How do property rights reforms provide incentives for forest landscape restoration? Comparing evidence from Nepal, China and Ethiopia

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SUMMARY

To promote forest landscape restoration (FLR), national governments have embarked on far reaching policy reforms to reclassify lands targeted for restoration, designate legitimate forest stewards and define acceptable land use practices, responsibilities and benefits. Policy reforms intended to influence forest management behavior face complex challenges but policy makers can learn from past experience to better design forest restoration initiatives that address forest governance. This paper attempts to distill lessons by examining national reform processes and their local manifestations in diverse socio-political and environmental contexts. Specifically, we compare local dynamics in Nepal, China and Ethiopia to illustrate how distinct policy reform processes intended to promote FLR changed governance institutions and encouraged local participation. These cases demonstrate how policy reforms, particularly those targeting property rights, have influenced local participation in forest restoration efforts, and modified land use behavior to increase forest cover as well as the benefits local households received from forests.

Keywords: restoration, tenure, smallholder, Nepal, China, Ethiopia

Les droits fonciers encouragent-ils la restauration du paysage forestier? Comparaison de données provenant du Népal, de Chine et d'Ethiopie

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Dans l'espoir de promouvoir la restauration du paysage forestier (FLR), les gouvernements nationaux se sont embarqués dans des réformes poussées de politique, pour reclasser les terres considérées comme nécessitant une restauration, pour désigner des gestionnaires légitimes de la forêt et pour définir les responsabilités, bénéfices et pratiques d'utilisation de la terre acceptables. Les réformes de politique visant à influencer le comportement de la gestion forestière font face à des défis complexes, mais les créateurs de politique peuvent glaner des expériences passées des moyens d'élaborer des initiatives de restauration forestière prenant en compte la gestion forestière. Ce papier s'efforce de distiller des leçons en examinant les processus de réforme nationale et leur manifestations locales dans divers contextes socio-politiques et environnementaux. Plus spécifiquement, nous comparons les dynamiques locales au Népal, en Chine et en Ethiopie, pour illustrer comment des politiques de réforme distinctes, visant à promouvoir la FLN, changeaient les institutions de gestion et encourageaient la participation locale. Ces cas illustrent la façon dont les changements politiques, en particulier ceux visant les droits fonciers, ont influencé la participation locale dans les efforts de restauration forestière, et ont changé les comportements d'utilisation de la terre, pour accroître le couvert forestier ainsi que les bénéfices reçus des forêts par les foyers locaux.

¿Cómo incentivan las eformas de los derechos de propiedad la restauración del paisaje forestal? Comparación de evidencia de Nepal, China y Etiopía

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Con el fin de promover la restauración del paisaje forestal (RPF), los gobiernos nacionales se han embarcado en reformas de políticas de largo alcance para reclasificar las tierras destinadas a la restauración, designar administradores forestales legítimos y definir prácticas de uso de la tierra, responsabilidades y beneficios que sean aceptables. Las reformas de las políticas destinadas a influir en los comportamientos relacionados con el manejo forestal se enfrentan a problemáticas complejas, pero los responsables de la formulación de políticas pueden aprender de las experiencias pasadas para lograr un mejor diseño de las iniciativas de restauración forestal que aborden la gobernanza forestal. Este documento intenta destilar lecciones mediante el estudio de los procesos nacionales de reforma y sus manifestaciones locales en diversos contextos sociopolíticos y medioambientales. Específicamente, se comparan las dinámicas locales en Nepal, China y Etiopía para ilustrar cómo los distintos procesos de reforma de políticas destinados a promover la RPF lograron cambios en las instituciones de gobernanza y alentaron la participación local. Estos casos ilustran cómo los cambios en las políticas, especialmente los que se centran en los derechos de propiedad, han influido en la participación local en los esfuerzos de restauración forestal y han cambiado el comportamiento en torno al uso de la tierra para aumentar la cobertura forestal y los beneficios que los hogares reciben de los bosques.

INTRODUCTION

Secure property rights are a key governance lynchpin in the design of forest landscape restoration (FLR) programs. These rights frame which stakeholders are involved, how they are able to participate, and how and where they interact. More than simply a question of titling, the legal classification and related property regime imposed on forests is often complex, dynamic and contested, meaning that clarifying and securing rights over forests is a challenge for policy makers. However, much can be learned by examining how the reform of forest property rights occurred in on-going cases of forest restoration; more specifically, how the devolution of certain types of use and management rights, associated with conditional responsibilities, provided incentives for local people to invest in and benefit from forest landscape restoration programs. In practice, these reforms often create co-management arrangements, but these emerged over extended periods as part of adaptive responses to local and national realities. Even with examples drawn from dramatically different national contexts, it is possible to identify general lessons with wide application. These cases focus on people managing forests in hilly and mountainous areas, landscapes that tend to be remote with marginalized populations. As such, these cases are similar to many areas around the world targeted for FLR initiatives.

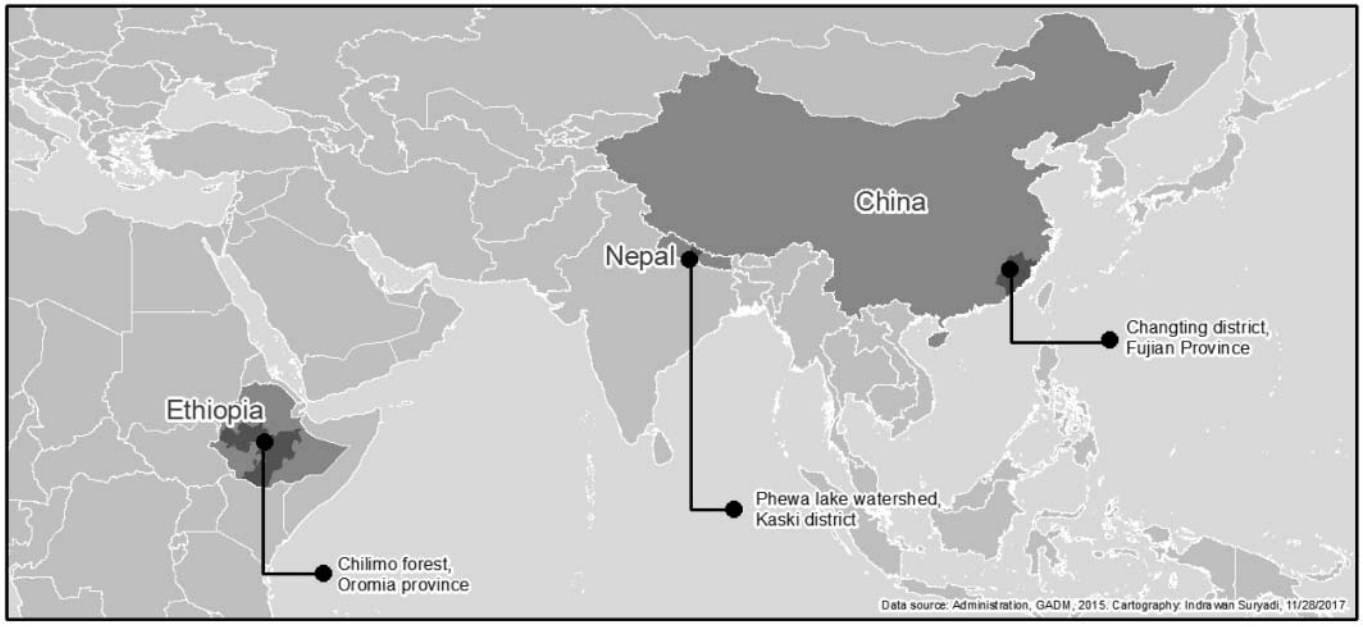
This comparative research paper focuses on reforms that addressed property rights to promote FLR initiatives in Nepal, China and Ethiopia. We selected these cases because they hold recognized examples of reforms that clearly shifted rights to local stakeholders. The analysis is based on comprehensive literature review but also draws on in-depth personal experience by co-authors working in and analyzing these locations. The paper describes historical trajectories before and after reforms to examine how the devolution of access and management rights to local stakeholders provided incentives to local families to invest in restoration activities. FLR initiatives often reclassify lands targeted for restoration, redefine which stakeholders can legitimately manage and benefit from restored lands, and refine acceptable land use practices and responsibilities. The approaches used by national governments to devolve property rights to local stakeholders take different forms, and produce variable patterns of local participation and benefit distribution.

