



Contents lists available at ScienceDirect

## World Development

journal homepage: [www.elsevier.com/locate/worlddev](http://www.elsevier.com/locate/worlddev)

## Creating an appropriate tenure foundation for REDD+: The record to date and prospects for the future



William D. Sunderlin<sup>a,\*</sup>, Claudio de Sassi<sup>b</sup>, Erin O. Sills<sup>c</sup>, Amy E. Duchelle<sup>a</sup>, Anne M. Larson<sup>d</sup>,  
Ida Aju Pradnja Resosudarmo<sup>e</sup>, Abdon Awono<sup>f</sup>, Demetrius Leo Kweka<sup>g</sup>, Thu Ba Huynh<sup>h</sup>

<sup>a</sup> Center for International Forestry Research, Jalan Cijor, Situ Gede, Bogor Barat, Jawa Barat 16115, Indonesia

<sup>b</sup> Federal Office for the Environment, Worblentalstrasse 68, 3063 Ittigen, CH-3003 Bern, Switzerland

<sup>c</sup> Department of Forestry and Environmental Resources, North Carolina State University, Box 8008, NCSU, Raleigh, NC 27695, USA

<sup>d</sup> Center for International Forestry Research, c/o CIP, Av. La Molina 1895, Lima 12, Peru

<sup>e</sup> Australian National University, Crawford School of Public Policy, J.G. Crawford Building, Canberra ACT 2601, Australia

<sup>f</sup> Independent Consultant, c/o 2008 Messa Yaoundé, Cameroon

<sup>g</sup> Independent Consultant, P.O. Box 13267, Dar es Salaam, Tanzania

<sup>h</sup> University of Melbourne, School of Ecosystem and Forest Sciences, Baldwin Spencer Building, Western Annexe, Victoria 3053, Australia

## ARTICLE INFO

## Article history:

Accepted 17 January 2018

## Keywords:

Forest  
Deforestation  
REDD+  
Climate change  
Tenure  
Tropical developing countries

## SUMMARY

Attention to tenure is a fundamental step in preparation for REDD+ implementation. Unclear and conflicting tenure has been the main challenge faced by the proponents of subnational REDD+ initiatives, and accordingly, they have expended much effort to remedy the problem. This article assesses how well REDD+ has performed in laying an appropriate tenure foundation. Field research was carried out in two phases (2010–2012 and 2013–2014) in five countries (Brazil, Peru, Cameroon, Tanzania, Indonesia) at 21 subnational initiatives, 141 villages (half targeted for REDD+ interventions), and 3,754 households. Three questions are posed: 1) What was the effect of REDD+ on perceived tenure insecurity of village residents?; 2) What are the main reasons for change in the level of tenure insecurity and security from Phase 1 to Phase 2 perceived by village residents in control and intervention villages?; and 3) How do intervention village residents evaluate the impact of tenure-related interventions on community well-being? Among the notable findings are that: 1) tenure insecurity decreases slightly across the whole sample of villages, but we only find that REDD+ significantly reduces tenure insecurity in Cameroon, while actually increasing insecurity of smallholder agricultural land tenure in Brazil at the household level; 2) among the main reported reasons for increasing tenure insecurity (where it occurs) are problems with outside companies, lack of title, and competition from neighboring villagers; and 3) views on the effect of REDD+ tenure-related interventions on community well-being lean towards the positive, including for interventions that restrain access to forest. Thus, while there is little evidence that REDD+ interventions have worsened smallholder tenure insecurity (as feared by critics), there is also little evidence that the proponents' efforts to address tenure insecurity have produced results. Work on tenure remains an urgent priority for safeguarding local livelihoods as well as for reducing deforestation. This will require increased attention to participatory engagement, improved reward systems, tenure policy reform, integration of national and local efforts, and "business-as-usual" interests.

© 2018 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

Land use and land cover change in the tropics figures prominently in the climate change threat, with agricultural growth,

\* Corresponding author.

E-mail addresses: [w.sunderlin@outlook.com](mailto:w.sunderlin@outlook.com) (W.D. Sunderlin), [claudio.de-sassi@bafu.admin.ch](mailto:claudio.de-sassi@bafu.admin.ch) (C. de Sassi), [sills@ncsu.edu](mailto:sills@ncsu.edu) (E.O. Sills), [a.duchelle@cgiar.org](mailto:a.duchelle@cgiar.org) (A.E. Duchelle), [a.larson@cgiar.org](mailto:a.larson@cgiar.org) (A.M. Larson), [daju.resosudarmo@anu.edu.au](mailto:daju.resosudarmo@anu.edu.au) (I.A.P. Resosudarmo), [demetrius@kilimanyika.com](mailto:demetrius@kilimanyika.com) (D.L. Kweka), [huynh@unimelb.edu.au](mailto:huynh@unimelb.edu.au) (T.B. Huynh).

<https://doi.org/10.1016/j.worlddev.2018.01.010>

0305-750X/© 2018 The Authors. Published by Elsevier Ltd.

This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

deforestation, and forest degradation accounting for 12% of annual greenhouse gas emissions (Smith, Bustamante, 2014), and corresponding loss of the capacity of forests to absorb atmospheric carbon (Goodman & Herold, 2014). Reducing Emissions from Deforestation and Forest Degradation (REDD+), first introduced at COP 11 in 2005, has been viewed as the leading option for climate change mitigation in the forest sector. The key innovation in REDD+ was to create conditional, performance-based incentives for preventing forest conversion (REDD) and for enhancing forest carbon stocks (the "+"). In so doing, it has been hoped that REDD+ would

pay the opportunity costs of forgone forest land conversion, vari-ously estimated at \$5 to \$60 billion annually (Angelsen, 2013; Morris & Stevens, 2011; Stern, 2006).

REDD+ has grown rapidly, with readiness activities in 55 countries and 351 subnational initiatives underway and active as of 2014 (Simonet, Karsenty, Newton, de Perthuis, Schaap, & Seyller, 2015). This rapid growth belies considerable difficulty in REDD+ developing as planned and meeting its objectives. The conditional, performance-based incentives intended in REDD+ have so far barely materialized, and subnational initiatives are essentially functioning as integrated conservation and development projects (ICDPs), the approach to controlling deforestation that precedes REDD+ and that did not make substantial progress (Sunderlin & Sills, 2012). Subnational initiatives have so far generated a small amount of carbon offsets (Peters-Stanley, Gonzalez, Yin, with Goldstein, & Hamrick, 2013: vii, ix), with only 26% selling forest carbon credits as of 2014 (Simonet et al., 2015). REDD+ was to have been capitalized through public funds in the initial years and then by the private market through forest carbon offsets, but with the failure of the global carbon market to materialize, REDD+ continues to be almost wholly publicly-funded (Norman & Nakhouda, 2014). REDD+ has failed to advance as planned not just because of financial difficulties, but more fundamentally (and relatedly) because “business as usual” (BAU) interests – those tied to the conversion of forests to non-forest uses – continue to be hegemonic in forest land-use decision-making (Brockhaus, Di Gregorio, & Mardiah, 2014; Edwards, Koh, & Laurance, 2011; Enrici & Hubacek, 2016; Sunderlin, Pratama, et al., 2014: 17).

The Paris Climate Agreement reached at COP 21 in December 2015 has invigorated attention to the need for climate change mitigation in national policies worldwide (Day et al., 2015). The forest sector has a prominent place in the Paris Agreement, with many countries having identified REDD+ as an integral part of their Nationally-Determined Contributions (NDCs) toward climate change mitigation (Harris & Stolle, 2016; Keenan, 2016; Leonard, 2016; World Bank, 2015). Consequently, it is likely that REDD+ will experience a boost and revival.

Clarification of tenure arrangements and improvement of tenure security for local stakeholders have been widely recognized as priorities for fulfilling REDD+ in a way that is effective, efficient, and equitable (Cotula & Mayers, 2009: v; Sunderlin et al., 2009; Day & Naughton-Treves, 2012: 7-8; Doherty & Schroeder, 2011: 82; Westholm, Biddulph, Hellmark, & Ekbohm, 2011: 1; Rothe & Munro-Faure, 2013: 1; UN-REDD Programme, 2013). Attention to tenure is essential not only for fulfilling the goals of REDD+, but also other land-based climate mitigation approaches such as green economy (FAO, 2012), low emissions development strategies (Fishbein & Lee, 2015: 19), “rights alone are sufficient” approaches (Hatcher, 2009: 11; Stevens, Winterbottom, Springer, & Reyntar, 2014: 1-3), and climate change adaptation (Quan & Dyer, 2008: 3).

Empirical research has documented the challenges faced by proponents in addressing tenure (Awono, Tambe, Owona, & Barreau, 2014; Dokken, Caplow, Angelsen, & Sunderlin, 2014; Duchelle et al., 2014; Larson et al., 2013; Naughton-Treves & Day, 2012; Resosudarmo, Atmadja, et al., 2014; Sunderlin, Larson, et al., 2014). Interviews with representatives of proponent organizations showed tenure is the single most difficult challenge in establishing REDD+ on the ground when ranked against all challenges (Sunderlin, Ekaputri, et al., 2014). Resolving tenure insecurity is difficult for a variety of reasons, ranging from problems like cost, poor data and capacity to more complex social, economic and political problems involving overlapping claims, conflict and widely divergent interests and goals (Larson et al., 2013). Fundamentally, current forest tenure conditions in most tropical countries tend to favor the prerogatives of

BAU interests at the expense of local stakeholders. This imbalance and the contested nature of tropical forests is a contemporary manifestation of formal state appropriation of forests centuries ago, and states giving privileged access to forest lands and resources to economically and politically powerful actors (Kelly & Peluso, 2015; Peluso, 1992). The process has left many forest people feeling like trespassers in their own homes. Grassroots movements, especially indigenous organizations, have been instrumental in efforts to assert customary tenure claims over and against statutory tenure and have won important battles, especially in Latin America (Roldan, 2004), and more recently in India (Springate-Baginsky et al., 2009) and Indonesia (Kahurani, Sirait, van Noordwijk, & Pradhan, 2013). Nevertheless, and although a process of devolution of forest rights has been underway for four decades, progress has been uneven among countries and in most cases has not fundamentally altered the relations of power and authority over the control of forest lands (RRI, 2014; RRI, 2015).

Early action on forest tenure serves five vital functions in fulfillment of the goals of REDD+: identification of the right holders to REDD+ rewards; mitigation of potential harm from restricting forest access and competition for REDD+ benefits; introduction or bolstering of community forestry; provision or assurance of enforceable rights of exclusion; and resolution of inter-sectoral and inter-ministerial tenure contestation at all scales (Sunderlin, 2014).

In many tropical countries, proponent organizations<sup>1</sup> have become *de facto* the lead implementers of tenure preparations in REDD+, for three reasons. First, as initiators and implementers they are the ones able to “read” the socioeconomic, political, and environmental conditions at the local level and plan how to match them to project goals (ideally in collaboration with local stakeholders). Second, by default they tend to be the main actors because of the absence of coordinated national-level action (e.g. forest tenure reform) to create appropriate tenure conditions. Third, they have the incentive to address tenure issues in order to capture and manage carbon funds. These tenure-related interventions include not only clarifying and securing tenure rights (enabling conditions likely to be viewed positively by local stakeholders), but also, in many cases, the implementation of restrictions on forest access and conversion (disincentives that one suspects would run counter to the livelihood interests of local stakeholders).

REDD+ has clearly influenced the attention given to local tenure rights globally, but it is not yet clear to what extent it has led to significant change on the ground. On the positive side, REDD+ has helped motivate national-level sorting out of overlapping forest claims through a “One Map Policy” (Resosudarmo, Oka, & Utomo, 2014; Samadhi, 2013) in Indonesia. In Brazil, linkage between promoting environmental compliance and securing land tenure rights is potentially a powerful instrument for early action (Duchelle et al., 2014). In Peru, one of the most significant developments to date is a World Bank project negotiated and prepared directly with indigenous leaders: the Saweto Dedicated Grant Mechanism for Indigenous Peoples and Local Communities under the Forest Investment Program (FIP). This \$5.5 million project includes funds for the recognition of 310 native communities and demarcation and titling of almost 1 million hectares of native lands.<sup>2</sup> Across the tropics, grassroots concerns over REDD+ gave

<sup>1</sup> Proponent organizations are responsible for initiating and implementing REDD+ on the ground. In our sample 11 are private nonprofit, four are private for-profit, two are private nonprofit/government, two are government, one is public bilateral, and one is a government-to-government partnership. Sixteen are at the project scale and five at the jurisdictional scale (Sills et al., 2014:490–493).

<sup>2</sup> For information on the Saweto Dedicated Grant Mechanism in Peru see: <http://www.worldbank.org/projects/P148499?lang=en>.

birth to movements such as “No Rights, No REDD” and an important international dialogue among multilateral and bilateral REDD+ proponents and indigenous organizations.

Multi-country field research has shown that almost all proponents of subnational REDD+ initiatives are seriously engaged in tenure clarifications (de Sassi et al., 2014:425; Sunderlin, Larson, et al., 2014). Proponents are motivated not just by a means-end logic (recognizing the way tenure clarification serves REDD+ effectiveness and efficiency) but also by ethical concerns (Sunderlin, Ekaputri, et al., 2014: 19).

On the negative side, national governments have not given sufficient attention to tenure in readiness activities (Davis, Daviet, Nakhooda, & Thuault, 2009; Williams, 2013), in the Intended Nationally Determined Contributions (INDCs) filed for COP 21 (RRI, 2016a: 3–4) and in specific Emissions Reductions plans (ER-PINs) such as those prepared for the Forest Carbon Partnership Facility (RRI, 2016b). Implementation of Indonesia’s constitutional decisions favoring indigenous forest tenure rights has been slow, and uneven. In many countries proponents try to resolve at the local level tenure challenges whose origin and scope are far beyond the borders of their site; without government collaboration or support, they have a mixed record in attempting to establish an appropriate tenure foundation (Sunderlin, Larson, et al., 2014).

This article presents the results of field research conducted at two periods in time (Phase 1 in 2010–2012 and Phase 2 in 2013–2014) in five countries at 21 subnational initiative sites, encompassing 142 villages and 3754 households (roughly half the villages and households are control and half are intervention).

The overarching research question in this article is: What impact did REDD+<sup>3</sup> have on the insecurity of tenure rights for local stakeholders? There are three subordinate questions: What was the effect of REDD+ on perceived tenure insecurity of village residents?; What are the main reasons for change in the level of tenure insecurity and security from Phase 1 to Phase 2 perceived by village residents in control and intervention villages?; How do intervention village residents evaluate the impact of tenure-related interventions on community well-being?

