Studies on forest landscape restoration in hilly and mountainous regions of Asia and Africa – an introduction to the Special Issue

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SUMMARY

The field of forest landscape restoration (FLR) is quickly gaining traction now that national commitments to restore degraded lands under the 2011 Bonn Challenge have reached upwards of 160 million ha. While the growing literature on FLR and associated methodologies being proposed emphasizes the importance of including stakeholders in decision making and implementation, local communities in hilly and mountainous regions often face particular challenges. The papers in this Special Issue of the International Forestry Review shed light on some of the approaches incorporated in FLR design and its outcomes in cases from China, Ethiopia, India, Nepal, Thailand, and Vietnam. These include direct subsidies or PES, land distributions and devolution of resource rights, engagement of communities in participatory management, and other approaches. Taken together, the studies in this Special Issue bring together a range of insights into the diversity of approaches favoring the implementation of FLR, particularly in sloping landscapes, under varying social and ecological conditions.

Keywords: forest landscape restoration, ecosystem services, rural welfare, stakeholder engagement, upland smallholders

Études sur la restauration des paysages forestiers dans les régions vallonés et montagneuses d'Asie et d'Afrique – Une introduction au Numéro Spécial

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Le domaine de la restauration des paysages forestiers (RPF) gagne rapidement du terrain en tant que moyen d'améliorer les services écosystémiques et le bien-être humain. Ce phénomène fait suite au Défi de Bonn de 2011 et, à ce jour, a inspiré des engagements nationaux pour restaurer plus de 160 millions d'hectares de terres dégradées. La littérature croissante sur la RPF et les méthodologies y associées souligne l'importance d'inclure les parties prenantes dans la prise de décision et la mise en œuvre. Les communautés locales dans les régions vallonés et montagneuses font face à des défis particuliers. À travers des études de cas en Chine, en Ethiopie, en Inde, au Népal, en Thaïlande et au Vietnam, les articles de ce Numéro Spécial de la International Forestry Review expliquent certaines des caractéristiques de la conception de la RPF et de ses résultats. Il s'agit notamment des subventions directes ou des PSE, des distributions de terres et de la dévolution des droits sur les ressources, de l'engagement des communautés dans la gestion participative, entre autres. Prises ensemble, les études de ce Numéro Spécial rassemblent des idées sur la diversité des approches favorisant la mise en œuvre de la RPF, en particulier dans les paysages vallonés et montagneux aux conditions sociales et écologiques variées.

Estudios sobre la restauración del paisaje forestal en regiones accidentadas y montañosas de Asia y África – Una introducción al Número Especial

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El campo de la restauración del paisaje forestal (RPF) está ganando terreno rápidamente como medio para mejorar los servicios de los ecosistemas forestales y el bienestar humano. Este fenómeno sigue al Desafío de Bonn de 2011 y, hasta la fecha, ha inspirado compromisos nacionales para restaurar más de 160 millones de hectáreas de tierras degradadas a nivel mundial. Si bien la creciente literatura sobre la RPF y las metodologías asociadas enfatizan la importancia de incluir a las partes interesadas en la toma de decisiones y en la implementación, las comunidades locales en regiones accidentadas y montañosas enfrentan desafíos particulares. A través de estudios de casos de China, Etiopía, India, Nepal, Tailandia y Vietnam, los artículos en este Número Especial de la International Forestry Review aclaran algunas de las características del diseño de RPF y de sus resultados. Estos incluyen subsidios directos o PSA, distribución de tierras y devolución de los derechos sobre los recursos, participación de las comunidades en la gestión participativa, entre otros. Tomados en conjunto, los estudios en este Número Especial reúnen ideas sobre la diversidad de enfoques que favorecen la implementación de RPF, particularmente en paisajes accidentados y montañosos, con sus diferentes condiciones sociales y ecológicas.