To explore these issues, this paper examines specific local cases drawn from the selected countries to answer the following questions:

- How did reforms change property rights frameworks and institutions to provide incentives for FLR?
- How did these changes shift the livelihood benefits and management responsibilities of local forest users as well as the role and responsibilities of government agencies?
- What are key lessons learned from FLR programs in these countries?

The next section briefly explores why property rights frame key governance variables for the design of FLR initiatives. It will examine the complexity of forest property regimes and explain how reforms often create co-management mechanisms by devolving certain rights while maintaining crucial controls under government authority. The third section will present case studies from Nepal, China and Ethiopia. The Nepal case focuses on the Phewa watershed in the Kaksi District, where 75 forest user groups gained management rights over 2,421 hectares of formerly degraded forest lands, achieving impressive restoration success, and obtaining a wide range of forest goods and services. In China, reform of the collective forest rights system and other incentives to encourage forest restoration on sloping lands has transferred rights to use and manage a large area of forestland to local families. Changting County in Fujian Province had been one of China's most degraded and impoverished counties but, after reform, has experienced a 20% increase in forest cover and dramatic increases in rural income. In Ethiopia, where participatory forest management (PFM) promotes the rehabilitation of natural forests, selected village user groups have won communal access to designated forests. Around the Chilimo Forest in Oromia, 12 forest user groups were granted forest management rights and, although livelihood benefits to participating families were limited, the governance reforms were sufficient to slow rates of deforestation and degradation. These cases illustrate how governance reforms, particularly those targeting property rights, have influenced local participation in forest restoration efforts, and changed land use behavior to increase forest cover as well as the benefits local

FIGURE 1 *Forest Landscape Restoration case study sites*



households received from forests. A discussion section drawing out key lessons from these examples and conclusions will follow the case studies.

Considering property rights in the design of forest landscape restoration

Recent global efforts to promote forest restoration have gained a high profile in policy and academic debates (see for example the Bonn Challenge, the 20X20 Initiative, and AFR100) but they will ultimately rely on national commitments, investments and institutional policy frameworks for their implementation. As governments initiate national processes, they will need to consider the diverse socio-ecological contexts present in territories targeted for restoration. A major challenge will be how best to involve local smallholders and forest communities in forest landscape restoration programs. As these are typically heterogeneous groups, it is difficult to accommodate their diverse interests and needs under uniform policies without some measure of flexibility and adaptation. Examining cases where countries have carried out reforms over years or decades can provide useful examples. As we will show, in these cases reforms resulted in the devolution of rights to local stakeholders through processes responding to local context over time. However, before examining these national cases, we briefly summarize a few key concepts to provide background.

The topic of how best to promote and implement forest landscape restoration has drawn considerable attention in recent years. Rather than an end state, forest landscape restoration is often defined as a process attempting to reestablish ecological integrity and improve human well-being in degraded forest landscapes (Lamb *et al*. 2012). In the FLR design process, policy makers need to determine where to target initiatives, how to affect the desired change, which stakeholders to involve, with all decisions framed within the purpose motivating the restoration effort to begin with (Mansourian 2016). Ultimately, successful restoration initiatives will depend on their relationship with the people living in and depending on the landscape (Chazdon 2008), although it is not always clear how effective relations and participation can be encouraged. Poorly planned restoration efforts could have unintended detrimental impacts on local people, especially because forest restoration will likely increase resource value, expand competition, intensify conflict over resources, and possibly disenfranchise vulnerable forest dependent people (Barr and Sayer 2012).

FLR discussions recognize the importance of governance factors in the design process, as well as the fundamental role clear and secure property rights play as an enabling condition for successful reforestation and forest restoration initiatives (Lamb *et al*. 2005, Barr and Sayer 2012, Mansourian 2016, Uriarte and Chazdon 2016). The premise is that local forest actors will change their behavior – either to make investments in the resource or to forgo immediate benefits by limiting extraction – when they can ensure future benefit from forest restoration, and have confidence that mechanisms to enforce rules exist and that others comply with them.

However, it is not always clear what 'secure property' means in practice or how policy makers can assist its development. Forest tenure can be complex, dynamic and contested, so securing rights goes beyond simply issuing titles or other formal tenure mechanisms. Governments need to continue to support and defend property rights and boundaries, but also engage with property rights holders as they develop governance institutions and authorities (Larson *et al*. 2015). Governments often resist transferring rights to local actors (Ribot 2002) and even when rights are granted, the lack of

government support to defend local rights can contribute to insecurity (Larson *et al*. 2008). Ironically, hesitance in supporting local stakeholders is sometimes justified as a necessary restraint to ensure sustainable resource use (Larson *et al*. 2010).

Secure property rights rely on suites of governance institutions that policy makers should understand on multiple dimensions. Property regimes often are grouped into public and private categories. Public or state property is held by government for citizens or, ostensibly, for the common good. Private property can be held either individually or collectively. Collective ownership is occasionally vested simultaneously at several scales or across overlapping institutional jurisdictions (as in China), thus defying clear classification as either public or private (Ho 2001). Typically, these regimes – public, private and collective – refer to those officially sanctioned through government policy as 'formal' institutions but, in fact, they can also be informal (i.e. without official sanction) or informal regimes may underlie or bridge different regimes. In some cases, these informal institutions can have as much, if not more, legitimacy as formal institutions (for example, customary practices defining who can rightfully access a resource). When property rights regimes are weak, ambiguous or in conflict, open access situations can occur, as can happen when governments attempt to shift resources from one regime to another or push informal institutions to become formal. One reason such government action can provoke open access is that during transition from one regime to another, stakeholders may venue shop selecting whichever of the overlapping regime best justifies their resource exploitation (Fitzpatrick 2005). Another reason is that transitions can trigger perceptions of insecure rights among stakeholders, leading to a "race for the resource" among users who fear losing access (McKean 2000, Putzel *et al*. 2013).

Another conceptual issue is that property should be understood as a set of constituent parts. Rather than being conceptualized as a single over-arching right, property consists of a bundle of rights (Schlager and Ostrom 1992), which disaggregates specific actions or privileges held for rights holders. Rights in the bundle consist of access, use (or withdrawal), management, exclusion, and alienation rights. These rights are defined by rules that grant distinct powers or abilities to the rights holder. Some of these rights, called 'collective-choice rights', give greater decision-making abilities (e.g. management, exclusion and alienation rights) because they allow rights holders to define rules or set standards for behavior (Schlager and Ostrom 1992). Resource management involves decision-making beyond immediate resource use for future intent and is closely tied to exclusion rights (Cronkleton *et al*. 2012). To invest in future resource use and capture future benefits, the rights holder needs the ability to exclude outsiders and others who do not comply with management rules. Such ability is more likely if their authority is supported by the state.