With respect to the first question, we estimate the impact of REDD+ as the impact of living in a village selected for the REDD+ intervention area. We hypothesize that tenure insecurity will decrease more for households in intervention villages due to the concerted effort by REDD+ proponent organizations to improve tenure. With respect to the second question, we hypothesize that external claims on local forests will be the main reason for worsening tenure insecurity and REDD+ will be the main reason for improving tenure security. With respect to the third question, we hypothesize that local stakeholders perceive that interventions intended to clarify tenure have increased the well-being of the community, and interventions intended to restrict forest access and conversion have decreased the well-being of the community.

The article contains the following subsequent sections: methods; results (answers to the three subordinate questions); discus-

sion, with a focus on comparison and contrast of results among countries, and an answer to the overarching question; conclusion and recommendations.

## 2. Methods

The field research reported in this article was carried out by CIFOR’s Global Comparative Study on REDD+ (GCS) on subnational REDD+ initiatives. The aim of this research component of GCS has been to evaluate the implementation of subnational REDD+ in terms of the 3E + criteria (effectiveness, efficiency, equity and co-benefits [well-being, secure tenure, biodiversity], see <http://www.cifor.org/gcs/modules/redd-subnational-initiatives/>). The research was designed to support quasi-experimental impact evaluation based on “before-after/control-intervention” (BACI) data from villages and households (Sunderlin et al., 2016). This experimental design has been recommended for rigorous impact evaluation of conservation and development interventions based on counterfactual analysis (Jagger et al., 2009; Jagger et al., 2010). However, concerns have also been raised about counterfactual analysis and the underlying potential outcomes framework for understanding causality (Scriven, 2008; Westthorp, 2014; White, 2009; White, 2014). Thus, we draw on both the BACI data for counterfactual analysis, and local perceptions of the drivers of observed changes and the effects of REDD+ activities.

The research reported in this article was conducted at 21 subnational initiative sites in Brazil, Peru, Cameroon, Tanzania, and Indonesia (Fig. 1, Annex 1).<sup>4</sup> These five countries were selected purposively to include two countries each in Africa, Asia, and Latin America; key tropical forest countries (e.g. Brazil, Indonesia); and high numbers of REDD+ initiatives (Brazil, Peru, Indonesia). We also sought countries with sufficiently stable governance for productive research, and strong donor support for REDD+ (e.g. Government of Norway funding for Brazil, Tanzania, Indonesia) (Sunderlin et al., 2016: 17–19). The initiatives were selected purposively on the basis of six criteria, including: (1) conformity to our operational definition of “REDD+” (i.e. aiming to get most of their carbon benefits from avoided deforestation and degradation or forest conservation/restoration/management, that is, not from afforestation and reforestation); (2) climate activities to be carried out in a quantifiable manner;<sup>5</sup> (3) site boundaries and intervention villages determined before the beginning of the research; (4) conditional incentives would not begin prior to May 2010;<sup>6</sup> (5) conditional incentives having a reasonable chance of being implemented in subsequent years; and (6) proponent willingness to cooperate with external, independent research (Sunderlin et al., 2016: 19). Our sample consists of all initiatives that we could confirm met the inclusion criteria in the five study countries and thus was not subject to selection bias due to researcher or institutional preferences. Based on a comparison of this sample of initiatives with an independent effort to catalog all subnational REDD+ initiatives worldwide (called ID-RECCO, Simonet et al., 2015), we conclude that the GCS sample of sites is a “reasonable if

<sup>3</sup> In this article we are measuring the impact of REDD+, rather than specific REDD+ interventions. Our question is whether and how implementation of forest conservation interventions in the context of REDD+, which has placed a relatively strong emphasis on conditional performance-based incentives and the associated requirements for tenure clarification, has affected use of forest land and well-being among smallholders. That is, we are interested in the impact of the bundle of interventions implemented in the name of REDD+ by proponent organizations. We hypothesize that REDD+ might have an impact on tenure security specifically, because of its emphasis on conditionality, the requirement for Free Prior and Informed Consent, and large investments in “readiness”. In addition to looking at overall impact, we assess the incidence of specific interventions related to tenure clarification and tenure enforcement and village and household perceptions of their effects. One caveat is that while the proponents of all of the initiatives were using the REDD+ label and intending to reduce net forest carbon emissions in a quantifiable way at the time of the baseline survey, several of them had shifted strategies by the time of the phase 2 research.

<sup>4</sup> The total sample is 23 initiatives. Two initiatives are completely omitted. Bolsa Floresta (Brazil) is omitted because of its unique character. It was well underway at the time the field research began, and could not therefore be part of a “before-after” investigation. Cat Tien (Vietnam) had no tenure-related interventions and it was terminated early, so it stands alone as a unique case. Jari/Amapá (Brazil) is partly omitted. It has four intervention villages and associated sample households, but no control villages. It is excluded from the difference-in-difference analysis, but included in other forms of analysis.

<sup>5</sup> We selected sites where greenhouse gas reduction activities are to be carried out in a quantified way, that is, with the intention to monitor, report and/or transact reductions in carbon emissions or increases in carbon stock.

<sup>6</sup> By “conditional incentive” we mean a *quid pro quo* arrangement whereby REDD+ participants could get livelihood support (whether monetary or in-kind) in exchange for satisfactory performance in protecting and/or enhancing forests, either on a household or village basis.



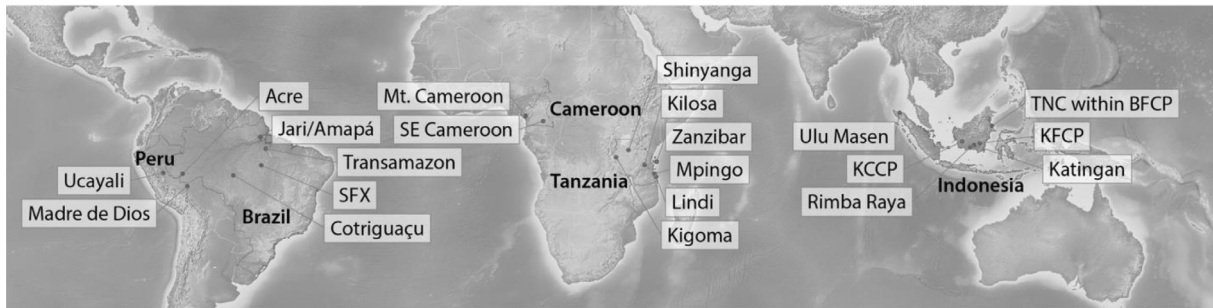


Fig. 1. Location of 21 REDD+ subnational initiatives in the sample.

imperfect representation of the wider universe of subnational REDD+” (Sunderlin et al., 2016: 154). There is strong alignment with the ID-RECCO proportions on some variables (e.g. proportion of private initiatives, those that have sold credits, those that have made payments to the local population, those that are certified, those that have provided environmental education), and there is rough alignment with ID-RECCO on the main drivers of deforestation and degradation. Further, some of the divergences between the average characteristics of the subnational initiatives in ID-RECCO and the GCS sample are due to the fact that our sample includes two large jurisdictions in Brazil (state of Acre and municipality of São Felix do Xingu), with the result that it contains almost half of the total area in subnational REDD+ worldwide.

At 16 of the sites (known as “household survey” sites), our sample included four villages in the intervention areas and four similar villages outside the intervention areas, called control villages.<sup>7</sup> In each of these villages, we interviewed approximately 30 households, for a total of 240 households related to each site. To select villages at household survey sites, field teams conducted rapid rural appraisal on 15 candidate intervention and 15 candidate control villages with average or above average deforestation. In each country, we selected matched samples of four intervention and four control villages per site that had similar distributions of population size, forest extent, market access, and deforestation pressures, among other potentially confounding characteristics. One intervention village at each site was selected on the basis of being identified by the proponent as the village most likely to succeed in reducing deforestation. At five of 21 sites (known as “village survey” sites), we selected four intervention villages, no control villages, and we did not conduct a household survey. Villages at village survey sites were selected from a pool of 15 candidate villages per site, with one village chosen on the basis of being judged by the proponent as most likely to succeed in reducing deforestation, and the rest were chosen randomly (Sunderlin et al., 2016: 21–28).

Combining information on both household and village survey sites, in Phase 1 (2010–2012) we sampled 142 villages (83 intervention, 59 control) and 3944 households (2062 intervention, 1882 control). In Phase 2 (2013–2014) we sampled 141 villages<sup>8</sup> (83 intervention, 58 control) and 3754 households (1996 intervention, 1758 control). Households were selected by simple random sample, with some instances of stratification (Sunderlin et al., 2016: 27–28).

The data reported in this article are drawn mainly from a group survey implemented in formal village focus groups in all study villages at two points in time (Phases 1 and 2). The respondents were typically 10–15 adults (all at least 16 years old) selected in collab-

oration with the village leadership and with a diverse composition that included men and women, young and old, rich and poor, and long-time residents and immigrants. In soliciting answers we sought to avoid having just a few voices dominate, and we sought consensus answers. In cases of disagreement, there was an attempt to obtain a consensus answer through further discussion, and if this was not possible, a vote was taken (Sunderlin et al., 2016: 62–63, 86–87). Data from a household survey administered also at two points in time are used to drill down into, corroborate, or complement some of the village-level findings. The reason for primary reliance on the village-level (focus group) data is because they capture dynamics that affect all village lands, and because they are available at all 21 sites reported on in this article, whereas the household-level data are available at 16 sites.<sup>9</sup>

The three research questions are answered on the basis of data obtained from village and household interviews. Here we specify the kinds of data obtained in relation to each research question.

#### 1. What was the effect of REDD+ on perceived tenure insecurity of village residents?

In one of the first sections of the village interview, we asked respondents to identify specific land areas within the village boundaries that are distinct by tenure type,<sup>10</sup> and that in the aggregate cover the whole area of the village. We then had a discussion about tenure security over those land types. We asked the respondents to specify whether they believed the tenure of each land area was secure or insecure at the time of the interview. We specified our definition of “tenure security” as “your confidence that the households in this village will continue to be able to use, at least for the next 25 years<sup>11</sup>, the land and forests you now use and benefit from in that particular tenure area.”<sup>12</sup> We emphasize that we measured respondent perception of tenure security, with subjective factors perhaps influencing that perception. Furthermore, we note that these questions were posed before we asked any questions about the local REDD+

<sup>7</sup> The Jari/Amapá site in Brazil is an exception. It has five intervention villages but no controls. For this reason Jari/Amapá is excluded from the difference-in-difference analysis. It is, however, included in the other forms of analysis.

<sup>8</sup> One village in Kilosa, Tanzania, declined participation in Phase 2.

<sup>9</sup> There are only 15 sites included in the difference-in-difference analysis because of the exclusion of the Jari/Amapá site.

<sup>10</sup> Village land areas were classified into “state,” “community,” and “individual” tenure categories, and eight sub-categories that specify if the land area is unclaimed, assigned, recognized, or titled.

<sup>11</sup> Tenure security was defined as the ability to use land over a *forward-looking* 25-year period to elicit an expansive answer from respondents that included the totality of their hopes, worries, and expectations in the long-term. This contrasts with a two-year *retrospective* time horizon for questions 1 and 2. (How has tenure security changed in the prior two years, if at all, and what are the reasons?) Though these time frames are different, they are compatible.

<sup>12</sup> To assess whether focus group participants could have misinterpreted the question as asking whether they would be able to use the land in the same way for the next 25 years (two reviewers were concerned this might have happened), we canvassed all field staff supervisors and reviewed the reasons provided for changes in security and insecurity (see question 2). This confirmed that respondents in all countries and all languages understood that the question was about tenure security rather than about changes or restrictions in use.

initiative. The total number of village land areas was 425 in Phase 1 and 388 in Phase 2.

In the household interview, we asked the respondent to differentiate household lands by tenure category (controlled and in use by household, controlled by household but in use by other household, rented or borrowed, communal) and land cover type (agriculture, forest). We asked the respondents to specify whether the tenure of each land area was secure or insecure at the time of the interview.

2. What are the main reasons for change in the level of tenure insecurity and security from Phase 1 to Phase 2 perceived by village residents in control and intervention villages?

For each of the land areas identified in Phase 2, we asked whether the tenure security of the land area had increased, stayed the same, or decreased in the two-year period prior to the interview.<sup>13</sup> If the tenure security of the land area was either lower or higher, we asked for the main reasons, and allowed up to four answers.<sup>14</sup>

3. How do intervention village residents evaluate the impact of tenure-related interventions on community well-being?

In the village focus groups, we asked about each tenure-related intervention, specifying: “Which of the following choices best describes the overall effect of the intervention on the well-being of the community?” The closed-option responses were: very negative; negative; no effect; positive; or very positive. We also permitted the response “both positive and negative”. In the analysis “very negative” and “negative” are clustered as “negative,” “no effect” and “both negative and positive” are clustered as “neutral,” and “positive” and “very positive” are clustered as “positive.” In a parallel way in the household questionnaire interview, we asked respondents: “What is your evaluation of the effect of [name of intervention] on the well-being of your household?” The response options were the same as those for the village questionnaire respondents.<sup>15</sup> Different from questions 1 and 2, in question 3 we limit our attention to the data from intervention villages.

A survey of village interventions was conducted in 2012–2013 to catalogue all interventions aimed intentionally at forest conservation, both in control and intervention villages and households (Sunderlin et al., 2016: 94–95). Among the seven types of interventions catalogued, two tenure-related interventions are spotlighted in this article: (1) tenure clarifications (TC), which we define as activities aimed at resolving unclear or contested ownership and access rights over local forestlands, trees, and carbon; and (2) restrictions on forest access and conversion (RFAC), which we define as activities such as determining the boundaries of set-aside forests, reaching agreement with local stakeholders on restricted forest use, community monitoring, enhanced policing of forest access and use, imposition of fines, enforcement of forest

<sup>13</sup> Note that in relation to Question 1 we ask about perceived tenure security at the time of the interview, and in relation to Question 2 we ask about the change in perceived tenure security in the course of the two years prior to the interview. It may seem redundant to ask respondents the current status of tenure security at the time of the interview, and change in tenure security in the recent past. Logically, there can be a relationship between the two answers, but they describe different realities. One is a static measure and the other dynamic.

<sup>14</sup> The reasons were pre-coded and there was no prompting when posing the question to respondents. Post-coding adjustments were made as reasons surfaced that were not anticipated prior to the field work.

<sup>15</sup> In the last section of both the village and household surveys, we asked questions that evaluate the impacts of each forest protection/REDD+ intervention at the site. We are confident that the respondents clearly understood exactly which interventions we were discussing, because we conducted a prior survey (“Survey of Village Interventions”) in which we carefully segregated all interventions into specific categories, and identified the exact local name of each specific intervention. This ensured that there was no confusion about which interventions we meant, and what the interventions intended.

protection laws and regulations, land use planning (if aimed at forest protection); and challenging claims made by internal or external agents to convert local forests to non-forest use. We call RFAC tenure-related because these interventions tend to constrain historic customary rights of local stakeholders to local forests, or land claims made on forest lands and resources by outsiders. At many sites, these types of interventions were implemented primarily by the government, sometimes – but not always – in coordination with the REDD+ proponent organization.