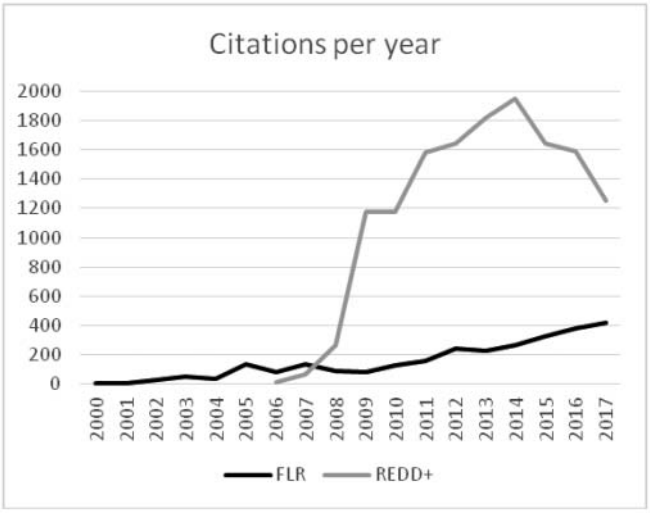
BACKGROUND TO THE SPECIAL ISSUE

An emergent multi-institutional regime in international forestry, forest landscape restoration (or FLR) is rapidly gaining traction as a unifying theme in national and subnational forestry programs. The incorporation of the term 'landscape' suggests that FLR broadens the space of forestry to non-forest zones, thereby requiring trade-offs between multiple land uses or diversification of uses and management practices as a starting point for planning interventions (Stanturf *et al*. 2014, Lamb 2013). In targeting non-forest lands, FLR programs must consider the economic interests and associated jurisdictions of other sectors, such as agriculture, animal husbandry, mining, and urban development (Holl and Aide 2011). For this reason, a key distinction between forest restoration and FLR is the latter's prerequisite of consultation and engagement with diverse stakeholders, either through their active participation, if not leadership of FLR initiatives (Chazdon *et al*. 2017, Guariguata and Brancalion 2014). Such actors benefit from existing land uses so are likely to shoulder an inordinate share of the costs of FLR in return for the possible benefits. Because they have clear interests and agency in these landscapes, they will have significant influence of success or failure. Another distinction is the fact that while forest restoration generally involves returning a pre-existing forest to some semblance of a former state, FLR may involve conservation of forest, restoration of pre-existing forest lands, reforestation of deforested land, afforestation of non-forested land, as well as incorporation of trees in lands that will remain as non-forest land (Lamb *et al.*2012). At the national level, FLR programs may employ a number of the above transformative activities; at the project level, FLR is likely to involve two or more such activities. Depending on the particular problem FLR is employed to address, its goals may include economic benefits through markets for forest goods or outdoor recreation, or restoration of ecological functions delivering services such as soil nutrient cycling, water buffering, and carbon sequestration. Based on all of these considerations, our working definition for FLR, therefore, is 'restoration of landscapes, ecosystem services and associated benefits to local and downstream stakeholders through incorporation of forests and trees.'

The term FLR as used in this paper was reportedly coined in 2000 in a meeting led by IUCN and WWF (Mansourian 2005). In 2003, the Global Partnership for Forest Landscape Restoration formed for the purpose of "sharing diverse experiences on restoration efforts which deliver tangible benefits to both local communities and nature through a landscape approach, while also fulfilling international commitments on forests" (GPFLR 2016).

In 2009, a group from the World Resources Institute, IUCN and South Dakota State University published an influential global map of "forest and landscape restoration opportunities" (and subsequently updated the map in 2014).

FIGURE 1 *Citations per year including reference to forest landscape restoration (FLR) and reducing emissions from deforestation and forest degradation (REDD+), based on a quick analysis of Google Scholar search results*



It identified 2 billion ha of land worldwide suitable for restoration, including 1.5 billion ha suitable for "mosaic restoration" or incorporation of forest and trees in mixed use agricultural, agroforestry or urban landscapes, and 0.5 billion ha suitable for closed forest restoration (Potapov *et al.* 2011). In 2011, the German Ministry of the Environment and IUCN convened an international meeting resulting in the Bonn Challenge, calling for FLR on over 150 million ha of land worldwide by 2020. The challenge was intended as a means to fulfill a number of global commitments to reduce carbon emissions from deforestation and forest degradation (REDD+), to reverse land degradation (RIO +20) and to improve ecosystem resilience and the contribution of biodiversity to carbon storage (CBD Aichi Target 15).[1] Later, the widely endorsed New York Declaration increased the commitment to 350 million ha by 2030 during a side meeting of the 2014 UN Climate Summit. To date, some 40 countries have pledged to restore 160 million ha (Bonn Challenge, undated). Literature addressing FLR specifically had been slow to emerge, particularly compared to other initiatives such as REDD+ (Table 1), but since 2011, as Bonn Challenge commitments and related funding have grown, a significant body of literature and a growing methods toolbox (see, e.g. IUCN and WRI 2014) has appeared.