In forest policy reform, it is common for governments to only devolve rights to local people partially, for example, retaining alienation rights but transferring access, use and management rights (Barry *et al*. 2010). Frequently, states only devolve forest management rights while maintaining state ownership, thus allowing some local decision-making but requiring rights holders to comply with regulations and seek authorization from state agencies to validate management actions, a situation that creates 'co-management' arrangements (Cronkleton *et al*. 2012). Co-management is an approach where two or more social actors negotiate, define and agree to arrangements to share management functions, entitlements and responsibilities for a given territory or set of natural resources (Borrini-Feyerabend 2000). Co-management systems are commonly used to promote community forestry (Fisher 1995). To function well, co-management should be a process of negotiation, bargaining and mediation to continuously re-adjust to the strengths and mitigate weaknesses of the partners involved (Carlsson and Berkes 2005, Singleton 1998). These systems are often adopted because government planners realize that local people have a role to play in resource management and cannot be excluded (Cronkleton *et al*. 2012). Decisions made during the creation of the co-management system can strongly influence how well the later system functions, particularly by defining how benefits and responsibilities are balanced between governmental authorities and local forest managers.

The following section presents case studies from Nepal, China and Ethiopia, illustrating how national and local stakeholders navigate through reform processes intended to support forest restoration. In each example, forest property definitions shift and change as public and private (and collective) stakeholders interact during the course of multi-year reforms. The policy reforms that devolved rights produced enabling conditions FLR by giving local stakeholders opportunities to benefit from restoration and clear interests to participate and engage with restoration programs and incentives. National dynamics start from distinct points and follow different trajectories but overall some general similarities can be observed in how they accommodate the needs of local people in FLR programs.

Forest reform in Nepal devolves right to local forest user groups

Nepal represents in many ways a remarkable success story, where a shift in national policy reversed a pattern of widespread deforestation and resource degradation by devolving management rights to local people and providing incentives that encouraged landscape restoration. This section briefly traces the history of these reforms, summarizes how they changed access to provide incentives, and examines some of the outcomes. It briefly reviews the case of the Sandhe Raniswara Dopahare community forestry users group (SRD CFUG) in the Phewa Lake Watershed, in western Nepal to illustrate how reforms operated.

In 1957, Nepal's government passed the Private Forest Nationalization Act, placing all forest under state authority. The act responded to growing concern over feudal control of the productive *Terai* forests by the politically ousted Rana

family and their former allies (Gautam *et al*. 2004). The government intended the act to protect and conserve forests by classifying them as government property. However, the measure set off a process of increased deforestation, as landowners converted forest to agriculture to maintain their ownership over the land (Ojha *et al*. 2014, Paudyal *et al*. 2017a). The trend to centralize management continued as the government bureaucracy attempted to consolidate control over forests through the 1961 Forest Act and the 1967 Forest Protection - Special Provision Act. These regulatory measures used a techno-bureaucratic approach that further consolidated forests as national patrimony under centralized government control (Ojha 2006). These policies empowered the forest bureaucracy to exercise stringent power over local people that depended on forest resources for their livelihoods. Unfortunately, despite the consolidation of power, government agencies were unable to oversee myriad forest patches or completely restrict forest extraction and use of these lands. Thus, rather than promoting sustainable use and conservation of forests, the centralized approach exacerbated a spiral of degradation and deforestation throughout the country (Ojha *et al*. 2014), contributing to serious environmental problems exemplified by landslides in the mountains and flooding in the plains. Increasing degradation also caused shortages of forest products and clean water. Concern that Nepal's mountains and middle hills were on the verge of complete deforestation and degradation became known as the 'Himalayan Crisis' (Eckholm 1975).

Starting in the mid-1970s and continuing through the 1980s, Nepal began an incremental policy shift. The 1976 National Forestry Plan passed some forest management authority to local government, although land ownership and most decision-making remained centralized. As the government devolved rights to local governments ('Panchayat'), it issued regulations for plantation forests (known as *Panchayat Forests*) and for degraded natural forests (known as '*Panchayat Protected Forest*') (Gautam *et al*. 2004). The government granted Panchayats some rights, for example, authorizing the collection of fodder firewood and limited amounts of timber, but also assigned the responsibility to protect plantations and other degraded forests from illegal extraction or encroachment. Local people began participating in landscape restoration during this period, by assisting with the establishment of forest plantations on public land. Although this policy remained in place for over a decade, the limited rights given to Panchayats were insufficient to restore most denuded forestlands. Moreover, a key underlying problem was that Panchayat political boundaries often did not coincide with forest boundaries, or include the people that traditionally used the forests. As a result, in some places the forest patches fell within one Panchayat, while the people using the forest belonged to another.

In 1989, Nepal's government adopted the Master Plan for the Forest Sector (MPFS), a landmark policy that proposed community forestry as a suitable option for slowing soil erosion and resource degradation of the denuded mid-hills region (Ojha *et al*. 2014, Paudyal *et al.* 2017a). This devolution trend in Nepal continued in the 1990s. The country's 1993 Forest Act marked a major departure from previous policy of centralized control by offering communities extensive rights over forests. Nepal's government recognized the inclusion of local groups of rights holders as an appropriate arrangement for forest landscape restoration. In this approach, the government, in consultation with people living around the patches of public forest, identified traditional users. Building on the MPFS, the Forest Act and the corresponding Forest Regulation passed in 1995, recognized community forestry users groups (CFUGs) as legal entities that could be granted rights to manage designated forest areas. The reforms obliged CFUGs to adopt constitutions for the group and develop operational plans for managing their forest area. The regulations also required that at least 33 percent executive committee members be female and that at least 35 percent of the funds generated by community forestry be allocated for poverty reduction activities. Once the requirements were met, the government facilitated the organization of user groups, assisting them to develop constitutions and operational management plans, as well as to implement forest management activities as stipulated in these plans. The law reduced the quasi-judicial power of forestry officials over territory set aside for community forestry. Under this framework, the lands would remain public, but access, use, management and exclusion rights were transferred to the CFUGs. As long as they complied with regulations, all CFUG member households received a share of income generated from forest management.

Devolving long-term rights over forests was a pragmatic approach to encourage participation in restoration efforts and ensure local benefits. The reforms in the 1990s set off a wave of CFUG formation throughout Nepal's middle hills region. The political role of CFUGs grew, and in 1995, the Federation of Community Forestry Users Groups became a prominent actor in national policy processes (Paudel *et al*. 2012). Currently, there are over 30 thousand CFUGs managing approximately 2.1 million hectares of forests, roughly 33% of Nepal's forests (Ojha 2014, Paudyal *et al*. 2017a). Membership in these CFUGs number about 2.8 million households, indicating that approximately 40% of Nepal's total population is involved in community-based forest management (Paudyal *et al*. 2017a).

The Sandhe Raniswara Dopahare (SRD) –CFUG

In the Phewa Lake watershed adjacent to the city of Pokhara, community-based forestry h has been instrumental in forest restoration. The watershed covers an area of 123 km^2 with diverse forest types. Its heavy monsoon rains (~5000 mm) frequently trigger landslides and flash floods, which in the past contributed to the natural degradation of the steep terrain (Regmi and Saha 2015). Some 40 years ago, siltation was considered a significant threat to the lake ecosystem, but the situation was reversed through forest restoration (Regmi and Saha 2015). Land cover in the watershed is currently dominated by forest (54%) and agriculture (43%), with only a small area of degraded lands (>1%) (Paudyal *et al*. 2017b, Rimal *et al*. 2015).