Table 1 shows the distribution of RFAC and TC interventions as documented across the sample of villages and households. High variation of intensity of deployment is evident, defined as the percentage of villages where an intervention is implemented, and/or the percentage of households involved in the intervention.<sup>16</sup> The table shows that although the interventions may have nominally reached many villages (see “village survey” column), the implementation of the interventions tends to reach only a portion of village households (see “household survey” column). The table also shows that while either RFAC or TC interventions are implemented universally and equally across control and intervention villages in Brazil and Peru, implementation is disproportionately focused on intervention villages and households in Cameroon, Tanzania, and Indonesia.<sup>17</sup> In Brazil and Peru, the reason for implementation of RFAC interventions across control and intervention villages is that most consisted of either environmental patrols and fines by government actors (across Brazilian sites) or land use restrictions in Brazil nut concessions (one site in Peru). Although these interventions were not implemented by REDD+ proponents, they were key strategies to reduce deforestation and forest degradation in these areas (Duchelle et al., 2017).

### 2.1. Data analysis

To address research question 1 (Table 2, Table 3, Fig. 2), we first present summary statistics on the distribution of tenure-related interventions (Table 1). Then we disaggregate the data on village land areas to describe the incidence of insecure tenure by phase and by intervention versus control villages, and estimate the effect of REDD+ by modeling the count of land areas with insecure tenure in a difference-in-difference framework. At the village level, we use the full sample of villages, both because of the small sample size and because the villages were “pre-matched.” Specifically, we selected our sample of villages to balance baseline characteristics by pre-matching with rapid rural appraisal data (Sills et al., 2017). We estimate a multi-level model of the count of village land areas perceived to have insecure tenure as a function of treatment (control/intervention), time (before-after) and their interaction, with site as a random effect, using the “glmer” function in the glmer package (Bates, Maechler, Bolker, & Walker, 2015). We assess statistical significance of the coefficients at the 1% (\*\*\*), 5% (\*\*), and 10% (\*) levels.

At the household level, we also estimate multilevel regressions using matched data in a “difference-in-difference” framework to assess changes in the insecurity of agricultural and forest land used and controlled by the household. We first assessed whether attrition bias is likely to be a significant concern, considering that in phase 2, we were able to locate and interview only 3299 households out of the 3944 interviewed in phase 1 (16% attrition). Using

<sup>16</sup> We define a household as being involved if it is an intended target or beneficiary in the implementation of the intervention (e.g. household’s forest access has been or will be reduced, or has or will receive livelihood benefits). We do not consider the household involved if it is indirectly affected by another household’s involvement (e.g. household is in resource competition with an involved household whose access to forest has been decreased) or if it is merely aware of the intervention.

<sup>17</sup> In Brazil and Peru there are government-level tenure-related interventions applied on a wide scale, that is, both in control and intervention villages.

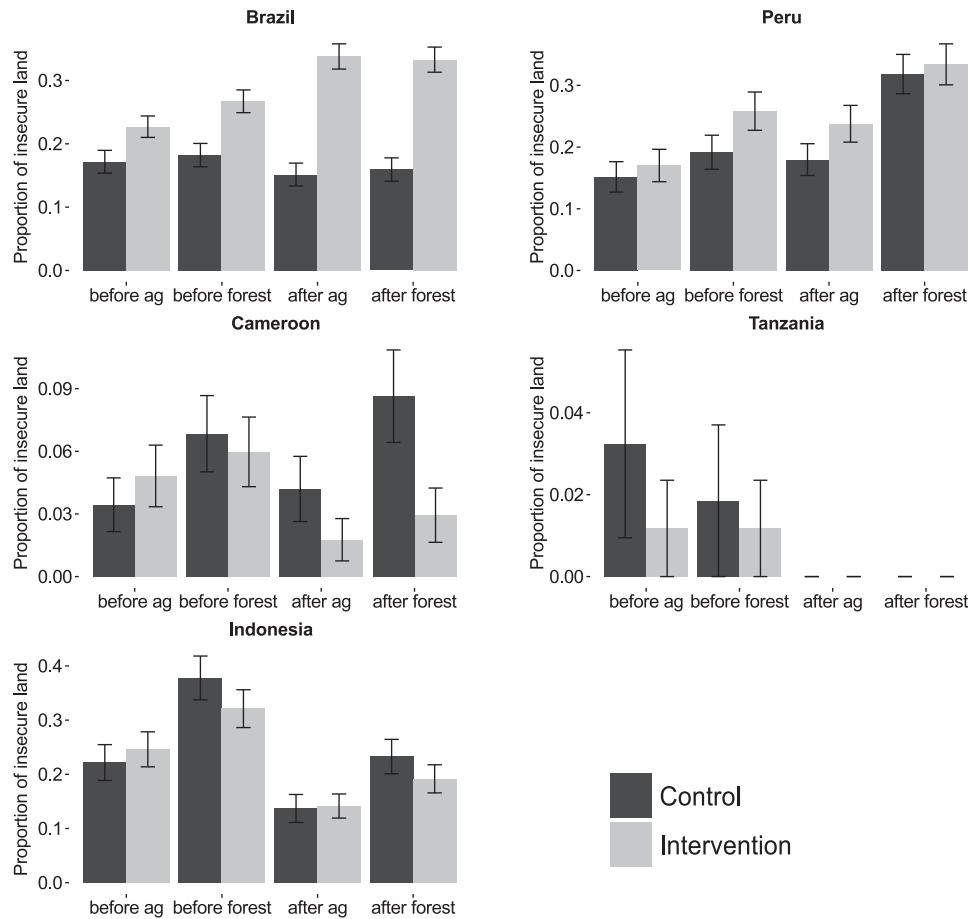


Fig. 2. Change in tenure insecurity at the household level, comparison of agricultural and forest lands.

Table 1

Distribution of tenure-related interventions across countries and villages, and degree of involvement by study households, Phase 2.

Country	Category	Village survey			Household survey				
		N	Percent of villages with RFAC	Percent of villages with TC	Percent of villages with RFAC or TC	N	Percent of households engaged in RFAC	Percent of households engaged in TC	Percent of households engaged in RFAC or TC
Brazil	Total	37	100.0%	75.7%	100.0%	1048	63.3%	15.0%	74.3%
	Intervention	21	100.0%	76.2%	100.0%	605	66.3%	49.4%	79.8%
	Control	16	100.0%	75.0%	100.0%	443	59.1%	48.8%	66.8%
Peru	Total	16	100.0%	50.0%	100.0%	495	60.8%	14.1%	60.8%
	Intervention	8	100.0%	50.0%	100.0%	249	57.8%	27.7%	57.8%
	Control	8	100.0%	50.0%	100.0%	246	63.8%	0.4%	63.8%
Cameroon	Total	13	84.6%	38.5%	84.6%	474	37.6%	18.6%	41.1%
	Intervention	6	100.0%	83.3%	100.0%	254	47.2%	34.6%	53.9%
	Control	7	71.4%	0.0%	71.4%	220	26.4%	0.0%	26.4%
Tanzania	Total	30	76.7%	26.7%	90.0%	396	18.9%	2.3%	19.2%
	Intervention	23	78.3%	34.8%	95.7%	206	26.2%	4.4%	26.7%
	Control	7	71.4%	0.0%	71.4%	190	11.1%	0.0%	11.1%
Indonesia	Total	45	33.3%	17.8%	40.0%	1340	5.0%	2.5%	6.7%
	Intervention	25	60.0%	32.0%	72.0%	681	9.8%	4.8%	13.2%
	Control	20	0.0%	0.0%	0.0%	659	0.0%	0.0%	0.0%

Note: “RFAC” is “restrictions on forest access and conversion” and “TC” is “tenure clarification.”

the phase 1 data, we found that tenure insecurity is not significantly related to either attrition status or the interaction of attrition status and village type (intervention vs. control), suggesting that attrition bias is not likely to affect our particular model (Beckett, Gould, Lillard, & Welch, 1988). We therefore proceeded to perform genetic matching with the sample of households interviewed in both phase 1 and phase 2, using the package Matching (Sekhon, 2011) and MatchIt (Ho, Imai, King, & Stuart, 2011) in R

(R Core Team, 2015) to identify a well-balanced sub-sample of households for further analysis.

The matching process was designed to obtain balance on five broad categories of covariates: (1) household socioeconomic indicators (total value of physical assets, total income, indices of house quality and condition, access to utilities); (2) household demographics (age and gender and years of education of household head; household size; dependency ratio); (3) household use of the forest

**Table 2**  
Difference-in-difference results on change in tenure insecurity at the village level.

		N	Difference	Village lands insecurity			
				Estimate	Std. Error	Z-value	Pr (> z )
POOLED	Intercept	N = 283		−0.51	0.52	−0.98	0.327
	BA		−2.04%	−0.38	0.27	−1.40	0.161
	CI		11.96%	0.34	0.25	1.36	0.173
	BACI (DiD)		−3.25%	−0.02	0.35	−0.05	0.962
BRAZIL	Intercept	N = 74		−0.84	0.68	−1.25	0.212
	BA		23.84%	0.80	0.63	1.28	0.201
	CI		34.52%	1.22	0.63	1.96	0.050*
	BACI (DiD)		16.37%	0.96	0.96	1.01	0.314
PERU	Intercept	N = 32		0.24	0.40	0.60	0.549
	BA		8.85%	−0.02	0.62	−0.03	0.977
	CI		−21.88%	−0.93	0.59	−1.58	0.114
	BACI (DiD)		21.89%	1.03	0.89	1.16	0.247
CAMEROON	Intercept	N = 26		0.00	0.53	0.00	1.000
	BA		−17.69%	0.08	0.67	0.12	0.905
	CI		51.59%	2.48	1.17	2.12	0.034**
	BACI (DiD)		−54.84%	−2.68	1.33	−2.02	0.043**
TANZANIA	Intercept	N = 61		−0.87	0.80	−1.09	0.277
	BA		−14.73%	−1.78	1.16	−1.54	0.124
	CI		−18.33%	−1.14	0.84	−1.36	0.174
	BACI (DiD)		6.22%	0.00	1.59	0.00	1.000
INDONESIA	Intercept	N = 90		−0.38	0.32	−1.18	0.238
	BA		−10.49%	−0.82	0.36	−2.29	0.022**
	CI		13.90%	0.32	0.30	1.06	0.288
	BACI (DiD)		−5.88%	−0.07	0.46	−0.16	0.872

Note: For the pooled sample and each country, the columns report the total number of villages and the difference in the percent of land areas that are insecure, comparing before and after (BA), control and intervention (CI), and the difference in difference, or the change in intervention villages relative to change in control villages (BACI). Differences are calculated as a double average, i.e., first averaging the percentage insecurity for each village to account for variable number of land parcels among villages, and then averaging at the country level. The next set of columns reports estimation results for multilevel regressions, including the coefficient, standard error, z-value, p-value and statistical significance at  $p < 0.10$  (\*),  $p < 0.05$  (\*\*), and  $p < 0.01$  (\*\*\*) for the intercept, an indicator for phase 2 (after), an indicator for intervention, and the interaction of those two indicators.

**Table 3**  
Difference-in-difference results on change in tenure insecurity at the household level.

		N	Household agricultural land tenure insecurity				Household forestland tenure insecurity				
			Estimate	Std. Error	z value	Pr(> z )	Estimate	Std. Error	z value	Pr(> z )	
POOLED	Intercept	N = 5781	−8.16	0.35	−23.59	<0.0001	N = 4194	−10.28	0.47	−21.76	<0.0001
	BA		−0.66	0.44	−1.47	0.141	0.09	0.59	0.15	0.883	
	CI		−0.44	0.35	−1.25	0.212	0.19	0.49	0.37	0.708	
	BACI (DiD)		0.89	0.52	1.69	0.091†	0.30	0.70	0.43	0.666	
BRAZIL	Intercept	N = 1602	−9.68	0.61	−15.80	<0.0001	N = 1578	−10.77	0.61	−17.61	<0.0001
	BA		−1.03	0.86	−1.19	0.235	−0.52	0.84	−0.62	0.538	
	CI		−0.52	0.65	−0.80	0.422	0.04	0.66	0.06	0.950	
	BACI (DiD)		1.79	0.99	1.82	0.069†	0.87	0.97	0.90	0.369	
PERU	Intercept	N = 804	−11.64	1.35	−8.65	<0.0001	N = 753	−11.76	1.56	−7.53	0.000
	BA		0.36	1.76	0.20	0.839	4.25	1.16	3.67	<0.001***	
	CI		−0.30	1.55	−0.19	0.848	2.10	1.37	1.53	0.125	
	BACI (DiD)		0.27	2.13	0.13	0.899	−2.18	1.31	−1.65	0.098†	
CAMEROON	Intercept	N = 821	−3.41	0.55	−6.25	<0.0001	N = 638	−10.45	1.40	−7.45	<0.0001
	BA		0.70	0.31	2.23	0.026**	−0.12	1.73	−0.07	0.945	
	CI		0.72	0.73	0.99	0.323	−0.48	1.60	−0.30	0.763	
	BACI (DiD)		−1.62	0.37	−4.40	<0.001***	−0.39	2.46	−0.16	0.873	
TANZANIA	Intercept	N = 681	−5.93	2.42	−2.45	0.014					
	BA		−52.03	460.84	−0.11	0.910					
	CI		−0.86	2.18	−0.39	0.694					
	BACI (DiD)		23.90	515.23	0.05	0.963					
INDONESIA	Intercept	N = 1873	−2.79	0.43	−6.46	<0.001	N = 753	−2.25	0.56	−4.00	<0.0001
	BA		−0.43	0.17	−2.61	0.009***	−1.21	0.54	−2.26	0.024**	
	CI		0.43	0.45	0.97	0.334	−0.15	0.48	−0.31	0.754	
	BACI (DiD)		−0.13	0.20	−0.65	0.514	0.19	0.63	0.30	0.767	

Note: The multilevel regression levels of significance are indicated as "\*\*\*" at  $p < 0.10$ , "\*\*" at  $p < 0.05$  and "\*" at  $p < 0.01$ . The estimates in the "BA" line are the effects of after (vs. before) on tenure insecurity. The estimates in the "CI" line are the effects of intervention (vs. control) villages. "BACI" is the interaction term and thus the coefficient is the change through time in intervention villages relative to their control, i.e. the effect that is attributable to REDD+. Reported N are the sample sizes used for estimation of each model: matched samples of households controlling agricultural or forest land.

(hectares of forest owned, hectares of land cleared, share of total income from forest); (4) household involvement in existing/previous forest conservation activities (government and/or NGO support, PES payments); and (5) village characteristics (distance to road and/or river with year-round access, distance to market).