Of course, the activities comprising FLR are not in themselves new: people and governments have engaged in multiple forms of tree planting and forest management to restore landscapes and ecosystem functions for longer than it makes sense to reconstruct here. In 2010, CIFOR began discussing a potential partnership with researchers from the China National Forestry Economics and Development Research

[1] See: IUCN's policy brief on the economics of forest landscape restoration. Available at : http://cmsdata.iucn.org/downloads/policy_brief_on_forest_restoration_2.pdf, accessed March 29, 2015.

Center in China to conduct joint research on their socioeconomic monitoring of the Conversion of Cropland to Forest Program (CCFP), also known as Grain for Green or the Sloping Land Conversion Program (SLCP). The CCFP has been running since 1999 and is arguably the largest FLR program in the world (e.g. Bennett *et al*. 2014, Xu *et al*. 2006, Gutiérrez Rodgríguez *et al*. 2016). In 2013 a CIFOR-China project started, and the group involved soon developed an interest in comparing China's FLR advances with developments in other countries. While FLR initiatives clearly represented an important opportunity for collaborative action to enhance the role of forests in addressing climate change and delivering a broad range of ecosystem services, there remained (and remain) many areas of uncertainty requiring scientific research to inform implementation. These included the relative importance of alternative land uses, especially for agricultural production, the complex roles played by forests in providing a broad range of ecosystem services and goods, and the interests of the ca. 1.6 billion people who live in proximity to forestlands and depend on them for their economic and subsistence needs.[2]

In particular, common interests emerged around the challenges and opportunities associated with FLR in hilly and mountainous landscapes, which tend to be targeted by FLR programs for several reasons. Downstream agricultural systems and urban communities rely on water delivery from upland forest ecosystems (Hill *et al*. 2013, Viviroli *et al.* 2003). Mountain forests also reduce soil erosion, landslides, and flood potential (Bryder 2014, Glatzel 2009), harbor enormous biodiversity (Grêt-regamey *et al*. 2010, Debarbieux *et al*. 2010). sequester atmospheric carbon and contribute to climate change mitigation and adaptation (Lamb 2014). All of these functions are, however, highly vulnerable to disturbance due to steep gradients and potentially severe changes in precipitation and temperature due to climate change, resulting in increased glacial melting and runoff, drying, erosion, and rapid biodiversity range shifts (Hill *et al*. 2013, Piao *et al*. 2010). Second, in relatively remote uplands, population and agricultural productivity tend to be lower, potentially reducing the opportunity costs of conversion to forest (Lamb 2011). However, human populations in such regions are often characterized by high cultural and ethnic diversity and economic marginalization, and low food security (Debarbieux *et al.* 2010), all of which could increase their vulnerability to the environmental, land use, and economic changes that could accompany FLR interventions. The identification by leading thinkers in FLR of 1.5 billion ha of mosaic lands (see above), of which a significant proportion is sloping land occupied by smallholder farmers, as representing an opportunity for restoration underscored the need to accelerate research specific to FLR in such landscapes.

While there is a growing consensus that FLR planners should address local stakeholder needs, there has been little reference to the types of risks faced by populations on sloping lands. There are significant bodies of literature relevant to these these questions (see, e.g. (Vliet *et al*. 2012, Scott 2009, Fox *et al*. 2009, Price, Kohler, and Gratzer 2011). For this reason, the research group was particularly interested in understanding the sources and types of incentives to participate from region to region, how they work, and how they relate to the outcomes of FLR programs in hilly and mountainous regions of Asia and Africa.