The *Sandhe Raniswara Dopahare (SRD)* –CFUG is representative of the watershed's history of forest and land degradation, followed by participatory watershed conservation, community forestry, and forest landscape restoration. As in other mountain regions, the area covered by SRD community forests was severely degraded four decades ago due to heavy grazing, rampant deforestation, soil erosion and landslides that caused scarcity of forest products and diminished food production. Watershed conservation efforts started in the late 1970s with technical assistance from the Food and Agriculture Organization of the United Nations (FAO) and the Japan International Cooperation Agency (JICA) (Paudyal *et al*. *this issue*). In 1977, a big landslide, (*Thulo Pahiro*) forced the relocation of approximately 25 families from SRD. The landscape was scarred by landslides, which left gullies, exposed soil and boulders ready to move during the next rain. To mitigate the risk of landslides, the Soil Conservation Office began constructing check dams to control gullies and establishing plantations to stabilize the landscape. However, local communities were opposed to this government initiative as they had not been consulted and were concerned about losing control of the area.

After 1993, as the concept of community forestry emerged, SRD residents formed a CFUG and prepared a constitution including rules and regulations for group organization and a forest operation plan. They initiated conservation plantations and protected surrounding degraded forest areas. In the mid-1990s, participatory watershed protection and forest management initiatives resulted in the devolution of more than 60% of the forested land to communities (DFO 2016, Fleming and Fleming 2009). Currently, seventy-five CFUGs representing 12,739 households manage a total of 2,739 hectares (DFO 2016). In 2007, after two and half decades of local community conservation of degraded forests and plantation, the SRD CFUG was officially granted management rights over the forest they protected. The SRD CFUG community forest management efforts converted eroded scrublands to managed pasturelands and forests that increased forest productivity twofold and grass and fodder productivity fivefold (Fleming and Fleming 2009). A 2015 assessment, which included the SRD community forest, found that vegetation cover and species diversity had improved and the supply of fuel wood, fodder, and other forest products had increased (Paudyal *et al*. 2017b), highlighting the effectiveness of forest landscape restoration efforts that provided many social, environmental and economic benefits to the Phewa watershed.

Despite the success of groups like the SRD-CFUG, they continue to consolidate their rights. A key emerging issue is whether local communities own all of the environmental services produced by their restoration efforts and whether they merit compensation from other stakeholders (Paudyal *et al*. 2015). A major outcome of community forests is that it reduced landslides and flooding, which improved soil retention and reduced siltation to the Phewa Lake (e.g., Paudyal *et al*. 2017b). Downstream businesses have benefited from the lake tourism, but CFUGs who have been conserving the watershed are not receiving significant benefits. Furthermore, informants suggested that water availability had decreased in areas surrounding community forests, but had increased further downstream because forests induced infiltration and improved the recharge of ground water. Also, forest restoration supported biodiversity conservation, but farmers report increased conflict with wildlife. For example, a growing monkey population in the community forest has become a pest, increasingly destroying crops each year. Local communities cannot control the monkeys nor are they compensated for crop damage. As a result, there have been calls to adjust issues emerging around property rights in the watershed where the SRD CFUG is located. A key question is how to value the biodiversity conserved or the carbon sequestrated by theses community forests so that CFUG members benefit from these services. Existing policies, acts and regulation are silent on these issues.

Forest tenure reform and landscape restoration in China

China has undergone a remarkable transition since 1980, when 58% of forests were collectively owned and the remainder was owned by the state (Luo *et al.* 2015). Today China has a more diverse system that has emerged from the devolution of use and management rights to individuals and local groups under locally adapted mechanisms. The Chinese government initiated the reform process in the 1980s, but in the following decades allowed the emergence of multiple pilot initiatives and local level trials of innovative approaches to reform and restoration (Xu *et al.* 2010). Since 2003, collective forest tenure reform, which enhanced conditions for forest restoration, has unfolded on two fronts: a tenure reform that devolved use rights over forests to individuals and individual entities, and governance decentralization that encouraged granting significant decision-making power over forests to local governments (He and Sikor 2017, Xie 2007). Thus, the Chinese example, while following a unique trajectory, illustrates how the devolution of individualized use and management rights serves as incentives that encourage investment in forest restoration. In this section, we will briefly summarize the general policy trends that have occurred in China over the last several decades and then focus on how these reform trends played out in the Changting County in the Fujian Province.

A key reform influencing later forest policy change in rural China occurred in 1981, when the Chinese government adopted the Household Responsibility System to increase agricultural productivity. This system reallocated collective agricultural lands by granting households long-term lease contracts called 'tenure certificates' that gave them use rights and some decision-making autonomy over agricultural production. That same year, the government expanded the underlying concepts of the household responsibility system to the forest sector with the Three Fixes Reform, a program that attempted to stabilize forest ownership, delimit mountain exclosures, and redefine responsibilities for forestry production (Liu 2006). The Three Fixes set off a massive shift of forestland out of collective systems. However, this was a volatile period: rural producers lacked confidence in the duration of these reforms, harvest rights and quotas were unclear, and

the fragmented holdings allocated to households were difficult to manage efficiently (Liu 2006). Therefore, an unintended consequence of de-collectivization and decentralization was a wave of degradation and deforestation caused by over harvesting. The reallocation of use rights also corresponded with a process of deregulation of forest harvesting, which also contributed to high deforestation and the eventual reintroduction of timber harvest restrictions (Xu *et al*. 2010).

Under Chinese policy, the government classified forests into two types: ecological forests and economic forests. There are specific rules for the management of each type. Nationally, ecological forests account for 60% of total forest area, while economic forests cover about 40% (Liu and Zhao 2009). Ecological forests are conservation forests and reserves managed primarily for their ecological benefits (but also for timber in the long term). Multiple levels of government finance the management of ecological forests through public fiscal investments. Economic forests, on the other hand, are areas managed to produce non-timber forest products such as fiber, fruit, nuts and rubber (Bennett *et al*. 2014). These forests may also receive public financing but at lower rates and for shorter times, supplementing the income individuals and enterprises receive through commercial activity such as fruit or pulp production.

In 1992, China implemented the Four Wasteland Auction Policy, which encouraged enterprises, households, cooperatives and other entities to participate in the restoration of forests by allocating rights to degraded lands. Through this policy, the government granted forest rights certificates to farmers and private groups to use and manage trees planted on degraded lands as an investment in afforestation efforts. The policy was based on the principle that those who make investments should be allowed to benefit from them.

Government agencies imposed strict regulations on logging and other types of extraction in ecological forests to achieve forest restoration goals but such measures imposed economic costs on landowners. In response, in 1998, the central government initiated the Forest Ecosystem Benefit Compensation Fund (FECF) to reimburse owners of ecological forests for their investment and lost income (Bennett 2009). The compensation amounts offered to forest owners ranged from about US$25 to US$50 per hectare annually. The FECF payments were an attempt to compensate land use right holders for forgoing income to set aside forest areas for conservation purposes, in a sense paying them for the expected environmental services.