For each of these five categories, we first performed a principal component analysis (PCA) using the PCAmixdata package for R (Chavent, Kuentz, Labenne, Liqueur, & Saracco, 2014), which allows integration of quantitative and qualitative data, in order to (a) reduce the number of individual covariates to match on, while

**Table 4**

Top ten reasons at the village level why tenure has become more insecure in the two years prior to the interview, in descending order from most frequent reason.

Reasons	Village Type	Brazil	Cameroon	Indonesia	Peru	Tanzania	Total	Percent of all reasons
Problems with outside company	Total	3	5	25	0	1	34	16.9%
	Intervention	3	1	5	0	1	10	
	Control	0	4	20	0	0	24	
Have no title, no or weak document, or weak claim	Total	5	0	20	1	2	28	13.9%
	Intervention	4	0	3	0	2	9	
	Control	1	0	17	1	0	19	
Problems with or fear/distrust of government	Total	5	5	1	12	0	23	11.4%
	Intervention	3	3	1	7	0	14	
	Control	2	2	0	5	0	9	
Rights can be easily revoked	Total	1	3	12	0	0	16	8.0%
	Intervention	1	2	3	0	0	6	
	Control	0	1	9	0	0	10	
Competition for land with people from other village	Total	0	0	13	1	1	15	7.5%
	Intervention	0	0	8	0	1	9	
	Control	0	0	5	1	0	6	
Conflicts over land	Total	2	0	7	0	1	10	5.0%
	Intervention	2	0	4	0	1	7	
	Control	0	0	3	0	0	3	
Unclear border, boundaries	Total	0	0	7	1	1	9	4.8%
	Intervention	0	0	4	0	1	5	
	Control	0	0	3	1	0	4	
Invasions/fear of invasions (outsiders, indigenous, etc.)	Total	0	1	5	2	0	8	4.0%
	Intervention	0	0	3	1	0	4	
	Control	0	1	2	1	0	4	
Natural conditions are poor or pose risk	Total	0	0	0	6	0	6	3.0%
	Intervention	0	0	0	3	0	3	
	Control	0	0	0	3	0	3	
Ambiguity of rights with <i>de facto</i> open access	Total	1	3	1	0	0	5	2.5%
	Intervention	1	2	0	0	0	3	
	Control	0	1	1	0	0	2	

**Table 5**

Top ten reasons at the village level why tenure has become more secure in the two years prior to the interview, in descending order from most frequent reason.

Reasons	Village Type	Brazil	Cameroon	Indonesia	Peru	Tanzania	Total	Percent of all reasons
REDD+ initiative has strengthened our rights claims on land	Total	0	2	3	0	4	9	9.9%
	Intervention	0	2	3	0	4	9	
	Control	0	0	0	0	0	0	
Clear boundaries or borders	Total	0	1	3	1	2	7	7.7%
	Intervention	0	1	3	1	2	7	
	Control	0	0	0	0	0	0	
Rights are now enforced	Total	0	3	1	0	1	5	5.5%
	Intervention	0	2	1	0	1	4	
	Control	0	1	0	0	0	1	
Rights can no longer be revoked	Total	0	1	4	0	0	5	5.5%
	Intervention	0	0	4	0	0	4	
	Control	0	1	0	0	0	1	
Villagers recognize rights within community	Total	0	0	5	0	0	5	5.5%
	Intervention	0	0	5	0	0	5	
	Control	0	0	0	0	0	0	
Land is owned	Total	2	1	1	0	0	4	4.4%
	Intervention	0	0	1	0	0	1	
	Control	2	1	0	0	0	3	
Ownership recognized by active land management	Total	0	1	2	1	0	4	4.4%
	Intervention	0	1	2	1	0	4	
	Control	0	0	0	0	0	0	
Rights recognized or governed customary law	Total	0	0	2	0	2	4	4.4%
	Intervention	0	0	2	0	0	2	
	Control	0	0	0	0	2	2	
Rights recognized/governed by village authorities	Total	0	0	3	0	1	4	4.4%
	Intervention	0	0	3	0	1	4	
	Control	0	0	0	0	0	0	
Government project connected to REDD+ initiative	Total	2	0	1	0	0	3	3.3%
	Intervention	0	0	1	0	0	2	
	Control	2	0	0	0	0	1	

(b) maintaining the likelihood that the sample will also be matched on unobserved variation correlated with any of the variables used in the PCA. We matched on the first three PCA dimensions of each of the five groups of covariates, which ensured a cumulative explained variation of over 40% of all categories, in addition to the propensity score based on these principal components.

Subsequently, for each country we estimated multilevel regressions of the proportion of household (agricultural or forest) land holding (in ha) perceived to have insecure tenure, using the same modeling approach as for village-level data. All regressions were tested for overdispersion and fitted with an individual-level crossed random effect as needed (Harrison, 2014). The model of



**Table 6**  
Perceived effect of tenure-related interventions (RFAC, TC, and both RFAC and TC) on community well-being in intervention villages, Phase 2. Number and percent of evaluations of tenure interventions at village level.

Country	Effect of tenure intervention on community well-being	RFAC		TC		Total	
		N	Percent	N	Percent	N	Percent
Brazil	Total	31	100.0%	16	100.0%	47	100.0%
	Negative	12	38.7%	4	25.0%	16	34.0%
	Neutral	17	54.8%	8	50.0%	25	53.2%
	Positive	2	6.5%	4	25.0%	6	12.8%
Peru	Total	11	100.0%	4	100.0%	15	100.0%
	Negative	2	18.2%	1	25.0%	3	20.0%
	Neutral	8	72.7%	3	75.0%	11	73.3%
	Positive	1	9.1%	0	0.0%	1	6.7%
Cameroon	Total	6	100.0%	4	100.0%	10	100.0%
	Negative	1	16.7%	0	0.0%	1	10.0%
	Neutral	2	33.3%	2	50.0%	4	40.0%
	Positive	3	50.0%	2	50.0%	5	50.0%
Tanzania	Total	21	100.0%	12	100.0%	33	100.0%
	Negative	3	14.3%	0	0.0%	3	9.1%
	Neutral	10	47.6%	9	75.0%	19	57.6%
	Positive	8	38.1%	3	25.0%	11	33.3%
Indonesia	Total	22	100.0%	11	100.0%	33	100.0%
	Negative	0	0.0%	0	0.0%	0	0.0%
	Neutral	11	50.0%	6	54.5%	17	51.5%
	Positive	11	50.0%	5	45.5%	16	48.5%
All	Total	91	100.0%	47	100.0%	138	100.0%
	Negative	18	19.8%	5	10.6%	23	16.7%
	Neutral	48	52.7%	28	59.6%	76	55.1%
	Positive	25	27.5%	14	29.8%	39	28.3%

Note: "RFAC" is restrictions on forest access and conversion" and "TC" is tenure clarification.

the pooled pan-tropical data was fitted in the same way, with the addition of "country" as a nested random effect.

To address questions 2 and 3, we rely on descriptive statistics of responses in the village focus groups (see Tables 4, 5, and 6 and Annex 2) and household interviews (Annex 3). To summarize perceived reasons for increased tenure insecurity and security, we spotlight the top ten reasons reported in the focus groups (Tables 4 and 5 respectively). With respect to tenure insecurity (Table 4), this includes 154 (77%) of the total 201 reasons offered for decreased security in the 82 of 388 Phase 2 land areas where tenure security is perceived to have decreased. With respect to tenure security (Table 5), the top ten reasons include 50 (55%) of the total 91 reasons offered and are drawn from 48 of 388 Phase 2 land areas where tenure security is perceived to have increased. For both Tables 4 and 5, the cells report the number of villages where a particular reason for increased tenure insecurity or security was mentioned in the group interviews. In analyzing the well-being effect of tenure-related interventions (Table 6), we classify the perceived effects at the village level (negative, neutral, positive) by country, and by type of intervention (RFAC alone, TC alone, both RFAC and TC).

### 3. Results

1. What was the effect of REDD+ on perceived tenure insecurity of village residents?

Table 2 displays the village-level difference-in-difference results. It shows that tenure insecurity has increased over time in Brazil and Peru (irrespective of control and intervention, i.e. positive percent in the column "Difference" and the row "BA"), while decreasing in the other countries. The change over time is statistically significant only in Indonesia (statistically significant negative coefficient estimate in the BA row). In Brazil and Cameroon, we note a significant difference in the level of insecurity at baseline, with both countries showing higher insecurity in the villages selected for intervention (statistically significant coefficient estimates in the CI row). While in Brazil, tenure insecurity then

followed similar trends in intervention and control villages over time, the trends diverged in Cameroon with a stronger decrease in tenure insecurity in the intervention villages, resulting in the only statistically significant effect of REDD+ on tenure insecurity at the village level. The limited statistical significance of the results in this table may partly reflect the small sample size of villages (by country) and the variation in trends across country (in the pooled results). Thus, the patterns in the difference column are also worth considering. In some countries, the change in the level of tenure insecurity is more favorable (in the sense of a more pronounced move toward security) in intervention than control villages (e.g. Cameroon, Indonesia), while in others, it is less favorable in intervention than control villages (e.g. Brazil, Peru, Tanzania). In our pooled results across all sites and countries at the village level, the difference suggests that REDD+ reduces tenure insecurity, but the effect is not statistically significant.

Table 3 displays household-level difference-in-difference results, disaggregated between agricultural and forest household lands, and Fig. 2 shows these results in graphical form.

The difference-in-difference results at the household level (Table 3) show that in REDD+ intervention villages in Brazil, tenure insecurity for agricultural lands increased relative to control sites, while there was no difference in the trends for forest lands. In Peru, tenure insecurity of forest land increased over time, but this increase was smaller in intervention villages. In Cameroon, household agricultural land insecurity increases over time in control villages, but decreases in intervention villages. In Indonesia, household tenure insecurity decreased on both agricultural and forest lands, in both control and intervention villages. In Tanzania, we detect no significant change in agricultural land tenure. We do not report estimation results for forest lands in Tanzania, because only a few households control forest land and they consistently reported a low level of tenure insecurity.

The pooled results at the household level show that REDD+ has increased tenure insecurity on agricultural lands and did not affect forest land tenure insecurity. On the basis of this result, we reject the hypothesis that REDD+ decreases smallholder tenure insecurity. This is further supported by the country level results: in three

countries, the point estimates suggest that REDD+ increased insecurity of agricultural lands, significantly in only one country, and in two countries, the point estimates suggest that REDD+ decreased tenure insecurity of agricultural lands, significantly in only one country. Thus, there is clearly no general pattern of improvements in smallholder perceptions of agricultural tenure security due to REDD+.

2. What are the main reasons for change in the level of tenure insecurity and security from Phase 1 to Phase 2 perceived by village residents in control and intervention villages?

In answer to the question about the direction of tenure security change in the two years prior to the Phase 2 interview (see Question 1), the results show that there was “no change” at an average of two-thirds of the land areas across the sample countries. In Brazil, Peru, Cameroon, and Indonesia the number of land areas with lower tenure security exceeded those with higher tenure security, whereas the number of land areas with higher security exceeded those with lower security only in Tanzania (Annex 2).

Across the sample there were 82 of 388 Phase 2 land areas (21.1%) where tenure insecurity is perceived to have increased, and 201 reasons for the increase. The top ten reasons, accounting for 77% of all reasons stated in the village-level interviews, are reported in Table 4.<sup>18</sup> There are at least<sup>19</sup> three reasons related to external claims on local forests: “problems with outside company,” ranked no. 1 at 16.9%; “competition for land with people from other village,” ranked no. 5 at 7.5%; and “invasions or fear of invasions” ranked no. 8 at 4.0%. Jointly, these three reasons (28.4%) make it clear that outside claims on local forests are the most important single explanation for increasing tenure insecurity. The hypothesis that external claims on local forests are the main reason for tenure insecurity is upheld.

It is noteworthy that most of the reasons for increased tenure insecurity given are concentrated in Indonesia. This is a reflection of the fact that 37 of the 82 land areas (45%) with increased tenure insecurity are in that country, and this in turn is a reflection of the fact that 199 of the 388 land areas (51.3%) are in Indonesia. The high concentration of land areas in Indonesia was a methods choice: the Indonesia team decided to investigate tenure issues at a higher level of detail than the other country teams. The high rate of the response “problems with outside company” in Indonesia is because of the large number of study villages where oil palm and other companies have made claims.

The second most prevalent answer, “have no title, no or weak document, or weak claim,” also has a high profile in Indonesia. In Indonesia, people understand that their land tenure would be stronger (and/or recognized by government) if they had a land certificate or title. However, the process is costly and difficult so very few villagers go through it. The strong showing of this reason in Brazil makes sense given the lack of formal land titles at our study sites. Many properties at our study sites have been georeferenced through the Rural Environmental Registry (CAR) program, but there is no guarantee that this will lead to land titles (Damasceno, Chiavari, & Lopes, 2017).

In Peru, the reasons for higher tenure insecurity have largely to do with “problems with or fear/distrust of government authorities” and “natural conditions are poor/pose risk.” At the Madre de Dios site, there are overlapping claims to Brazil nut and timber concessions, and Brazil nut producers are highly distrustful of govern-

ment authorities (Garrish, Perales, Duchelle, & Cronkleton, 2014). At the Ucayali site, the dynamics of flooded forests – including more flooding than normal in recent years – alter local people’s access to landholdings (Rodriguez-Ward & Paredes del Aguila, 2014).

Responses at the household level on reasons for tenure insecurity at the time of the interview (and not reasons for increasing tenure insecurity at the village level as above) partly corroborate these findings. Six of the top ten reasons are the same as those in Table 4, though with different rankings. The rankings are: “Have no title, no or weak document, or weak claim” (33.2%); “Land is borrowed or rented” (11.5%); “Problems with or fear/ distrust of government authorities” (9.5%); “Rights can be easily revoked” (7.9%); “Problems with outside company” (5.6%); “Changes in law or policy” (4.2%); “Rights are only temporary” (4.2%); “Invasions or fear of invasions” (3.2%); “Existential fear” (3.0%); and “Conflicts over land” (2.2%). Recall, however, (from the methods section), that these are different questions at different scales, so it is expected that the answers would be different.

Across the sample there were 48 of 388 land areas (12.4%) where tenure security is perceived to have increased, and 91 reasons for the increase. The top ten results, accounting for 55% of all reasons stated in the village-level interviews, are reported in Table 5. The most prevalent reason is “REDD+ initiative has strengthened our rights claims” (9.9%). Some other reasons are likely REDD+-related, inasmuch as the majority (42 of 50) are reported in intervention villages and the stated reasons correspond to the aims of proponents e.g., boundary clarification and enforcement of rights. This finding supports the hypothesis that REDD+ is the main (single) reason for improved tenure security, however it falls short of demonstrating that REDD+ explains most tenure security improvements where they are reported. As in Table 4, the results have a disproportionately high count for Indonesia, with 20 of the 48 land areas (41.6%) with improved tenure security located in that country.