A research agenda formed around the themes of FLR and 'Sloping Lands in Transition' or SLANT (CIFOR 2017). Between 2013 and 2016, the UK Department of International Development's International Forestry Knowledge (KnowFor) program supported several meetings of researchers from China, Ethiopia, South Asia, and Southeast Asia. These encounters facilitated the sharing of research and experience related to the socioeconomic and environmental outcomes of FLR in hilly and mountainous countries, with a particular focus on the impacts of FLR programs on rural smallholder communities. In addition to researching the various forms of economic incentives available to such communities to engage in FLR, associated research teams examined institutional frameworks, implementation models and monitoring. The same project allowed the compilation of the papers presented in this Special Issue of the International Forestry Review.

OVERVIEW OF PAPERS

The papers in this Special Issue cover a wide range of topics of interest to the field of FLR and in particular in understanding factors of successful implementation. Topics covered include the relationships between government agencies responsible for FLR implementation and local smallholders and forestry groups; incentives that encourage participation by local landholders; and environmental outcomes of restoration in terms of land use change, ecosystem services, and carbon stocks. The papers present several distinct FLR models adapted to smallholder and community forestry systems in different country contexts, including smallholder-based payment for environmental services, community and participatory forestry management, and community exclosures.

The first paper (Cronkleton *et al*. 2017) addresses the fundamental issue of household and community property and forest resource rights, describing a positive relationship between devolution of rights to landholders and forestry groups and FLR implementation in co-management systems. Though markedly different in their arrangements, FLR programs in Nepal, China, and Ethiopia have all shifted a degree of ownership of formerly state lands to smallholders or communities, which both incentivizes participation and increases the probability of restoration and maintenance of forest landscapes in upland agricultural zones. After years of deforestation associated with a nationalization of forestry land, Nepal's government devolved forest property rights to

[2] See, e.g.: "New York Declaration on Forests elicits praise, concerns", http://blog.cifor.org/24536/new-york-declaration-on-forests-elicits-praise-concerns, accessed March 29, 2015.

some 30,000 community-based forestry user groups, granting them rights and responsibilities to manage one third of the country's forest land, and, increasingly, rights to use forests for income generation. The Nepali model of community forestry has been extensively studied, and provides a number of key lessons applicable to FLR in many countries with strong traditions of community resource management. In China, forest tenure reforms followed a distribution of agricultural lands to households, but in the case presented from Fujian province, the initial forestland distributions were incomplete and unsupported by economic conditions, resulting in little restoration benefit. When larger areas of land were distributed and the process was accompanied by forestry extension, subsidies and access to new sources of credit, forest cover increased dramatically and management improved. In Ethiopia, a transition from centralized state ownership of forests in the 1970s to a number of participatory forest management projects in the 1990s has allowed the development of co-management systems with local government and NGOs offering supportive services to improve access to markets for non-timber forest products. This model is expected to provide a basis for future FLR efforts on two million ha of the 15 million committed by Ethiopia to the Bonn Challenge.

In another case from China's southwestern region, Zhang *et al*. (2017) describe the design of the Conversion of Cropland to Forest Program from the national to household level, outlining the many connections among multiple sector-specific agencies at all scales involved in planning, implementation and monitoring. These functions link the enrolment of households, the verification of their restoration activities and the conditional disbursement of subsidies directly into farmers' bank accounts. This study illustrates the highly organized institutional complexity of the inspection and monitoring system required to ensure the investment of incentives and allow the efficient implementation of a centralized FLR program that engaged individual local households as the primary forest managers and direct beneficiaries.

Two models from Ethiopia are relevant to FLR. The first based on community-managed area exclosures designed to protect plantings and natural regeneration from degradation by livestock and extraction; the second is a system of participatory forest management of primarily state lands. Based on surveyed communities in Tigray Region in northern Ethiopia, Birhane *et al*. (2017) assess how extension programs provided information to local communities about exclosures, assisted with the development of by-laws, and instituted stakeholder engagement in subsequent planning, implementation and management activities. Results of this study indicate a general perception of environmental improvement and ecosystem recovery, despite a lack of economic benefits due to limited access to resources and the absence of external financial assistance such as that provided in China. Kassa *et al*. (2017) provide a comparative view of participatory forest management and area exclosures in Oromia and Tigray Regional states, respectively. The authors find that both systems have achieved a relatively high degree of buy-in and are contributing to restoration outcomes but also identifies a number of challenges related to unclear land use designations and tenure, lack of access to land, insufficient benefits from afforestation and alternative income activities as well as inadequate systems for sharing benefits. These shortcomings, difficult to address due to lack of capacity at the government level, reduce the benefits of FLR efforts, which is problematic given the amount of volunteer labor required of local people to manage plantings and exclosures.