Finally, a process of collective forest reform emerged in China during the 2000s from multiple localized initiatives culminating in guidelines issued in 2008 encouraging local authorities to reallocate forest use rights to individuals, groups of households or enterprises based on a majority vote (Xu *et al*. 2010). By the end of 2012, the ownership of the sum of around 190 million ha[2] of forest land, representing 97.7% of the total amount of collective forests in China, had been clarified (Zhang 2012). These measures provided long-term tenure security and subsidies for forest restoration to those with forest tenure certificates, reversing the trend of forest loss.

Reforms bring restoration and change to Changting County, Fujian Province

Changting County, located in western Fujian Province, has undergone a major change in forest cover because of tenure reforms and restoration incentives. Covering 309,900 hectares with a population of approximately 539,000 people in 2016, Changting was once among China's most degraded and impoverished counties. Almost 60% of the county's area suffered from soil erosion, which has since dropped to 10%; most of the county is now forested (81%), with only a small area (16%) still under agriculture (Li and Liu 2015). In the early 1980s, annual per capita farm income was US$60, with agricultural income accounting for 77% of total income (ACC 2014). In 2015, the annual per capita farm income had increased to US$1,110.

Changting offers a model to explore the process of forest landscape restoration in China. The forest coverage rate increased from 60% in 1986 to 80% in 2015, while the soil erosion rate decreased from 31% in 1985 to 10% in 2015, according to statistics released by the Soil and Water Conservation Bureau of Changting County in 2016. To understand how this change took place, from 2013 to 2016 researchers from Renmin University of China conducted research involving key informant interviews and a review of secondary data.

Prior to China's reform and opening-up policy, most of Changting's agricultural and forest land was held by collectives. During this period, overuse and mismanagement had led to degradation and soil erosion because village collectives were unwilling to invest capital or labor in reforestation. During the early period of reform, tree planting and large-scale restoration activities relied on government services. For example, in the 1980s the Changting Forestry Bureau used aerial seeding to plant Chinese bayberry (*Myrica rubra*) on 30 thousand hectares of barren hills around Hetian Town (PCC 2013).

In 1981, Changting's forest landscape restoration programs began by introducing orchard plantations and hillside exclosures (delimited areas where access and use were restricted) on eroded lands to promote afforestation. The county government designated 41,900 hectares of forest, approximately 17% of all forestland in the county, for mountain exclosures (ACC 2014). The government distributed this area to 44,800 households, approximately 94% of the county's households, amounting to about 1 hectare per household (ACC 2014). However, the small parcels allocated provided households little incentive to invest in forest rehabilitation. The government did not distribute most of the remaining forestland. Instead, the administrative village continued to manage these collective forests, and because the income distribution was not clear, individuals had little economic interest in these forests. Local residents did not invest in management or protection and there were serious problems with the theft of forest products. In theory, villagers managed these forestlands collectively, but in practice, there was no coordinated management. Therefore, because government-controlled collectives still dominated forest restoration efforts, the "Three Fixes" forestry reform had little effect and limited success.

During the early phases of reform, ecological restoration focused on excluding local use. As a result, the government implemented policies to offset impacts on local families excluded from forests that were key to their livelihoods. For example, to lower demand for firewood, the provincial government provided the village with a coal subsidy of US$ 124,000 dollars per year from 1983 to 1999 (PCC 2013). The government also promoted labor-intensive industries such as textile production and food processing in the region to provide non-agricultural employment opportunities to lower resource pressure in areas where forest restoration was planned (PCC 2013). These coordinated policies supported progress in forest landscape restoration (Tu *et al.* 2016).

In the 1990s, once the national government adopted the Wasteland Auction Policy, the Changting government encouraged reforestation of economic forests in degraded areas. In this period, more households started planting oil tea (*Camellia* spp.), Chinese bayberry (*Myrica rubra*), Chinese chestnut (*Castenea mollissima*) and other economically valuable species. This eventually increased village forest incomes by restoring the land with plantations of economically valuable species (Cao *et al*. 2009). Reforms had less of an effect on ecological forests still managed by exclosure. Although theft and illegal harvests decreased, there were few incentives for afforestation activities in those areas. With small areas and limited rights in remote locations, villagers were unwilling to participate in FLR in the ecological forests if it entailed household investments.

To encourage participation, FEFC incentives were deployed towards some of Changting's forestlands. About 77 thousand hectares of ecological forest off limits to logging was eligible for FECF funds. These funds were distributed in three parts: 50% to forest owners as compensation for lost income, 40% to the County Forest Bureau as fees for management activities and 10% to the village collective organization as fees for supervision. These incentives brought positive change by effectively curbing the incidence of deforestation, forest fires, and illegal forest extraction in the ecological forests.

In 2003, Changting's approach to forest restoration underwent a major shift. Reforms had started to allow the local government to transfer use rights from collectives to households and clarifying property rights, delegating management responsibilities, reducing taxes and fees, and regulating forestland circulation. Forest owners with forest rights certificates that wished to engage in forest restoration could gain access to mortgages that would finance this work. From 2007–2012, the Changting County offered mortgages on 17.3 thousand ha of forestland, valued at US$48 million dollars (Tu *et al.* 2016), encouraging public investment in afforestation and diversifying the pattern of participation in forest landscape restoration. These measures stimulated interest to invest in afforestation and diversified local participation in forest landscape restoration.

The reforms allowing individualized property rights also permitted the emergence of market-oriented forestland transfer mechanisms, which gave individuals the opportunity to pass forest rights to family members or others to continue forest investments. Market transfer, co-investment, and bidding mechanisms also encouraged the formation of joint management, cooperative management, and other enterprises to scale up restoration efforts. Transfers affected 26,800 ha, accounting for 27.5% of the total area of restored forests, according to a report released by the Changting Forestry Bureau in 2015. At the same time, increasing timber prices and lower forestry taxes made farmers more optimistic about their potential to profit from forest management. Therefore, the devolution of forest rights to individuals not only contributed to poverty alleviation but also provided market opportunities for farmers to generate economic benefits. According to survey data collected by Renmin University of China in 2014, after the reforms, forest income increased significantly as a proportion of total household income. Per capita forestry income reached 278 US dollars, approximately 1/4 of total income in 2013. The area reforested by individual households increased from 25% in 1981 to 55% in 2013.

In the reforms described above, as the government directed the devolution of forest rights it maintained land ownership, but granted use and management rights over forestland to households. This change in forest rights shifted forest restoration efforts from collectives to individual households, groups of households and enterprises.

In the study area, collective property rights over forests provided relatively low incentives for FLR. Under collective forest management during the Three Fixes period (1981–2002), forests were poorly managed and protected, making theft of forest products a serious problem. Villagers had relatively low motivation to participate in FLR. After collective forest tenure reform in 2002, individual forest rights arrangements combined with subsidies and credit opportunities increased economic incentives such that large households, enterprises and cooperatives were more willing to invest in reforestation. The individualization of property rights arrangements encouraged a diverse pattern of public participation in forest landscape restoration.

Forest reforms in Ethiopia and the emergence of Participatory Forest Management as a restoration strategy

Ethiopia presents a case where state efforts to exert ownership over forests, coupled with the lack of capacity to enforce regulations, or actually to control access to forests, produced institutional uncertainty and led to general patterns of forest degradation and deforestation (Mekonnen and Bluffstone 2015). Over the last decades, Ethiopian governments have attempted to offset this degradation trend with large-scale reforestation and plantation policies but with limited success (Hoben 1995). One positive exception has been a program called Participatory Forest Management (PFM) originating in the 1990s (Siraj *et al*. 2015). A key component of this program has been the recognition of rights of some local community groups to manage and protect forest resources. As we will describe, the collection of rights and obligations devolved to these groups provided sufficient incentives to collectively maintain and restore forest cover. Although there

are signs of success, the lack of local consultation and top down decision-making has raised questions of equity and long-term viability of these systems (Siraje *et al*. 2015).