3. How do intervention village residents evaluate the impact of tenure-related interventions on community well-being?

Table 6 shows the results on the perceived effect of tenure-related interventions on community well-being at the village level. The units in the table are evaluations of specific tenure-related interventions by respondents in the village-level interviews. The table specifies the results in terms of the two types of intervention (restriction on forest access and conversion, tenure clarification), and the aggregate of the two (all tenure-related interventions).

The results for all countries (see bottom of table) show a net positive view, with 16.7% of villages having a negative view, 55.1% a neutral view, and 28.3% a positive view. The results are corroborated at the household level (see Annex 3) with 18.6% holding a negative view, 35.5% a neutral view, and 46.0% a positive view. Why is the positive outlook stronger at the household than the village level? We do not know, but it is clear there is a different logic at work in evaluating the security of village lands (encompassing dominant tenure types in land areas) as compared to household lands (i.e. lands largely under the control of the household itself).

Looking at the results for specific countries at the village level, we see that Cameroon, Tanzania, and Indonesia have a net positive evaluation of the well-being impact of tenure-related interventions with a tendency toward a higher share of non-negative responses, whereas Brazil and Peru have a net negative evaluation, with fewer villages reporting positive responses (Table 6). At the household level, there is a net positive view of tenure-related interventions in all countries (Annex 3).

The results suggest a somewhat less positive evaluation of the impact of restrictions on forest access and control (RFAC) than tenure clarification (TC) interventions, both at the village and household level (Table 6, Annex 3). Nevertheless there is a net pos-

<sup>18</sup> Although the coding labels in Tables 4 and 5 may suggest a degree of overlap, we carefully defined the codes to avoid this problem and assure that the responses are orthogonal. In the process of assigning codes, we were careful to specify middle-level categories (avoiding too much generality or detail), thus avoiding the typical coding problem of gaps or overlaps among categories.

<sup>19</sup> Other reasons (e.g. “conflicts over land,” “unclear borders and boundaries”) may disguise instances of external claims on local forests.

itive view not just of TC interventions, but also of RFAC interventions. We can therefore reject the hypothesis that local stakeholders will have a favorable view of tenure clarification interventions, and a negative view of restrictions on forest access and conversion interventions, at the level of all countries. It should be taken into account, however, that this analysis does not distinguish RFAC interventions that restrict access for village households versus for actors external to the village. Also, the hypothesis is partly supported in Brazil and Peru, where there is a net negative evaluation of the impact of RFAC interventions (both countries) and of the TC interventions (Peru only) at the village level (Table 6). At the household level, there is no net negative view of RFAC or TC interventions in any country (Annex 3). However, results in a separate analysis of interventions at the household level highlight how heavy-handed RFAC interventions applied on their own (i.e. without incentives in the mix) negatively affected tenure security and local perceptions of well-being (Duchelle et al., 2017).

There appears to be a correspondence between trends in perceived tenure insecurity between Phase 1 and Phase 2 and the appraisal of tenure-related interventions. Tenure insecurity tends to increase over time in Brazil and Peru (Table 2, BA result), and this appears to be corroborated by the fact that Brazil and Peru show the least positive evaluations of the impact of tenure-related interventions on community well-being (Table 6). Conversely, the decrease in tenure insecurity between Phase 1 and Phase 2 in Indonesia (Table 2, BA result) is matched by more positive evaluations of the impact of tenure-related interventions in that country (Table 6, Annex 3). Cameroon, Tanzania also show the same pattern, although the decrease in tenure insecurity was not significant at the village level (Table 2, BA result).

#### 4. Discussion

The overarching question of this article is: What impact did REDD+ have on the security of tenure rights for local stakeholders? The results reveal a patchwork of progress and lack of progress across land uses and countries.

Among the areas of progress we can see the following. As reported in village focus groups, in three out of five countries, tenure insecurity appears to have decreased over time, significantly so in Indonesia. In Cameroon, REDD+ villages have higher tenure insecurity, but REDD+ has effectively reduced that insecurity (Table 2). At the aggregate level, tenure insecurity at the village level decreased more in intervention as compared to control, although the difference is not statistically significant with our relatively small sample of villages (Annex 2). By disaggregating land in agricultural and forest use, we find that the bundle of interventions in REDD+ villages increased tenure insecurity of agricultural land held by smallholders in Brazil but decreased the tenure insecurity of forest land held by smallholders in Peru. In contrast to these mixed findings from the difference-in-difference analysis, smallholders have a moderately net positive view of tenure-related interventions at the village level (Table 6), and a relatively strong net positive view at the household level (Annex 3). Where they report improvements in tenure security, REDD+ interventions are a leading reason, although not necessarily a dominant one (Table 5).

Lack of progress can be seen in the following results. For all of the effort deployed to reduce tenure insecurity in REDD+ in the period 2010 to 2014, it has barely changed across all countries, and we only find evidence of a decrease in tenure insecurity attributable to REDD+ in one country among the five: Cameroon (Tables 2 and 3).

There is an inverse relationship between the intensity of deployment of tenure-related interventions and success in reducing tenure insecurity. Brazil and Peru have high rates of tenure-related intervention deployment (Table 1), but low success in

reducing tenure insecurity (Table 2), and relatively low perceived positive impact of tenure-related interventions (Table 6). This may reflect the fact that organizations other than project proponents – most notably the government – are carrying out tenure-related interventions in those countries. Conversely, Cameroon, Tanzania, and Indonesia have relatively low tenure-related intervention deployment (Table 1), relatively high success in reducing tenure insecurity (Table 2), and relatively high perceived positive impact of tenure-related interventions (Table 6). Indonesia achieved success in reducing tenure insecurity in both control and intervention villages, and the success is not attributable to REDD+ (Table 3). This is perplexing considering that all tenure-related interventions were deployed in intervention villages and households, and none in controls (Table 1).

What can be done to improve the slow progress in laying an appropriate foundation for REDD+? To answer that question, we must first address a series of questions that surface from the summary of findings above.

Why does REDD+ increase smallholder perceptions of tenure insecurity over agricultural lands in the Brazilian sites, in spite of institutional collaboration between proponents, government, and civil society organizations that might be expected to benefit smallholders?

Subnational REDD+ initiatives may be targeted at highly-forested and highly-threatened areas where the carbon gains of avoiding deforestation and forest degradation will be greatest. Many of the REDD+ sites in our sample are located on such forest frontier areas where land rights and markets are also notoriously precarious (Holland, Coomes, & Robinson, 2016). Although Brazil has allocated a comparatively large share of its forest estate to formal control by indigenous peoples and local communities (RRI, 2014: 15), the country ranks low on secure property rights on a world scale (Damasceno et al., 2017; Mueller, 2016). While proponents took early steps to work with governmental agencies to clarify land tenure at these sites and engage in the CAR process (Duchelle et al., 2014), real progress on the ground has been slower and more problematic than expected (Gebara, 2014). Most of the RFAC interventions applied in the study villages were government restrictions on smallholder clearing of forests for agriculture, which can translate into low levels of tenure security for people without clear land rights (i.e. title). Across the Brazilian Amazon, these government restrictions increasingly mean that people without clear land rights (i.e. title) report low levels of tenure security. In a case study in the eastern Brazilian Amazon, Viana et al. (2016) found that even collaborative efforts between local government, civil society, and landowners to reduce deforestation can end up marginalizing smallholders. Indeed across all sites in Brazil, lack of title, fear of rights being revoked, and government restrictions on land use were the main reasons given for land tenure insecurity in both intervention and control villages.

In Peru, why has tenure insecurity generally worsened over time on forest lands held by smallholders, and how has REDD+ effectively dampened that trend for households in intervention villages?

It is not surprising that forest areas are more insecure than agricultural areas in Peru, as this fits with the findings of previous studies (e.g. Cronkleton & Larson, 2015) and is linked to the law that declares forests public property and prohibits their titling. What is less clear is why there is a highly significant increase in insecurity over time in forests, and why there is significantly less increase in intervention than in control villages, despite concern about “carbon cowboys” operating in Peru.<sup>20</sup>

<sup>20</sup> Carbon cowboys are dubbed “questionable carbon project developers” by the media, according to Babon, McIntyre, & Sofe, 2012; see also de Jong, del Castillo Torres, & Salazar, 2012.

The results in Table 4 provide a potential explanation for the overall worsening of tenure security over forests. It is notable that 12 of 16 villages named “problems with or fear/distrust of government” as one of the reasons for an increase in insecurity. A review of other village data on land conflict shows that all eight villages in Madre de Dios have problems with their Brazil nut concessions – problems that must be resolved by government authorities. Many concessions have overlapping borders (Garrish et al., 2014). Also, by law, the concessionaires are responsible for outsiders’ incursions; in Phase 2 interviews, villagers mention issues with corrupt officials and needing to pay bribes to get issues resolved.

Overall tenure insecurity may have worsened due to other contextual factors. In 2014, for example, the indigenous activist Edwin Chota, who fought for his community’s land title and against illegal loggers, was murdered with three other men; the case drew national and international attention.<sup>21</sup> At the same time, the regions were in the midst of gubernatorial elections, land titles were being issued subject to multiple interpretations of regulatory procedures, and regulations relating to a new forestry law were still under negotiation (Kowler L.F. et al., 2016).

With regard to the better outcome in intervention than control sites, the research suggests three possible reasons. First, if distrust of government is a primary, common concern, then having an NGO working in the village, such as in the intervention villages, can somewhat mitigate this concern by providing the perception of support. The same could potentially be true for natural resource risks, which is the second most-mentioned reason by both groups. Second, the distribution of tenure-related interventions (Table 1) shows, at the household level, that almost 30% of households in intervention villages were involved in tenure clarification, compared to less than 1% in control villages. Finally, three explanations for increasing insecurity in Table 4 appear only in control villages, although only in one each: having a title or weak right, competition for land and unclear borders.

On the national scale, REDD+ has been a strong impetus for addressing and clarifying land and forest tenure rights, with multiple titling programs currently underway with substantial international support through REDD+-related finance. Most of these programs were beginning to hit the ground by the end of 2015, however, more than a year after the completion of the research, hence it is unlikely that they affected the results.

In Cameroon, what explains the success of REDD+ in reducing tenure insecurity, notably on household agricultural lands?

At the two Cameroon sites, the success of REDD+ in reducing tenure insecurity could be a result of the positive engagement of proponent organizations with local stakeholders. At the Mount Cameroon project, a protected area that encompasses Mount Cameroon National Park, a remnant of the Bomboko Forest Reserve and a leakage belt (Awono, Tambe et al., 2014), villagers are involved in a management committee which serves as a platform for discussion and planning of project activities, including reducing contestation over the ownership and access rights and ambiguity in forest land use. The boundaries between community lands and the Mount Cameroon National Park have been traced with the participation of the population. Community farmland recognized through the process was extended in some villages. More importantly, community members patrolled against illegal activities in the park, receiving in exchange a bonus payment when illegal activities were reported to the proponent (Awono, Tambe et al., 2014: 194). Even though villagers do not have official rights to their land, the collaborative management structure and conservation incentives

(which give local people a feeling of ownership) enabled the population to feel more secure. At the South East Cameroon site, not only have community projects been implemented, but conditional payments have begun, enhancing participant appreciation for the PES project. Villagers in Nkolonyeng and Nomedjoh have a community forest project, which by Cameroonian law entitles them to extract and sell timber resources. Payments to the community for carbon sequestration after it has renounced timber extraction at the South East Cameroon site has raised hopes that there would be positive impact on local livelihoods, even though it is not clear how long the payments will last. Most importantly at the South East Cameroon site, project activities and the distribution of PES benefits were decided through a participatory approach (Awono, Barreau, & Owona, 2014: 207–208, 216).

Although both projects have experienced towering challenges, they provide evidence that the participatory approach may be key to stakeholder engagement and satisfaction (Awono, Somorin, Eba’a Atyi, & Levang, 2014). The South East Cameroon case supports the point made by Karsenty and Assembé (2011) that successful REDD+ in Central Africa will require tenure clarification accompanied by an effective compensation system. Why does tenure security worsen in control villages? It is in part because some control villages are adjacent to the Dja Wildlife Reserve and the Mengine Gorilla Sanctuary at the South East Cameroon site, where stringent controls were imposed to stop illegal activities, including the bushmeat trade.

What explains the high rate of tenure security in Tanzania (compared to the other countries)?

At the Tanzania sites, the high rate of tenure security can be explained largely by tenure and land management conditions that predate REDD+, rather than REDD+ itself. Existing customary land rights are strong enough to provide security in many areas of the country. In 1999 the Village Land Act endowed more than 10,000 Village Councils with authority as land managers, and in the process acknowledged customary land rights are equivalent to rights secured through statutory channels (Alden Wily, 2001; Alden Wily, 2007: 27–28, 277). The Forest Act of 2002 gave Village Councils the authority to set aside forest areas as community-owned and managed Village Forest Reserves (Alden Wily, 2007: 27–28, 277). The Forest Act made it abundantly clear that “community forests are the spearhead of forest management, not a token add-on” (Alden Wily, 2007: 240). Among the countries that have pioneered devolution of forest ownership and management in Africa, Tanzania is the most advanced (Alden Wily, 2007: 277). This is true in spite of the fact that the formalization of village ownership is proceeding much slower than the statistics say (Lund, Sungusia, Mabele, & Scheba, 2017). The Land Act (different from the Village Land Act and also enacted in 1999) poses a challenge for the implementation of REDD+ because it enables the government to withdraw “surplus” (not yet registered) lands from villages (Vice President’s Office, 2013: 30). There are cases of large land acquisitions in Tanzania in recent years (e.g. Purdon, 2013) that might threaten land tenure security, but they have not happened in the vicinity of the research sites.

In Indonesia, how do we explain that perceived tenure insecurity has been reduced in both control and intervention villages, and that REDD+ has had no effect in this process, even though there are no tenure-related interventions in control villages?

