolve management to the local level.

Putting community-based forest management on the map: lessons from the damar agroforests of Krui (Indonesia)

Creating fair and effective policies and institutions to govern land and tree tenure is a prerequisite for eradicating poverty and protecting the environment in the humid tropics. The lands of the Krui people of Lampung Province in southwest Sumatra are a shining example of productive and sustainable agroforestry. The Krui have devised a system that meets their immediate needs for food and cash while also providing them with diverse sources of income in the medium to long term.

Key findings	Implications
1. By combining environmental and economic benefits, the Krui system offers considerable advantages over many other systems that replace or exploit natural forest.	Agroforests such as the damar agroforest of Krui are key 'alternatives to slash and burn', combining environmental and economic functions in a single land use
2. Lack of recognition for these agroforests in existing forest policies implies a major threat for the Krui community.	The institutional separation of forests from the rest of the landscape ignored local perspective in defining economic targets for state revenue and large-scale forest industry
3. A ground-breaking reform was achieved when the Minister of Forestry issued a decree classifying the Krui agroforest as a 'special purpose' part of Indonesia's forest	The agroforestry system developed by the Krui people is now seen as a model of productive and sustainable community-based management.
4. The process leading to the policy change offers opportunities for south-south exchange as does the agroforest concept itself	Indonesia has taken a bold first step along the path of tenure reform— one that offers lessons for other countries facing similar opportunities to devolve management to the local level.

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