Historically, a dominant topic in Ethiopian forest policy has been ownership by the state. Starting in the early twentieth century, national authorities recognized that the country's forest estate was decreasing in extent and quality. In response, Ethiopia's emperor proclaimed that all forests, whether on state or private lands, belonged to the government and required all forest users to pay royalties for use (Mekonnen and Bluffstone 2015). This policy lasted decades but did not stop forest degradation and loss. In the 1960s, to conserve remaining forests, the government stopped distributing state forestlands to private owners and attempted to exchange denuded lands for private lands with forest, actions that instead of reaching these goals, provoked uncertainty and fear of private land seizure by the state and likely increased deforestation (Bekele 2003).

In 1974, when a military regime came to power, Ethiopian property rights underwent a radical shift. The following year, the regime issued 'Proclamation No. 31', an ambitious policy intended to transform rural socioeconomic and political systems. Among its multiple goals, the proclamation promoted expanded agricultural development and increased food security as well as slower environmental degradation and soil erosion (Hoben 1995). More specifically, the policy abolished private ownership, and attempted to provide equal land distribution to the rural landless (Ambaye 2015, Mekonnen and Bluffstone 2015). However, the policy did not accommodate local customary practices that in many cases framed resource access and use behavior. Under this policy, land was periodically reallocated to support government programs, such as agricultural expansion, resettlement, and other development programs, a process that increased insecurity and triggered further environmental degradation (Hoben 1995). While the state claimed exclusive rights over forests, it lacked the institutional capacity and resources to enforce regulations or restrict access, creating in effect *de facto* open access conditions (Ambaye 2015). Faced with accelerated forest loss and land degradation, the military regime launched massive reforestation, afforestation and soil conservation programs on state lands to mitigate degradation and generate income from tree plantations (Mekonnen and Bluffstone 2015). Rural laborers working on these initiatives were compensated by the government through food for work programs; however, since these people had little stake in the planted trees, they had less incentive to protect them from free ranging livestock and fire (Hoben 1995).

After almost twenty years, Ethiopia's military regime collapsed in 1991. The new government introduced broad reforms but maintained the existing tenure policy in which land remained under state ownership (Ambaye 2015). At the same time, the government began experimenting with natural resource policy reform, such as the 1994 National Conservation Strategy, which created space for innovation (Ayana *et al*. 2013). The strategy decentralized some controls over forests passing responsibility to regional governments and encouraging local participation in development. There were no formal changes in tenure policy but regional agencies could delegate use rights as well as some management and exclusion rights to the local user group. Ethiopian natural resource authorities, donors and NGOs began to realize that centralized expert-led forest management efforts had been unsuccessful and that local communities that held major stakes in forest resources would be interested in investing in sustainable forest management (Kubsa *et al*. 2003, Temesgen *et al*. 2007 in Ameha *et al*. 2014). These steps allowed non-governmental organizations to begin experimenting with a model that became known as Participatory Forest Management (PFM) (Ameha, *et al*. 2014a).

PFM is a strategy allowing local users to control some benefits from forest in return for taking responsibility for the good management of the designated forest area. The guiding principles of PFM were to secure rights for participating communities by creating a legal mechanism recognizing their participation, assist community groups to become forest managers and integrate forest management within their other livelihood activities (MOA 2012). Generally, PFM initiatives aim to reduce deforestation and alleviate poverty in communities living near forests (Gelo and Alemu 2015). PFM attempts to balance conservation and use by organizing local participation and transferring management responsibilities to community groups living in and around designated forest areas (MOA 2012).

In practice, PFM projects were co-management agreements negotiated by NGOs with regional government agencies to assist local user groups (Ameha *et al*. 2014). Most PFM initiatives received assistance from NGOs that mediated negotiations between communities and government agencies (local and regional) to develop the agreements. Once agreements were ready, NGOs would provide technical assistance, for marketing, processing, trading, certification and storage of forest products (Gelo and Alemu 2015).

PFM programs targeted communities living near forests with some of the poorest, forest dependent residents organized into forest user groups (FUGs). The FUGs received management rights, but the forest continued to be owned by the government (Ameha *et al*. 2014a). Members of FUGS have rights to collect grass for livestock, hang beehives, collect fuelwood, gather medical plants and extract construction material for domestic use. In addition, in some cases FUGs could harvest higher value products such as forest coffee and timber, as long as management decisions were communal, benefits were shared collectively and the groups complied with other relevant regulations (Gelo and Alemu 2015).

Initially, eight PFM pilot projects were implemented but over the last decade more effort has been made to expand the number of PFM sites as a national strategy (Ameha *et al*. 2014). In 2007, the government issued the 'Forest Development, Conservation and Utilization Strategy (FDRE 2007), a multi-faceted policy intended, among other things, to promote forestry development and to increase forest cover through restoration. The policy encouraged local communities to develop management plans for lands the government had not classified as protected or production forests and, in return for restoration efforts, the government would allow

residents to extract non-timber forest products such as honey, fruit, grasses and even forest coffee (Mekonnen and Bluffstone 2015). While generally seen as successful, there has been significant variation in the outcomes with some cases of PFM being more successful than others (Kellbero and Stellmacher 2016, Ayana *et al*.2013). More recently, it has been estimated that 1.5 million hectares of forest are under PFM institutions (Kassa *et al*. 2016), a figure that is likely to increase as the government's Climate Resilient Green Economy Strategy (CRGE) is implemented. The CRGE targets 7 million hectares of forest for rehabilitation as part of the government's commitments under the Bonn Challenge and expects PFM to be the designated mechanism on 2 million hectares of that total area targeted (CRGE 2011).

Participatory Forest Management in the Chilimo National Forest Priority Area

The Chilimo forest is located in the Oromia regional state and is one of Ethiopia's few remaining Afromontane forests. The government designated the area as a National Forest Priority Area (NFPA) in 1991 in an attempt to slow the sharp decline in forest cover (Million and Leykun 2001). For years, the surrounding rural population had encroached on the Chilimo forest to support agriculture, livestock production, and the extraction of timber and non-timber forest products (Mamo *et al*. 2007, Ameha *et al*. 2014). Of the 15,000 households living in the surrounding villages, approximately 20 percent actually live inside the Chilimo forest (Kassa *et al*. 2009). Because of uncontrolled timber extraction and incursions by local people using the area for grazing and farming, the forest area shrank from 22,000 ha in 1982 to about 6,000 ha by 1994 (Kassa *et al*. 2009). Past reforestation efforts in the area had resulted in 415 ha of timber plantations around the forest but this modest area was scattered around just a few of the neighboring villages (Mohammed and Inoue 2012).