First, in East Kalimantan, perceived tenure security has improved in both control and intervention areas because villagers were advised by the local forestry staff that their control of managed or planted lands will not be challenged even though they are located in the Forest Zone (*Kawasan Hutan*). Importantly, this was not recorded as an “intervention” because it was simply a policy clarification, yet it may have influenced perceptions of tenure security. Because control is recognized by proof of active land

<sup>21</sup> See, for example, an article in *The Guardian* reporting on the case, at <https://www.theguardian.com/world/2014/sep/09/illegal-loggers-blamed-for-of-peru-forest-campaigner>. Articles also appeared in Al Jazeera, BBC News, National Geographic, the Huffington Post, and others.



management, perception of security of tenure (both in control and intervention areas) can be enhanced by planting fallow and idle lands with tree crops (e.g., rubber and even oil palm). Second, most threats to perceived tenure insecurity come from outside the village, either migrants originating from other areas or large companies. In Phase 2, respondents in both control and intervention villages perceived few threats to tenure security from within the village and from the neighboring villages. Moreover, rights are recognized or governed by customary law, and people from neighboring villages tend to understand and respect customary laws, and are more aware of village boundaries. Hence, neighboring villagers are less of a problem than people from other areas who lack understanding and recognition of local custom and boundaries. Third, at least in some of our study areas, external actors such as oil palm and timber companies appear to have improved their engagement with local stakeholders, realizing that they need to do this to be able to continue with their activities. Importantly, communities are getting better and more proactive at negotiating with companies, both in control and intervention villages where they are affected. Fourth, in some villages (both control and intervention) a portion of the community prefers oil palm over REDD+, therefore diminishing (to them) the tenure challenge posed by the external claim. In this regard, REDD+ interventions have had relatively little influence on perceived tenure security.

Across all five country cases, four insights can be derived from the country-specific information supplied above. The first lesson is analytic and comparative, and the other three are in the realm of policy and implementation.

First, in comparing the five country cases, we reach the conclusion that respondent perception of tenure security is heavily conditioned by the context at the starting point and level of expectations. At one extreme, in Brazil, the perception of low and worsening tenure security is shaped by the reality of extreme and violent contestation and conflict across the country, and some REDD+ initiatives being located in places where these negative tendencies are elevated, placing high hurdles in the way of achievement. While efforts to link environmental compliance with tenure regularization at REDD+ sites held promise (Duchelle et al., 2014), the challenges of addressing decades-long land conflicts amidst the bureaucracy of titling land in the Brazilian Amazon are immense. While top-down command-and-control interventions (i.e. most of the RFAC interventions at our Brazilian study sites) have been linked to Brazil's recent success in reducing Amazonian deforestation (Assunção, Gandour, & Rocha, 2012), a clear negative effect of these interventions on households' perceived well-being has been documented (Duchelle et al., 2017). Tanzania, at the other extreme, is a country where tenure contestation and conflict tends to be relatively low, not just because of a relative absence of competition for land, but because of a legal and customary framework that has already provided a comparatively high level of security. In contrast to the situation in Brazil, land rights have already been delivered at a satisfactory level before REDD+ interventions began. Under these conditions, expectations began low, and they were easily exceeded when interventions began to deliver supplementary benefits. The other country cases lie between these extremes. In Peru, the starting point with regard to insecurity was somewhat similar to Brazil, with a common history of violence, including murders of environmental and land rights activists in the past decade (Global Witness, 2014). But there was little expectation with regard to REDD+ after a decade of virtual inaction on indigenous and community land tenure rights and a conception of REDD+ strongly clouded by the carbon cowboy rumors. In Cameroon, there is a moderate amount of land contestation, and historically, low expectations of what the

government has to offer and deliver in the way of rights and livelihoods. So two projects that deliver improved tenure security and livelihood benefits can not only meet an urgent need, but can also exceed low expectations. In Indonesia, there is a high level of land contestation and, as in Cameroon, a historically jaded outlook towards the national government on the issue of land rights.

Second, national-level forest tenure reform and/or action are an indispensable framework for achieving early, effective, and lasting increases in tenure security. This conclusion is ironic given the increase in tenure insecurity seen in Brazil (where national action on tenure reform is high), and the decrease in tenure insecurity in Cameroon (where national action on tenure is low). Nevertheless, we affirm this point recognizing that the diverging outcomes in Brazil and Cameroon are made relative rather than absolute by the conditioning factors of starting point and expectation. At least in theory, and probably in practice, it remains the case that in clarifying tenure, proponents are attempting to change circumstances the origin and scope of which lie far beyond their borders at the national level, so it is appropriate for the scale of the intervention to match the scale of the problem. Results over the next few years in Peru, as massive titling projects begin to bear fruit, will provide more insights on this issue.

Third, building on this last point, we affirm that it makes sense for proponents and government to collaborate on tenure clarification efforts. As pointed out earlier, proponents (together with local stakeholders) have the interest and local-level knowledge necessary to clarify tenure, and government actors have the leverage – provided that they can be freed of control by countervailing BAU interests. As above, we affirm this point in spite of the Brazil outcome. We also point to the Indonesia case as an example where proponents potentially benefit from the national One Map policy, even if proponent collaboration with government was minimal or non-existent.

Fourth, the Cameroon experience instructs us that an authentically participatory approach that delivers tangible early benefits can be a key to achieving success in reducing tenure insecurity for local stakeholders.

This section has helped identify some of the strengths and limitations of the BACI approach in evaluating the impact of conservation and development programs. On the one hand it is useful in measuring whether change has happened between control and intervention, even at short intervals, but on the other hand it runs up against its limitations in trying to understand why and how change takes place. As pointed out by Scriven (2008: 18, 20), the net effects of development programs tend to be smaller, less immediate, and less obvious, and the “gold standard” for causal claims is critical observation. And as observed by Westthorp (2014), context makes a big difference to program outcomes.

## 5. Conclusion

In this article, we have presented empirical evidence that early REDD+ initiatives have not (overall) made significant progress toward reducing tenure insecurity, in spite of the paramount importance of tenure to the REDD+ agenda, and the large amount of effort proponents have invested in it. We can only attribute improvements in tenure security to REDD+ at the sites studied in Cameroon (question 1). Although REDD+ was the top reason for increased tenure security where improvement was recorded and did not figure prominently among the reasons for increased tenure insecurity (question 2), and although there was a net positive view of the effect of REDD+ tenure-related interventions on community well-being in three of the five study countries (question 3), REDD+

nevertheless fell short of its goal to substantially improve tenure preparedness.

In the discussion we mentioned three key approaches and policies necessary to turn the tide and undergird a successful effort to build an appropriate tenure foundation: national-level action on tenure; integration of proponent efforts to those national actions; and an authentically participatory approach to local stakeholders together with a system of rewards for foregone forest clearing.

As we look to the future, some might argue that the historical moment for tenure and REDD+ has passed. After all, some of the effort toward making tenure clearer and more secure was mobilized in anticipation of a revenue stream from the forest carbon market that has barely materialized, and public funding in support of REDD+ is not a long-term proposition.

But that argument would be erroneous. As mentioned earlier, the Paris Agreement is in the process of reviving attention to REDD+. Moreover, as mentioned earlier, the reasons proponents give attention to tenure go beyond preparation for a revenue stream to other matters. Furthermore, as mentioned earlier, there is an urgent need to address tenure in all forms of climate change mitigation, whether forest-based or not. So even if an initiative diversifies away from REDD+, tenure remains a high priority. This reality is pertinent to our own sample of cases. Of the 21 initiatives, five no longer operate, and of the 16 that continue, 12 continue to use the “REDD+” label and four do not. That fact notwithstanding, all 16 initiatives continue to work towards forest-based climate change mitigation at their locations, and all continue to work on tenure.

In closing, we wish to emphasize the importance of one more national-level action that has a high bearing on the achievement of the other three: successfully restraining the BAU interests that continue to have the upper hand in tropical land use decisions. As suggested in the reasons given for tenure insecurity, the role played by companies and by governments is central, and concerted efforts by civil society may be needed to bring about

change.

### Conflict of interest

We, the authors of the article titled “Creating an appropriate tenure foundation for REDD+: The record to date and prospects for the future,” believe we do not have any relationships with individuals or organizations that would constitute conflict of interest, and that would therefore compromise the scientific integrity and objectivity of our field research, data analysis, findings, and recommendations.

### Acknowledgements

This research is part of CIFOR’s Global Comparative Study on REDD+ ([www.cifor.org/gcs](http://www.cifor.org/gcs)). The funding partners that have supported this research include the Norwegian Agency for Development Cooperation (Norad) [grant numbers QZA-10/0468, QZA-12/0882, QZA-16/0110], the Australian Department of Foreign Affairs and Trade (DFAT) [grant numbers 46167, 63560], the European Commission (EC) [grant number DCI-ENV/2011/269-520], the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) [grant number KI II 7 - 42206-6/75], the United Kingdom Department for International Development (UKAID) [grant number TF069018], and the CGIAR Research Program on Forests, Trees and Agroforestry (CRP-FTA) [grant number TF No. 069018], with financial support from the donors contributing to the CGIAR Fund. David Solis provided a valuable service in reviewing our methods for taking into account attrition of households over time.

### Annexes

#### Annex 1

CIFOR GCS case study initiatives by study design, number of sample villages and households, Phases 1 and 2.

Study design	Country	Initiative Abbreviation	Phase 1 (2010–2012)						Phase 2 (2013–2014)					
			Intervention		Control		Total villages	Total Households	Intervention		Control		Total villages	Total Households
			Villages	Households	Villages	Households			Villages	Households	Villages	Households		
Household	Brazil	Acre	4	127	4	117	8	244	4	116	4	98	8	214
		Cotriguaçu	4	122	4	121	8	243	4	123	4	105	8	228
		Jari/Amapá	5	122	0	0	5	122	5	120	0	0	5	120
		SFX	4	124	4	122	8	246	4	123	4	120	8	243
		Transamazon	4	137	4	126	8	263	4	124	4	120	8	244
	Peru	Madre de Dios	4	126	4	124	8	250	4	126	4	125	8	251
		Ucayali	4	123	4	124	8	247	4	123	4	121	8	244
	Cameroon	Mt. Cameroon	4	160	3	90	7	250	4	144	3	80	7	224
		SE Cameroon	2	120	4	160	6	280	2	110	4	140	6	250
	Tanzania	Kilosa	3	90	3	90	6	180	3	89	2	50	5	139
		Shinyanga	4	120	5	150	9	270	4	117	5	140	9	257
	Indonesia	Katingan	4	133	4	132	8	265	4	133	4	132	8	265
		KCCP	4	132	4	132	8	264	4	135	4	135	8	270
		KFCP	4	131	4	130	8	261	4	118	4	125	8	243
		TNC within BFCP	5	163	4	132	9	295	5	156	4	135	9	291
Ulu Masen		4	132	4	132	8	264	4	139	4	132	8	271	
SUBTOTAL			63	2062	59	1882	122	3944	63	1996	58	1758	121	3754
Village	Tanzania	Kigoma	4				4		4				4	
		Lindi	4				4		4				4	
		Mpingo	4				4		4				4	
		Zanzibar	4				4		4				4	
	Indonesia	Rimba Raya	4				4		4				4	
SUBTOTAL			20				20		20			20		
TOTAL			83	2062	59	1882	142	3944	83	1996	58	1758	141	3754

**Annex 2**

Perceived change in tenure security with respect to village land areas: higher, no change, or lower. Comparison of REDD+ intervention villages and controls, Phase 2 (2013–2014) results.

Country	Number and percent of village land areas where perceived tenure security is...					
	Higher		No change		Lower	
	N	Percent	N	Percent	N	Percent
Brazil	6 of 54	11.1%	37 of 54	68.5%	11 of 54	20.4%
Intervention	1 of 26	3.8%	18 of 26	69.2%	7 of 26	26.9%
Control	5 of 28	17.9%	19 of 28	67.9%	4 of 28	14.3%
Peru	2 of 37	5.4%	18 of 37	48.6%	15 of 35	42.9%
Intervention	2 of 19	10.5%	9 of 19	47.4%	7 of 18	38.9%
Control	0 of 18	0.0%	9 of 18	50.0%	8 of 17	47.1%
Cameroon	8 of 42	19.0%	22 of 42	54.2%	12 of 42	28.6%
Intervention	3 of 17	17.6%	9 of 17	52.9%	5 of 17	29.4%
Control	5 of 25	20.0%	13 of 25	52.0%	7 of 25	28.0%
Tanzania	12 of 58	20.7%	39 of 58	67.2%	7 of 58	12.1%
Intervention	10 of 44	22.7%	29 of 44	65.9%	5 of 44	11.4%
Control	2 of 14	14.3%	10 of 14	71.4%	2 of 14	14.3%
Indonesia	20 of 199	10.1%	142 of 199	71.4%	37 of 199	18.6%
Intervention	20 of 116	17.2%	81 of 116	69.8%	15 of 116	12.9%
Control	0 of 83	0.0%	61 of 83	73.5%	22 of 83	26.5%
TOTAL	48 of 390	12.3%	258 of 390	66.2%	82 of 388	21.1%
Intervention	36 of 222	16.2%	146 of 222	65.8%	39 of 221	17.6%
Control	12 of 168	7.1%	112 of 168	66.7%	43 of 167	25.7%

**Annex 3**

Perceived effect of tenure-related interventions (RFAC, TC) on well-being of intervention households, Phase 2. Number and percent of evaluations of tenure interventions at household level.

Country	Effect of tenure intervention on household well-being	RFAC		TC		Total	
		N	Percent	N	Percent	N	Percent
		Brazil	Total	442	100.0%	286	100.0%
	Negative	129	29.2%	42	14.7%	171	23.5%
	Neutral	166	37.6%	140	49.0%	306	42.0%
	Positive	147	33.3%	104	36.4%	251	34.5%
Peru	Total	146	100.0%	69	100.0%	215	100.0%
	Negative	45	30.8%	5	7.2%	50	23.3%
	Neutral	32	21.9%	19	27.5%	51	23.7%
	Positive	69	47.3%	45	65.2%	114	53.0%
Cameroon	Total	120	100.0%	87	100.0%	207	100.0%
	Negative	19	15.8%	8	9.2%	27	13.0%
	Neutral	39	32.5%	18	20.7%	57	27.5%
	Positive	62	51.7%	61	70.1%	123	59.4%
Tanzania	Total	71	100.0%	9	100.0%	80	100.0%
	Negative	1	1.4%	0	0.0%	1	1.3%
	Neutral	10	14.1%	1	11.1%	11	13.8%
	Positive	60	84.5%	8	88.9%	68	85.0%
Indonesia	Total	77	100.0%	46	100.0%	123	100.0%
	Negative	2	2.6%	0	0.0%	2	1.6%
	Neutral	37	48.1%	18	39.1%	55	44.7%
	Positive	38	49.4%	28	60.9%	66	53.7%
All	Total	856	100.0%	497	100.0%	1353	100.0%
	Negative	196	22.9%	55	11.1%	251	18.6%
	Neutral	284	33.2%	196	39.4%	480	35.5%
	Positive	376	43.9%	246	49.5%	622	46.0%

Note: "RFAC" is restrictions on forest access and conversion" and "TC" is tenure clarification.