In India's State of Assam, the case of the Poba reserve forest, an important repository of biodiversity, provides a counterpoint to cases from Ethiopia, China and Nepal, where rights to forest land and resources and management responsibilities have been devolved and clarified. In the Assam case (Rahabhat *et al.* 2017), an attempt to implement restoration through joint forest management with local committees suffered from institutional failure due to the persistence of forest department control without sufficient management planning and a lack of economic incentives to community members. The population surrounding the reserve is highly dependent on its resources, which creates an open access situation and, as a result, a declining resource base and reduced water buffering capacity of the forest. The authors propose that a community forestry system such as that implemented in Nepal could bring better restoration results.

Two studies of FLR in the watershed of Lake Phewa, western Nepal, demonstrate the potential value of community ownership aligned with local economic interests in achieving FLR objectives. The first paper (Paudyal *et al*. 2017a) traces the evolution of approaches to community forestry around Lake Phewa from land rehabilitation in the early '80s to conservation and enrichment of plantations in the late '80s, followed by promotion of natural regeneration and multi-use forestry in the '90s and '00s. The study then assesses the contribution of political, social, ecological and economic factors motivating community decisions to engage in FLR. In contrast to China, where government subsidies to smallholders has provided the underpinning for restoration, in the Lake Phewa case, the value of ecosystem services from restoration and the increase of associated market opportunities (tourism, forest products) have apparently been sufficient to produce a significant transition in forest cover and quality. Meanwhile, clear institutional structures supported by the forestry department and the flow of benefits to community forest users have prevented degradation by unplanned open access usage as seen in the India case. The second paper (Paudyal *et al*. 2017b) assesses land use change in the watershed following the establishment of community forestry in the 1980s to address years of degradation following nationalization of forest lands and disruption of traditional management systems in the late 1950s. Severe erosion in the uplands affected farm productivity and caused siltation of the lake, reducing its economic potential as a tourist attraction. Following the shift to community management, dense forest cover increased by over 80 percent and swamplands by over 150 percent. Most ecosystem benefits associated with forest cover have improved, including water regulation, wood products, and carbon sequestration. Despite a small increase in the area of agricultural land, community members perceived an increase in food production. Improved water quality in the lake due to

reduced siltation has revived tourism, which is a mainstay of the local economy.

In Thailand, the national government has responded to a severe depletion of forest cover in the 60s and 70s by implementing strict conservation measures and eventually a ban on logging of natural forests in 1989. Virapongse (2017) suggests that the severity of the problem combined with a perception that upland smallholders were responsible for deforestation caused the government to move slowly in establishing community forestry, engaging in large-scale expansion of timber monocultures while leaving smallholder forest farmers out of forest planning and management until the 2000s. Deforestation continued even as the government enacted measures to remove, control or sedentarize upland smallholders managing forest agricultural landscapes through shifting cultivation. In the mid-2000s, unofficial community forestry groups began to form in anticipation of a community forestry law that has yet to be passed. Nonetheless, there is a trend suggesting that by the time Thailand fully embraces community or smallholder forestry as a forest restoration model, the population of traditional forest users will have declined. Such a result would represent a lost opportunity to design FLR programs that support forestry activities in diverse mixed-use agricultural mosaics, systems that might be more sustainable than either monocultural timber plantations (the approach currently used by forest authorities) or strict conservation zones that bring limited benefits to local residents.

In Vietnam's Dinh Hoa district, since forest land was allocated to households in the early 1990s for the purposes of forest restoration and poverty reduction, the area of forest has roughly doubled. Neupane *et al*. (2017) provide estimates of carbon stored in above ground biomass, below ground root biomass, soil organic carbon, leaf litter and understory green biomass, comparing values across several scenarios including planted forests vs. natural forests, and between production vs. protection vs. special use forests. In terms of carbon storage, per area values were generally lower than the reported national average, particularly in above ground biomass, and lower in the case of natural regrowth vs. planted forests. There are several reasons these values may be lower than official national estimates. The land allocated to smallholders may have been more degraded initially than the national average. The smallholder plots studied may also have been in early development stages and the result of short rotation cycles. Also, the national average may have overestimated carbon storage. Nonetheless the expansion of forest cover over degraded lands through smallholder forestry, the high diversity of local forests, and relatively high soil organic carbon values represent a potential additional income stream of carbon forestry to sustain FLR participation by households.