In 1996, two international NGOs -FARM Africa and SOS Sahel International- introduced a PFM program in Chilimo to promote the conservation and sustainable forest management of the existing natural forest and patches of plantations, and to improve local community welfare (Kassa *et al*.2009). The NGOs negotiated the PFM agreement with the Department of Forestry in the Dendi District's Agriculture Office. During an implementation phase, the NGOs and the government promoted awareness of PFM, collected data on forest resources and users, defined membership lists for FUGs and designed benefit-sharing mechanisms. Technicians from the Department of Forestry assessed the 'carrying capacity' of the forest to determine how many people could participate in FUGs (Ameha *et al*. 2014) while the NGOs selected resident households prioritizing the forest dependent poor. The local government demarcated 3800 hectares of forestland that was granted to eleven FUGs with a total of 1,600 members in six villages (Kassa *et al*. 2009). FUG members held access, use, and management rights to a section of forest and plantations if present. They also held exclusion rights, which allowed them legally to deny non-members access to the forest. Their rights allowed them to harvest wood for subsistence and commercial purposes such as firewood. Members could also cut a limited number of live trees for construction with permission from their FUG executive committee. The agreements did not permit grazing livestock in the forest. For FUGs that had timber plantations, members shared benefits from the timber harvests with proceeds distributed 70:30 between FUGs and the Oromia Forest and Wildlife Enterprise (Ameha *et al*. 2014, Ameha *et al*. 2014a). The government continued to control decision related to the sale of timber from the plantation although the FUGs participated in the development of the annual harvest plan. Logs are not sold through a bidding system but rather through a patronage network to wealthier FUG members or community leaders. As a result, FUG members receive below market price for their logs. Although NGOs focused training on poor forest dependent households, wealthier members and leaders gained more benefits from activities such as timber sales (Mohammed and Inoue 2012). The initiative also included a revolving fund mechanism to improve agricultural activities and credit for small businesses (Ameha *et al*. 2014a). In 2004, the district forestry office officially approved the Chilimo FUGs' bylaws, which transferred management rights to the FUGS for two years (Ameha *et al*. 2014b).

Because of its promising results, the Chilimo PFM initiative became a model for a national community based forest management program in Ethiopia (Mohammed and Inoue 2012). The Chilimo PFM initiative had targeted the poorest, forest dependent residents of selected communities. It increased participants' annual forest income by about 70 percent after implementation (Ameha *et al*. 2014b). While participants had higher forest income than non-participants, in terms of total annual income, non-participants income was still higher on average because they owned more land and livestock compared to the participants. PFM participants were also still more likely to suffer from food insecurity (Ameha *et al*. 2014a).

The devolution of forest management to local communities in Chilimo showed significant impact on forest condition. Analysis of satellite imaginary from 2003 and 2012 indicated that Chilimo forest cover had increased by about 7% after PFM implementation (Kebebew 2012). By prohibiting livestock grazing in the forest, the agreement lowered pressure on resources improving forest regeneration and allowing wildlife populations to increase (Kassa *et al*. 2009).

Moreover, PFM decreased forest conflict between participating communities and the state, and participants reported greater feelings of ownership over the forest once the program initiated (Ameha *et al* 2014b). FUG members benefited from subsistence and commercial use of forest products, so they had incentives to exclude others and protect resources. Reduced conflict thus is an indicator of forest devolution success.

The success of the Chilimo PFM program is evident in participants increased income, improved forest condition, as well as reduction in forest conflicts between local communities and the state. However, lack of accountability of leaders could threaten forest devolution in Chilimo in the future. The

Chilimo PFM initiative suffers from some remaining inequity in benefit sharing particularly due to the lack of transparent management of plantation revenue, which was a matter of concern in some FUGs (Ameha *et al*. 2014, Ameha *et al*. 2014a, Mohammed and Inoue 2012). Finally, government reluctance to hand over forest management to local community, and top down selection of FUG members likely marginalized some community residents.

DISCUSSION: SECURE PROPERTY RIGHTS AS INCENTIVES FOR FOREST LANDSCAPE RESTORATION?

The country case studies presented here were purposefully selected as examples where national policy reform brought dramatic change to FLR programs. They illustrate how reforms, particularly reforms that devolved property rights, led to the successful involvement of local stakeholders in restoration efforts spanning a diverse range of national policy dynamics, socio-economic patterns and environmental conditions. These processes followed distinct paths that reflected national conditions as well as internal variation. However, they do allow us to draw a few general lessons. To review, we need to return to the questions raised in the introduction.

How did reforms change property rights frameworks and institutions to provide incentives for FLR?

By devolving and strengthening local property rights reforms, these cases are examples that reflect what has been a growing consensus on the role of property rights in supporting forest management by local stakeholders. A recognized challenge for restoration efforts is that rural people with insecure tenure will be unlikely to invest in activities for which they derive little benefit (Lamb *et al*. 2005). Conversely, secure property rights have been linked to lower incidence of deforestation (Deacon 1999) and tenure security has been associated with lower forest cover change (Ferretti-Gallon and Busch 2014, Robinson *et al*. 2014). Comparative analysis of Paraguay and Madagascar noted that critical factors for the success of forest restoration were tenure and management rights (which are both elements of property in our view) as well as incentives (Mansourian *et al*. 2014). A recent study in Peru found that land titling dramatically reduced forest clearing and forest disturbance in indigenous territories (Blackman *et al*. 2017). While there is agreement that secure tenure is an important point of departure for FLR, a challenge faced by policy makers globally is how to establish and maintain such property regimes on forest frontiers.

The cases presented in this paper illustrate how the devolution of rights and increased security in local control of forest property were positive incentives for the community level actors involved. In each case, prior to the reforms, local people were denied rights and legal opportunities to use and manage forest resources, a situation that contributed to the over exploitation of resources and discouraged cooperation with state efforts to conserve or restore forests. In all three cases, all or most forests in question started as public or collective property within systems that placed strict regulations on forest access and use for local stakeholders. However, national agencies or other authorities lacked the capacity or political will to control and enforce restrictions. The unintended consequence was a general trend of forest degradation and deforestation. Different stakeholders extracted what they could and there was little incentive to forgo immediate benefits or invest in the resources' future. In a sense, this historic period served as a counterfactual, to changes that occurring after the reforms in the three countries.

Over time, in each country, a national consensus developed that command and control measures were failing and reform was needed to adjust the policy approach to forests. Consequently, these countries launched processes to decentralize forestry institutions and devolve rights to stakeholders closer to forests, eventually transferring rights to local forest dependent people themselves. The devolution of rights to local stakeholders in each case was limited to use, management and exclusion rights, but these were enough to give local actors sufficient incentive to invest in management activities and, more importantly, contributed to efforts to stop overuse and protect forest resources from outsiders.

As mentioned earlier, clear and secure property rights provided necessary enabling conditions for forest restoration but, alone they are insufficient to ensure that restoration occurs (Lamb *et al*. 2005, Barr and Sayer. 2012 Mansourian 2016, Uriarte and Chazdon 2016), a point illustrated by the cases presented here. The devolution of property rights severed as a catalyst but other policy changes and programs accompanied reforms. The model adopted in each country was unique but generally, reforms included changes to the regulatory frameworks guiding forest use, technical support both for resource management and for navigating compliance bureaucracy, and capital investments. In Nepal devolution passed rights to community-level user groups controlling nearby remnant forests, while in China, the eventual approach adopted in the Changting county resulted in a varied array of local individuals and groups controlling different types of forest for different purposes. In Ethiopia, a national forest was subdivided to grant control to local organizations representing subgroups from surrounding communities. While none of these models was perfect and all continue to evolve, they each laid foundations that worked within the local context and dynamic in each country.

How did changes shift the livelihood benefits and management responsibilities?