**References**

- Alden Wily, L. (2001). *Forest management and democracy in East and Southern Africa: Lessons from Tanzania*. London, UK: International Institute for Environment and Development. <http://pubs.iied.org/pdfs/6350IIED.pdf>.
- Alden Wily, L. (2007). *So who owns the forest? Monrovia, Liberia: Sustainable Development Institute*. Moreton in Marsh, UK: FERN. <https://rightsandresources.org/en/publication/so-who-owns-the-forest/#.WmY3Q5M-f-Y>.
- Angelsen, A. (2013). *REDD+ as performance-based aid: General lessons and bilateral agreements of Norway*, WIDER Working Paper No. 2013/135. UNU-WIDER. <https://www.wider.unu.edu/publication/redd-performance-based-aid>.
- Assunção, J., Gandour, C. C., & Rocha, R. (2012). *Deforestation slowdown in the Legal Amazon: Prices or policies?* Rio de Janeiro, Brazil: Climate Policy Initiative, Pontifical Catholic University. <http://climatepolicyinitiative.org/wp-content/uploads/2012/03/Deforestation-Prices-or-Policies-Working-Paper.pdf>.
- Awono, A., Barreau, E., & Owona, H. (2014). Community payments for ecosystem services in the south and east regions of Cameroon. In E. O. Sills, S. S. Atmadja, C. de Sassi, A. E. Duchelle, D. L. Kweka, I. A. P. Resosudarmo, & W. D. Sunderlin (Eds.), *REDD+ on the ground: A case book of subnational initiatives across the globe* (pp. 203–221). Bogor, Indonesia: Center for International Forestry Research. <https://www.cifor.org/redd-case-book/case-reports/cameroon/community-payments-ecosystem-services-south-east-regions-cameroon/>.
- Awono, A., Somorin, O. A., Eba'a Atyi, R., & Levang, P. (2014). Tenure and participation in local REDD+ projects: Insights from southern Cameroon. *Environmental Science & Policy*, 35, 76–86. <https://doi.org/10.1016/j.envsci.2013.01.017>.
- Awono, A., Tambe, A. A., Owona, H., & Barreau, E. (2014). REDD+ around Mount Cameroon, southwest region of Cameroon. In E. O. Sills, S. S. Atmadja, C. de Sassi, A. E. Duchelle, D. L. Kweka, I. A. P. Resosudarmo, & W. D. Sunderlin (Eds.), *REDD+ on the ground: A case book of subnational initiatives across the globe* (pp. 188–202). Bogor, Indonesia: Center for International Forestry Research.

- <https://www.cifor.org/redd-case-book/case-reports/cameroon/redd-around-mount-cameroon-southwest-region-cameroon/>.
- Babon, A., McIntyre, D., & Sofe, R. (2012). *REDD+ politics in the media: A case study from Papua New Guinea*, Working Paper 97. Bogor, Indonesia: CIFOR. <https://doi.org/10.17528/cifor/003908>.
- Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1–48. <https://doi.org/10.18637/jss.v067.i01>.
- Beckett, S., Gould, W., Lillard, L., & Welch, F. (1988). The panel study of income dynamics after fourteen years: An evaluation. *Journal of Labor Economics*, 6, 472–492.
- Brockhaus, M., Di Gregorio, M., & Mardiah, S. (2014). Governing the economics of national REDD+: An analysis of the power of agency. *Forest Policy and Economics*, 49, 23–33. <https://doi.org/10.1016/j.forpol.2013.07.003>.
- Chavent, M., Kuentz, V., Labenne, A., Liqueur, B., & Saracco, J. (2014). PCAmixdata: Multivariate analysis of mixed data. R package version 2.2. <https://CRAN.R-project.org/package=PCAmixdata>.
- Cotula, L., & Mayers, J. (2009). *Tenure in REDD: Start-point or afterthought?* London, UK: International Institute for Environment and Development. <http://pubs.iied.org/pdfs/13554IIED.pdf>.
- Cronkleton, P. J., & Larson, A. M. (2015). Formalization and collective appropriation of space on forest frontiers: Comparing communal and individual property systems in the Peruvian and Ecuadorian Amazon. *Society and Natural Resources*, 28(5), 496–512. <https://doi.org/10.1080/08941920.2015.1014609>.
- Damascono, R., Chiavari, J., & Lopes, C. (2017). *Evolution of land rights in rural Brazil: Frameworks for understanding, pathways for improvement*. Rio de Janeiro, Brazil: Climate Policy Initiative. [https://climatepolicyinitiative.org/wp-content/uploads/2017/06/Evolution\\_of\\_Land\\_Rights\\_In\\_Rural\\_Brazil\\_CPL\\_FinalEN.pdf](https://climatepolicyinitiative.org/wp-content/uploads/2017/06/Evolution_of_Land_Rights_In_Rural_Brazil_CPL_FinalEN.pdf).
- Davis, C., Daviet, F., Nakhoda, S., & Thualt, A. (2009). *A review of 25 readiness plan idea notes from the World Bank Forest Carbon Partnership Facility*, WRI Working Paper. Washington, DC: World Resources Institute. [https://www.wri.org/sites/default/files/pdf/world\\_bank\\_readiness\\_review.pdf](https://www.wri.org/sites/default/files/pdf/world_bank_readiness_review.pdf).
- Day, T., Röser, F., Tewari, R., Kuramochi, T., Warnecke, C., Hagemann, M., Fekete, H., Sterl, S., Kurdziel, M., Gonzales, S., & Höhne, N. (2015). *What the Paris Agreement means for global climate change mitigation*. Bonn, Germany: New Climate Institute. <https://newclimate.org/2015/12/14/what-the-paris-agreement-means-for-global-climate-change-mitigation/>.
- Day, C., & Naughton-Treves, L. (2012). Lessons from early efforts to secure land tenure within forest carbon management projects. In L. Naughton-Treves & C. Day (Eds.), *Lessons about land tenure, forest governance and REDD+: Case studies from Africa, Asia and Latin America* (pp. 1–9). Madison, Wisconsin: UW-Madison Land Tenure Center. Retrieved from: <https://www.nelson.wisc.edu/ltc/docs/Lessons-about-Land-Tenure-Forest-Governance-and-REDD.pdf>.
- de Jong, W., del Castillo Torres, D., & Salazar, A. (2012). Carbon cowboys in Peru and the prospects of local REDD governance. *Portes: Revista Mexicana de Estudios Sobre la Cuenca del Pacífico*, 8(16), 61–83.
- de Sassi, C., Sunderlin, W. D., Sills, E. O., Duchelle, A. E., Ravikumar, A., Resosudarmo, I. A. P., et al. (2014). REDD+ on the ground: Global insights from local contexts. In E. O. Sills, S. S. Atmadja, C. de Sassi, A. E. Duchelle, D. L. Kweka, I. A. P. Resosudarmo, & W. D. Sunderlin (Eds.), *REDD+ on the ground: A case book of subnational initiatives across the globe* (pp. 420–439). Bogor, Indonesia: Center for International Forestry Research. <https://www.cifor.org/redd-case-book/part-3-synthesis/redd-ground-global-insights-local-contexts/>.
- Doherty, E., & Schroeder, H. (2011). Forest tenure and multi-level governance in avoiding deforestation under REDD+. *Global Environmental Politics*, 11(4), 66–88. [https://doi.org/10.1162/GLEP\\_a\\_00084](https://doi.org/10.1162/GLEP_a_00084).
- Dokken, T., Caplow, S., Angelsen, A., & Sunderlin, W. D. (2014). Tenure issues in REDD+ pilot project sites in Tanzania. *Forests*, 5(2), 234–255. <https://doi.org/10.3390/f5020234>.
- Duchelle, A. E., Cromberg, M., Gebara, M. F., Guerra, R., Melo, T., Larson, A., et al. (2014). Linking forest tenure reform, environmental compliance, and incentives: Lessons from REDD+ initiatives in the Brazilian Amazon. *World Development*, 55, 53–67. <https://doi.org/10.1016/j.worlddev.2013.01.014>.
- Duchelle, A. E., de Sassi, C., Jagger, P., Cromberg, M., Larson, A. M., Sunderlin, W. D., et al. (2017). Carrots and sticks in REDD+ implementation: Implications for social safeguards. *Ecology & Society*, 22(3), 2. <https://doi.org/10.5751/ES-09334-220302>.
- Edwards, D. P., Koh, L. P., & Laurance, W. F. (2011). Indonesia's REDD+ pact: Saving imperiled forests or business as usual? *Biological Conservation*, 151(1), 41–44. <https://doi.org/10.1016/j.biocon.2011.10.028>.
- Enrici, A., & Hubacek, K. (2016). Business as usual in Indonesia: Governance factors effecting the acceleration of the deforestation rate after the introduction of REDD+. *Energy, Ecology and Environment*, 1(4), 183–196. <https://doi.org/10.1007/s40974-016-0037-4>.
- FAO (2012). *Greening the economy with agriculture*. Rome, Italy: Food and Agriculture Organization of the United Nations. <http://www.fao.org/docrep/015/i2745e/i2745e00.pdf>.
- Fishbein, G., & Lee, D. (2015). *Early lessons from jurisdictional REDD+ and low emissions development programs*. The Nature Conservancy: Forest Carbon Partnership Facility; World Bank Group. [https://www.forestcarbonpartnership.org/sites/fcp/files/2015/January/REDD%2B\\_LED\\_web\\_high\\_res.pdf](https://www.forestcarbonpartnership.org/sites/fcp/files/2015/January/REDD%2B_LED_web_high_res.pdf).
- Garrish, V., Perales, E., Duchelle, A. E., & Cronkleton, P. (2014). The REDD Project in Brazil Nut Concessions in Madre de Dios, Peru. In E. O. Sills, S. S. Atmadja, C. de Sassi, A. E. Duchelle, D. L. Kweka, I. A. P. Resosudarmo, & W. D. Sunderlin (Eds.), *REDD+ on the ground: A case book of subnational initiatives across the globe* (pp. 147–165). Center for International Forestry Research. <https://www.cifor.org/redd-case-book/case-reports/peru/redd-project-brazil-nut-concessions-madre-de-dios-peru/>.
- Gebara, M. F. (2014). Sustainable landscapes pilot program in São Félix do Xingu, Brazil. In E. O. Sills, S. S. Atmadja, C. de Sassi, A. E. Duchelle, D. L. Kweka, I. A. P. Resosudarmo, & W. D. Sunderlin (Eds.), *REDD+ on the ground: A case book of subnational initiatives across the globe* (pp. 106–123). Bogor, Indonesia: Center for International Forestry Research. <https://www.cifor.org/redd-case-book/case-reports/brazil/sustainable-landscapes-pilot-program-sao-felix-xingu-brazil/>.
- Global Witness (2014). *Deadly environment: The dramatic rise in killings of environmental land defenders – 1.1.2002-31.12.2013*. London, UK: Global Witness.
- Goodman, R., & Herold, M. (2014). *Why maintaining tropical forests is essential and urgent for a stable climate*, Working Paper 385. Washington, DC: Center for Global Development. <https://www.cgdev.org/sites/default/files/CGD-Climate-Forest-Paper-Series-11-Goodman-Herold-Maintaining-Tropical-Forests.pdf>.
- Harris, N., & Stolle, F. (2016). *Forests are in the Paris Agreement! Now what?* Washington, DC: World Resources Institute. <http://www.wri.org/blog/2016/01/forests-are-paris-agreement-now-what>.
- Harrison, X. A. (2014). Using observation-level random effects to model overdispersion in count data in ecology and evolution. *PeerJ*, 2, e616. <https://doi.org/10.7717/peerj.616>.
- Hatcher, J. (2009). *Securing tenure rights and reducing emissions from deforestation and degradation (REDD): Costs and lessons learned*. Washington, DC: World Bank. [http://siteresources.worldbank.org/EXTSOCIALDEVELOPMENT/Resources/244362-1164107274725/3182370-1164201144397/Securing\\_Tenure\\_Rights\\_REDD-web.pdf](http://siteresources.worldbank.org/EXTSOCIALDEVELOPMENT/Resources/244362-1164107274725/3182370-1164201144397/Securing_Tenure_Rights_REDD-web.pdf).
- Ho, D. E., Imai, K., King, G., & Stuart, E. A. (2011). MatchIt: Nonparametric preprocessing for parametric causal inference. *Journal of Statistical Software*, 42(8), 1–28. <http://www.jstatsoft.org/v42/i08/>.
- Holland, T. G., Coomes, O. T., & Robinson, B. E. (2016). Evolving frontier land markets and the opportunity cost of sparing forests in western Amazonia. *Land Use Policy*, 58, 456–471. <https://doi.org/10.1016/j.landusepol.2016.08.015>.
- Kahurani, E., Sirait, M., van Noordwijk, M., & Pradhan, U. (2013). *Indonesia upholds indigenous people's rights to forest*. Bogor, Indonesia: World Agroforestry Centre. <http://www.asb.cgiar.org/article/indonesia-upholds-indigenous-people%E2%80%99s-rights-forest>.
- Karsenty, A., & Assemblé, S. (2011). Land tenure and implementation of REDD+ in Central Africa. *Land Tenure Journal*, 2(11), 105–129. <http://www.fao.org/nr/tenure/land-tenure-journal/index.php/LTJ/article/view/35/75>.
- Keenan, R. (2016). The Paris climate agreement and forests: Will the COP21 agreement encourage growth in investment in sustainably-managed forests? Asia and the Pacific Policy Society. <http://www.policyforum.net/the-paris-climate-agreement-and-forests/>.
- Kelly, A. B., & Peluso, N. L. (2015). Frontiers of commodification: State lands and their formalization. *Society and Natural Resources*, 28, 473–495. <https://doi.org/10.1080/08941920.2015.1014602>.
- Kowler, L. F., Ravikumar, A., Larson, A. M., Rodriguez-Ward, D., Burga, C., & Gonzales Tovar, J. (2016). *Analyzing multilevel governance in Peru: Lessons for REDD+ from the study of land-use change and benefit sharing in Madre de Dios, Ucayali and San Martín*, Working Paper 203. Bogor, Indonesia: Center for International Forestry Research. [https://www.cifor.org/publications/pdf\\_files/WPapers/WP203Kowler.pdf](https://www.cifor.org/publications/pdf_files/WPapers/WP203Kowler.pdf).
- Larson, A. M., Brockhaus, M., Sunderlin, W. D., Duchelle, A., Babon, A., Dokken, T., et al. (2013). Land tenure and REDD+: The good, the bad and the ugly. *Global Environmental Change*, 23(3), 678–689. <https://doi.org/10.1016/j.gloenvcha.2013.02.014>.
- Leonard, S. (2016). *Paris Agreement signed. Now what?* Bogor, Indonesia: Center for International Forestry Research. <http://blog.cifor.org/41210/paris-agreement-signed-now-what?fnl=en>.
- Lund, J. F., Sungusia, E., Mabele, M. B., & Scheba, A. (2017). Promising change, delivering continuity: REDD+ as conservation fad. *World Development*, 89, 124–139. <https://doi.org/10.1016/j.worlddev.2016.08.005>.
- Morris, D. F., & Stevens, A. (2011). *REDD+ and international climate finance: A brief primer*. Washington, DC: Resources for the Future. <http://www.rff.org/RFF/Documents/RFF-IB-11-13%20%28Rev%29.pdf>.
- Mueller, B. (2016). *Key issues for property rights in Brazil: Implications for the Forest Code*. Rio de Janeiro, Brazil: Climate Policy Initiative. [https://climatepolicyinitiative.org/wp-content/uploads/2016/07/Literature\\_Review\\_Property\\_Rights\\_and\\_Forest\\_Code.pdf](https://climatepolicyinitiative.org/wp-content/uploads/2016/07/Literature_Review_Property_Rights_and_Forest_Code.pdf).
- Naughton-Treves, L. & Day, C. (Eds.) (2012). *Lessons about land tenure, forest governance and REDD+: Case studies from Africa, Asia and Latin America*. Madison, Wisconsin: UW-Madison Land Tenure Center. <https://www.nelson.wisc.edu/ltc/docs/Lessons-about-Land-Tenure-Forest-Governance-and-REDD.pdf>.
- Norman, M., & Nakhoda, S. (2014). The state of REDD+ finance. CGD Working Paper 378. Washington, DC: Center for Global Development. <http://www.cgdev.org/publication/state-redd-finance-working-paper-378>.
- Peluso, N. (1992). *Rich forests, poor people: Resource control and resistance in Java*. Berkeley & Los Angeles, California, USA: University of California Press.
- Peters-Stanley, M., Gonzalez, G., Yin, D., with Goldstein, A., & Hamrick, K. (2013). *Covering new ground: State of the forest carbon markets 2013*. Washington, DC: Forest Trends' Ecosystem Marketplace. <http://www.forest-trends.org/documents/files/SOFM-full-report.pdf>.