EXPANDING THE KNOWLEDGE BASE FOR FLR

Taken together, the studies in this issue bring together a range of insights into the diversity of approaches favoring the implementation of FLR, particularly in sloping landscapes, under varying social and ecological conditions. The cases in China and Vietnam demonstrate the effectiveness of distribution of lands and management responsibilities to individual households, which provides a strong basis for benefit sharing as an incentive to restoration. The case from southwestern China (Zhang *et al*. 2017) indicates, however, that the institutional basis and investment required to establish and sustain such a program as the CCFP may rely on a particularly intricate preexisting sociopolitical organization that largely predated FLR programs and serves multiple national programs. Regular site monitoring for conditional direct disbursements is key to the function of the program.

Nepal and Ethiopia demonstrate the promise of community forestry with a significant devolution of ownership. In particular in the Phewa Lake case (in Nepal), the generation of direct benefits of forestry through forest product markets and indirect benefits of improved ecosystem supporting agriculture and ecotourism apparently provide sufficient incentives to sustain FLR. In Ethiopia, the results are somewhat less clear-cut, in part due to the lower production potential of the arid landscape and the high level of need of the local population. Nonetheless, community members participate and recognize the imperative of restoring ecosystem function to improve overall production. That said, in times of more extreme human needs, which Ethiopia faces on a periodic basis due to drought, the lack of compensatory benefits for maintenance of restoration zones could leave local communities little choice but to extract resources and degrade restored forest areas.

In Thailand and the case from Assam, India, government has been slower to develop community or smallholder-based approaches and the forestry administration continues to operate at loggerheads with local forest users. Experiments with community forestry have come late, forest lands have not been allocated for the purpose, and investments in the forms of outreach and support that are needed in smallholder forest systems are insufficient. While the government and private sector do plant trees and conserve forest, the scale of planting and use of monocultures is likely to result in sub-optimal restoration outcomes.

Finally, to underpin community or stakeholder ownership of FLR, land rights need to be clarified if not devolved to the user level (either individual or community). This process takes time and effort, but the consequences of not doing it can be open access exploitation by excluded user groups, which can stymie efforts of the implementing institution.

FLR is currently undergoing a rapid expansion, as countries commit to large-scale restoration in response to the Bonn Challenge and attract donor and investors. While this is a positive trend, it must be stressed that establishing opportunities for restoration requires much more than a map indicating the differential between actual and potential forest cover, and proceeding to launch activities. Significant capacities are required for landscape planning and cross sector coordination. Local contributions to decision-making and management are key to preventing the inappropriate application of policies, laws and support systems. While lessons may be shared from country to country and some specific approaches

may work from one system to another, there are no one-size-fits-all solutions. Implementation processes for FLR that involve working at the landscape level, which by definition implies a high specificity of socioecological conditions, the convergent interests of actors in multiple sectors, economy-specific trade-offs between uses, opportunity costs and incentive thresholds. Therefore, new FLR programs ideally should be built from the ground up, even if initiated from the top down.

ACKNOWLEDGEMENTS

The preparation of this special issue was led by the Center for International Forestry Research as a part of the CGIAR Research Program on Forests, Trees and Agroforestry and supported by the UK Department for International Development (DFID) through the KNOWFOR program. We are grateful to all the authors and their institutions for their collaboration. We also thank the many colleagues who joined us in discussions along the way, including Michael Bennett, Kiran Asher, Bimbika Basnett, Manuel Guariguata, Guangcui Dai, Shuxin Liu, Kanchi Kohli, Manju Menon, Annie Shattuck, Ahmad Dermawan, John Stanturf, Oliver Frith, Yanxia Li, Chunquan Zhu, Yan Zhang, Thuy Thu Pham, Christine Padoch, Miguel Pinedo Vasquez, Jianchu Xu, Dietrich Schmidt-Vogt, Deli Zhai, Jun He, and many others.

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