As described in the three case studies, the partial devolution of rights to use and manage forestlands creates co-management regimes. Faced with chronic problems of forest loss and degradation, these governments passed the right to use, manage and benefit from forest to designated local actors, but did not give them full ownership. Instead, by withholding alienation rights and requiring compliance with forestry regulations as a condition for maintaining rights, governments retained a role in and control over forests use. The arrangements developed over time in a process of negotiation and mediation to reach

balanced agreements to allocate forest stewardship responsibilities and benefits, which are characteristics commonly defined as co-management (Borrini-Feyerabend 2000, Carlsson and Berkes 2005)

Such approaches for promoting restoration have appeared in the literature, even if not explicitly called co-management. For example, in discussing the promotion of FLR, Lamb *et al.* (2012) draw a distinction between three possible approaches. Governments could adopt top-down, command and control efforts driven by state agencies to reach FLR objectives. Such an approach, the authors suggest, might be efficient, but would also likely to be contested by local stakeholders and generate political resistance. Conversely, government could cede to priorities set by local stakeholders to address grassroots agendas. While this approach might be politically expedient, it would be less likely to address national restoration goals. The authors finally define a third way that combines elements of both approaches, which would entail certain tradeoffs but is probably effective in engaging local people and ensuring restoration occurs. What they describe would include co-management schemes, where governments and local stakeholders share benefits and responsibilities to balance tradeoffs in an effort to address common interests.

Co-management systems were part of the programs that promoted FLR implementation in these cases. Co-management is prominent in community forestry around the world (Fisher 1995) and co-management regimes will frame the design of FLR programs that occur in countries where policies grant some forest property rights to local users but the state withholds others or shares them between stakeholders. In these cases, local stakeholders will have received some rights to benefit from the resource but also responsibilities to comply with government rules and guidelines as well as to demonstrate their compliance and their progress towards restoration goals. These arrangements mean that state agencies will still hold obligations to support and defend the property rights holders involved in restoration, and in some instances provide support such as technical assistance or incentives. The outcomes in each country resulted from negotiations that balanced government priorities with local needs and interests. Again, they are not perfect, and are works in progress, but in each case, the outcomes are improvements over the *status quo* prior to reform.

What are key lessons learned from FLR programs in these countries?

There are five general lessons that can be drawn from these examples that may be useful for FLR program implementation.

The first lesson from these cases is that they confirm the role of the devolution of property rights in providing incentives for participation in FLR programs. This is not surprising as the cases were purposefully selected as examples recognized as reforms that devolved rights in attempts to enhance forest management. However, the important point of comparing these cases is to show the diverse patterns these reforms have taken and how they have responded to unique national contexts and adapted to local realities.

The second lesson is that the approaches to reform used in these cases represented types of co-management regimes. This is likely to be a common situation for FLR in countries where forest property rights are only partially devolved. By withholding some rights, governments maintain a level of control over forest resources to better ensure that management meets certain guidelines and that forest lands are not converted to other uses. Co-management introduces a level of conditionality as rights holders need to demonstrate their compliance with regulations in order to preserve rights and access to benefits. By passing rights to local users, governments are relieved of some responsibilities to management and police access because local user take over these roles.

The third lesson is that these kinds of reform processes require negotiation and the balancing of tradeoffs to produce systems that work. They need to be attractive to local actors to provide incentives for investment in FLR but also provide state policy makers with enough assurance that forests will be restored and maintained. The success illustrated in these cases was the result of long processes of negotiation, learning and adaptation. Generally, state actors were reluctant reformers but circumstances, such as unmistakable trends of deforestation and degradation, plus the need to respond to livelihoods needs of local constituents, required course correction and the implementation of reforms. By devolving rights over forests to local stakeholders, governments changed the incentives to invest in forest resources and to forgo immediate returns, and created opportunity for potential benefits in the future.

A forth lesson is the importance of including local stakeholders in the design and implementation of FLR initiatives. While encouraging local inclusion and participation through the devolution of property rights can be seen as a generalizable approach, it is difficult to present a uniform model for this purpose. Because local stakeholders and biophysical context are so heterogeneous within a between countries, the approach used in any location needs to take into account this variation. However, involving local stakeholders from the outset in the design and implementation process of FLR programs is a strategy likely to ensure that relevant local details are considered and appropriate measures are taken as programs are developed. There are systematic governance challenges to effective forest restoration efforts, and these are often overlooked in planning (Guariguata and Brancalian 2014). Including local stakeholders and accommodating their needs is an important factor in ensuring their collaboration and investment. It can produce efficient and effective solutions in areas where forest restoration is needed. Because these actors are close to the resources in question, and interact with others in these spaces, they have a high capacity to influence what happens there, particularly in monitoring and defending resources. If they are ensured clear and secure benefits in the future, they will have incentives to invest.

A final lesson suggested from these cases is that the FLR process will need to continue to evolve and adapt to changing conditions. New issues, are likely to appear such as the design mechanisms for compensation and benefit sharing related to environmental services resulting from FLR. Also, as forest

restoration is likely to increase resource value, policy makers will monitor shifting patterns of access and distribution to avoid, exclusion or social conflict (Barr and Sayer 2012). In addition, these are imperfect systems and all stakeholders involved, from government planners to local managers at the community level, will need to collaborate to respond as new opportunities appear or unintended consequences occur. Just as forest landscape restoration should be seen as a process attempting to reestablish ecological integrity and improve human well-being in degraded forest landscapes (Lamb *et al*. 2012), the underlying policy reforms and constituent governance institutions they create will need to be adjusted as conditions change.

CONCLUSIONS

This paper has explored how secure property rights serve as a key governance linchpin in the design of forest landscape restoration programs. While it is generally accepted that property rights are fundamental as a starting point for restoration design, the discussion here has attempted to detail how this worked in practice in the Nepali, Chinese and Ethiopian contexts, three very different national scenarios where forest restoration efforts did engage with and involve local stakeholders. Property rights frame which stakeholders are involved, how they are able to participate, and how and where they interact. Clarifying and securing property rights over forests is often a challenge for policy makers because property regime imposed on forests is often complex, dynamic and contested. The cases presented here showed how the devolution of certain types of use and management rights, associated with conditional responsibilities, provided incentives for local people to invest in and benefit from forest landscape restoration programs. In practice, these reforms often create co-management arrangements, but these emerged over extended periods as part of adaptive responses to local and national realities.

In each case, governments initially attempted to exert more centralized control over forests but when confronted by persistent degradation trends, reoriented policies to devolve rights to local stakeholders, which provided enabling conditions for advancing with FLR efforts. The resulting co-management systems were distinct and reflected national and local contexts. These cases do illustrate how the granting of property rights, even if not full ownership, can provide sufficient incentive for local actors to invest in and support efforts to restore and protect forests on degraded landscapes.

This article's examination of the clarification and securing of local stakeholders' property rights as one incentive for FLR in China, Ethiopia and Nepal holds lessons generally relevant to the implementation of restoration programs globally. As they are diverse in their form and precedents, they also demonstrate the importance of local and national context and the history of property rights and relationships between power and possession. As noted in previous work relevant to these questions, formal reassignments of property rights do not necessarily preclude the reversion to unofficial or customary *de facto* systems of ownership and transfer (Cronkleton and Larson 2015). At the same time, the process of initiating changes in property rights, especially when states formalize informal local systems of access and management, can result in the commodification and appropriation of lands, exclusion of historical landholders and future conflict (Kelly and Peluso 2015). Therefore, any program involving property rights certification, whether as an incentive for afforestation or an underpinning for benefit sharing, should predict the potential for elite capture of land rights, ensure adequate and timely information to local stakeholders who depend on land resources, and provide assistance in navigating the process of obtaining and certifying their rights to avoid competition from outsiders with greater means (Benjaminsen *et al*. 2009, Putzel *et al.* 2015).

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