- Purdon, M. (2013). Land acquisitions in Tanzania: Strong sustainability, weak sustainability and the importance of comparative methods. *Journal of Agriculture and Environmental Ethics*, 26(6), 1127–1156. <https://doi.org/10.1007/s10806-013-9442-2>.
- Quan, J., & Dyer, N. (2008). *Climate change and land tenure*. Rome, Italy: Food and Agriculture Organization of the United Nations. [http://www.fao.org/nr/Itten/abst/Itten\\_081101\\_en.htm](http://www.fao.org/nr/Itten/abst/Itten_081101_en.htm).
- R Core Team (2015). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Resosudarmo, I. A. P., Atmadja, S., Ekaputri, A. D., Intarini, D. Y., Indriatmoko, Y., & Astri, P. (2014). Does tenure security lead to REDD+ project effectiveness? Reflections from five emerging sites in Indonesia. *World Development*, 55, 68–83. <https://doi.org/10.1016/j.worlddev.2013.01.015>.
- Resosudarmo, I. A. P., Oka, N. P. S., & Utomo, N. A. (2014). Governing fragile ecologies: A perspective on forest and land-based development in the regions. In H. Hill (Ed.), *Regional dynamics in a decentralized Indonesia* (pp. 260–284). Singapore: Institute of Southeast Asian Studies.
- Rodriguez-Ward, D., & Paredes del Aguila, P. (2014). The REDD project in Brazil nut concessions in Madre de Dios, Peru. In E. O. Sills, S. S. Atmadja, C. de Sassi, A. E. Duchelle, D. L. Kweka, I. A. P. Resosudarmo, & W. D. Sunderlin (Eds.), *REDD+ on the ground: A case book of subnational initiatives across the globe* (pp. 166–187). Bogor, Indonesia: Center for International Forestry Research. <https://www.cifor.org/redd-case-book/case-reports/peru/redd-project-brazil-nut-concessions-madre-de-dios-peru/>.
- Roldan, R. (2004). *Models for recognizing indigenous land rights in Latin America*, Biodiversity Series Paper 99. Washington, DC: Environment Department, World Bank. <http://documents.worldbank.org/curated/en/608941468743178264/Models-for-recognizing-indigenous-land-rights-in-Latin-America>.
- Rothe, A., & Munro-Faure, P. (2013). *Tenure and REDD+. UN-REDD Policy Brief Issue #06*. Geneva, Switzerland: UN-REDD Programme Secretariate. <file:///Users/William/Downloads/JUN-REDD%20Programme%20Policy%20Brief%20Tenure%20and%20REDD+.pdf>.
- RRI (2014). *What future for reform? Progress and slowdown in forest tenure reform since 2002*. Washington, DC: Rights and Resources Initiative. [http://rightsandresources.org/wp-content/uploads/RRI4011D\\_FlagshipMAR2014r13B.pdf](http://rightsandresources.org/wp-content/uploads/RRI4011D_FlagshipMAR2014r13B.pdf).
- RRI (2015). *Who owns the world's land?: A global baseline of formally recognized indigenous and community land rights*. Washington, DC: Rights and Resources Initiative. [http://rightsandresources.org/wp-content/uploads/GlobalBaseline\\_web.pdf](http://rightsandresources.org/wp-content/uploads/GlobalBaseline_web.pdf).
- RRI (2016a). *Indigenous peoples and local community tenure in the INDCs: Status and recommendations*. Washington, DC: Rights and Resources Initiative. <https://rightsandresources.org/en/publication/indigenous-peoples-local-community-tenure-indcs/#.WmZaCpM-f-Y>.
- RRI (2016b). *Community rights and tenure in country emissions reductions programs*. Washington, DC: Rights and Resources Initiative. <https://rightsandresources.org/en/publication/community-rights-tenure-country-emission-reduction-programs-fcpf-carbon-fund/#.WmZaeJM-f-Y>.
- Samadhi, N. (2013). Indonesia ONE MAP: Assuring better delivery of national development goals. Presentation at Geospatial World Forum 2013, Rotterdam, May 12–13, 2013. <http://geospatialworldforum.org/2013/presentation/Nirata%20Samadhi.pdf>.
- Scriven, M. (2008). A summative evaluation of RCT methodology: & an alternative approach to causal research. *Journal of Multi Disciplinary Evaluation*, 5(9), 11–24. [http://journals.sfu.ca/jmde/index.php/jmde\\_1/article/view/160/186](http://journals.sfu.ca/jmde/index.php/jmde_1/article/view/160/186).
- Sekhon, J. S. (2011). Multivariate and propensity score matching software with automated balance optimization: The matching package for R. *Journal of Statistical Software*, 42(7), 1–52. <http://www.jstatsoft.org/v42/i07/>.
- Sills, E. O., de Sassi, C., Jagger, P., Lawlor, K., Miteva, D., Pattanayak, S., et al. (2017). Building the evidence base for REDD+: Study design and methods for evaluating the impacts of conservation interventions on local well-being. *Global Environmental Change*, 43, 148–160. <https://doi.org/10.1016/j.gloenvcha.2017.02.002>.
- Simonet, G., Karsenty, A., Newton, P., de Perthuis, C., Schaap, B., Seyller, C. (2015). REDD+ projects in 2014: An overview based on a new database and typology. Information and Debate Series No. 32. Paris, France: Paris-Dauphine University Climate Economics Chair. <https://www.chaireeconomieduclimat.org/en/publications-en/information-debates/id-32-redd-projects-in-2014-an-overview-based-on-a-new-database-and-typology/>.
- Smith, P., & Bustamante, M. (2014). Agriculture, forestry, and other land use. In O. Edenhofer, R. Pichs-Madruga, Y. Sokona, J. C. Minx, E. Farahani, S. Kadner, & K. Seyboth, et al. (Eds.), *Climate Change 2014: Mitigation of Climate Change* (pp. 811–922). New York, New York: Cambridge University Press. [http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc\\_wg3\\_ar5\\_chapter11.pdf](http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter11.pdf).
- Springate-Baginsky, O., Sarin, M., Ghosh, S., Dasgupta, P., Bose, I., Banerjee, A., Sarap, K., et al. (2009). Redressing 'historical injustice' through the Indian Forest Rights Act 2006. Discussion paper series 27. Manchester, UK: IPPG. <http://www.ippg.org.uk/papers/dp27.pdf>.
- Stern, N. (2006). *Stern Review: The economics of climate change*. Cambridge, UK: Cambridge University Press. [http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview\\_report\\_complete.pdf](http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview_report_complete.pdf).
- Stevens, C., Winterbottom, R., Springer, J., & Reyta, K. (2014). *Securing rights, combating climate change: How strengthening community forest rights mitigates climate change*. Washington, DC: World Resources Institute and Rights and Resources Initiative. <https://www.wri.org/sites/default/files/securingrights-full-report-english.pdf>.
- Sunderlin, W. D., Anne M. Larson, and Peter Cronkleton. (2009). Forest tenure rights and REDD+: From inertia to policy solutions. Chapter 11 in Arild Angelsen (ed.) *Realising REDD+: National strategy and policy options* (pp. 139–149). Bogor, Indonesia: Center for International Forestry Research. [http://www.cifor.org/publications/pdf\\_files/Books/BAngelsen090211.pdf](http://www.cifor.org/publications/pdf_files/Books/BAngelsen090211.pdf).
- Sunderlin, W. D., & Sills, E. O. (2012). REDD+ projects as a hybrid of old and new forest conservation approaches. In A. Angelsen, M. Brockhaus, W. D. Sunderlin, & L. V. Verchot (Eds.), *Analyzing REDD+: Challenges and choices* (pp. 177–192). Bogor, Indonesia: Center for International Forestry Research. [http://www.cifor.org/publications/pdf\\_files/Books/BAngelsen120110.pdf](http://www.cifor.org/publications/pdf_files/Books/BAngelsen120110.pdf).
- Sunderlin, W. D. (2014). *Why tenure is key to fulfilling climate and ethical goals in REDD+*. REDD+ Safeguard Brief 3. Bogor, Indonesia: Center for International Forestry Research. [http://www.cifor.org/publications/pdf\\_files/SafeguardBrief/5189-brief.pdf](http://www.cifor.org/publications/pdf_files/SafeguardBrief/5189-brief.pdf).
- Sunderlin, W. D., Ekaputri, A. D., Sills, E. O., Duchelle, A. E., Kweka, D. L., Diprose, R., Doggart, N., Ball, S., Lima, R., Enright, A., Torres, J., Hartanto, H., & Toniolo, A. (2014). *The challenge of establishing REDD+ on the ground: Insights from 23 subnational initiatives in six countries*, Occasional Paper 104. Bogor, Indonesia: Center for International Forestry Research. [http://www.cifor.org/publications/pdf\\_files/OccPapers/OP-104.pdf](http://www.cifor.org/publications/pdf_files/OccPapers/OP-104.pdf).
- Sunderlin, W. D., Larson, A. M., Duchelle, A. E., Resosudarmo, I. A. P., Huynh, T. B., Awono, A., et al. (2014). How are REDD+ proponents addressing tenure problems? Evidence from Brazil, Cameroon, Tanzania, Indonesia, and Vietnam. *World Development*, 55, 37–52. <https://doi.org/10.1016/j.worlddev.2013.01.013>.
- Sunderlin, W. D., Pratama, C. D., Bos, A. B., Avitabile, V., Sills, E. O., de Sassi, C., et al. (2014). REDD+ on the ground: The need for scientific evidence. In E. O. Sills, S. S. Atmadja, C. de Sassi, A. E. Duchelle, D. L. Kweka, I. A. P. Resosudarmo, & W. D. Sunderlin (Eds.), *REDD+ on the ground: A case book of subnational initiatives across the globe* (pp. 2–32). Bogor, Indonesia: Center for International Forestry Research. <https://www.cifor.org/redd-case-book/part-introduction/redd-ground-need-scientific-evidence/>.
- Sunderlin, W. D., Larson, A. M., Duchelle, A. E., Sills, E. O., Luttrell, C., Jagger, P., et al. (2016). *Technical guidelines for research on REDD+ subnational initiatives*. Bogor, Indonesia: Center for International Forestry Research. [http://www.cifor.org/publications/pdf\\_files/Books/BSunderlin1601.pdf](http://www.cifor.org/publications/pdf_files/Books/BSunderlin1601.pdf).
- UN-REDD Programme (2013). *Options for addressing tenure under REDD+. Expert meeting report*. Geneva, Switzerland: UN-REDD Programme. [https://www.wri.org/sites/default/files/pdf/world\\_bank\\_readiness\\_review.pdf](https://www.wri.org/sites/default/files/pdf/world_bank_readiness_review.pdf).
- Viana, C., Coudel, E., Barlow, J., Ferreira, J., Gardner, T., & Parry, L. (2016). How does hybrid governance emerge? Role of the elite in building a green municipality in the eastern Brazilian Amazon. *Environmental Policy and Governance*, 26(5), 337–350. <https://doi.org/10.1002/et.1720>.
- Vice President's Office (2013). *National strategy for reduced emissions from deforestation and forest degradation (REDD+)*. Dar es Salaam, Tanzania: Vice President's Office.
- Westholm, L., Biddulph, R., Hellmark, I., & Ekbohm, A. (2011). *REDD+ and tenure: A review of the latest developments in research, implementation and debate*, Focali report 2011:02. Gothenberg, Sweden: Focali. <http://citeserx.ist.psu.edu/viewdoc/download?doi=10.1.1.455.3451&rep=rep1&type=pdf>.
- Westhorp, G. (2014). *Realist impact evaluation*. London, UK: Overseas Development Institute. [http://www.adcoesao.pt/sites/default/files/avaliacao/4\\_4\\_realist\\_impact\\_evaluation\\_an\\_introduction\\_setembro\\_2014.pdf](http://www.adcoesao.pt/sites/default/files/avaliacao/4_4_realist_impact_evaluation_an_introduction_setembro_2014.pdf).
- White, H. (2009). *Some reflections on current debates in impact evaluation*. New Delhi, India: International Institute for Impact Evaluation. [http://www.3ieimpact.org/media/filer\\_public/2012/05/07/Working\\_Paper\\_1.pdf](http://www.3ieimpact.org/media/filer_public/2012/05/07/Working_Paper_1.pdf).
- White, H. (2014). Current challenges in impact evaluation. *The European Journal of Development Research*, 26(1), 18–30. <https://doi.org/10.1057/ejdr.2013.45>.
- Williams, L. G. (2013). *Putting the pieces together for good governance of REDD+: An analysis of 32 REDD+ country readiness proposals*. Washington, DC: World Resources Institute. [http://www.wri.org/sites/default/files/pdf/putting\\_the\\_pieces\\_together\\_for\\_good\\_governance\\_of\\_redd.pdf](http://www.wri.org/sites/default/files/pdf/putting_the_pieces_together_for_good_governance_of_redd.pdf).
- World Bank (2015). *Outcomes from COP21: Forests as a key climate and development solution*. Washington, DC: World Bank. <http://www.worldbank.org/en/news/feature/2015/12/18/outcomes-from-cop21-forests-as-a-key-climate-and-development-solution>.