



## Using markets to leverage investment in forest and landscape restoration in the tropics



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### ABSTRACT

Governments and international organizations are promoting or drafting programs to undertake Forest and Landscape Restoration (FLR) of hundreds of millions of hectares of degraded tropical landscapes to support the provision of ecosystem goods and services. But the challenge to recover economic and ecological functionality could be far beyond their financial capacity. Here, we explore the potential of markets and their interaction with policies to leverage investment for FLR in the tropics. We first review the challenges and opportunities of exploiting market forces for FLR, which can be essential for kick-starting the implementation of programs globally. We identify four key opportunities for regulating markets to promote FLR: economic mechanisms; technological, educational or infrastructural investment; legal and enforcement mechanisms; and market-led standards and certification schemes. Finally, we present five pitfalls that may arise when relying on markets to promote FLR. Governments will need to play a critical role in establishing appropriate policy frameworks and institutional arrangements to leverage investments when market signals are not strong enough to initiate changes in traditional land use or farming practices, or to regulate reforestation activities when market signals become so strong that they overwhelm all other land-use activities, leading to a transformed and homogenized landscape.

### 1. The scale of restoration potential in the tropics

The extent of degraded land around the world poses a growing concern. Although degradation is used to describe a range of contexts (Ghazoul et al., 2015; Gibbs and Salmon, 2015; Hobbs, 2016), wide consensus holds that anthropogenic impacts have remarkably changed Earth's natural processes and compromised the capacity of ecosystems to supply benefits to humanity (Lewis et al., 2015). The short-term profits of unsustainable exploitation of natural resources are largely uncompensated by the negative economic consequences of longer-term restrictions on the capacity of ecosystems to provide goods and services to people (Costanza et al., 1997; Balmford et al., 2002). Reducing perverse incentives for degrading activities and instead promoting those that support ecosystem recovery are thus key issues to be addressed by the global economy to provide a better future to all

(Hoekstra and Wiedmann, 2014; Diaz et al., 2015; Newbold et al., 2016).

Throughout human history, population densities have normally been sufficiently low to ensure that environmental resources are available and accessible to people, and that the future provision of natural benefits was safeguarded. However, the large expansion of intensive agriculture, urbanization, and global population in the 20th century means that ecosystem goods and services (EGS) are no longer freely available for a large share of humans. Harvesting forest products from natural ecosystems is no longer an option for supplying the high and still growing demand. Land scarcity and concentration of population in large urban centers mean that migration is unable to improve access to EGS essential for human wellbeing. Today, large regions of the globe face water security risks (Vorosmarty et al., 2010), are threatened by climate change (Heltberg et al., 2009), and/or have agricultural

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production constrained by soil degradation (Zika and Erb, 2009) and deficits of pollination (Garibaldi et al., 2013) and pest control services (Boyles et al., 2011; Karp et al., 2013).

In the most biologically diverse, populated and poor regions of the planet, deforestation has been one of the main drivers of declines in EGS to people and biodiversity loss (Hansen et al., 2013; Sloan and Sayer, 2015). Although deforestation has declined in some tropical regions as a consequence of effective national and international policies and programs (Boucher et al., 2014; Nepstad et al., 2014), losses in forest cover were so high in the past that large-scale reforestation is now needed to safeguard the provision of essential EGS to society (Chazdon et al., 2016b; in this article, we use reforestation in the broad sense of returning forest overstorey to land where it has been removed). Forest and Landscape Restoration (FLR) has emerged as a promising activity to recover economic and ecological functionality of large territories deteriorated by the depletion of natural resources in previously forested landscapes (Sabogal et al., 2015). A recent assessment has suggested that, globally, 2 billion ha of land present opportunities for some form of FLR (WRI, 2014). Many governments and international organizations are now promoting or drafting programs to undertake FLR (Menz et al., 2013; Suding et al., 2015; Chazdon et al., 2016b), at scales of hundreds of millions of hectares.

The variety of contexts and implementers creates a variety of approaches being contemplated. Some governments are primarily concerned with traditional forms of reforestation, especially planting trees in plantation monocultures to generate goods such as timber or pulpwood (Xu, 2011; Temperton et al., 2014). Others are more concerned with forms of reforestation that are able to recover biodiversity and supply the EGS once provided by the original native forests (Melo et al., 2013). These mostly involve more complex, multi-species silvicultural systems (Lamb, 2014; Stanturf et al., 2014). Both approaches represent a deliberate new land use choice at a particular location. But it is also likely that much of any future increase in tree cover, as in the past, will be achieved through unplanned and uncertain spontaneous natural regeneration in abandoned former agricultural areas (Aide et al., 2013; Gilroy et al., 2014). FLR could thus include commercial monoculture tree plantations, smallholder woodlots, shifting cultivation, agroforests, restoration plantations and natural regeneration, each of which provide specific outcomes for generating forest products, conserving biodiversity, supplying EGS, and safeguarding cultural, religious and aesthetic values of human groups (Chazdon et al., 2016a). FLR differs from ecological or ecosystem restoration, which aims to assist the recovery of native ecosystems to achieve some level of similarity to their pre-disturbance species composition, structure, and functioning (SER, 2004). Rather, FLR's ultimate goal is to re-shape highly deforested landscapes to better meet human needs, which includes – but is not restricted to – ecological restoration.

However, despite the growing enthusiasm for increased reforestation amongst governments and international bodies, current efforts being undertaken by individuals and communities will not be sufficient in itself to achieve the aspirational targets set for FLR and associated outcomes for EGS provisioning, which rely on shifts in land use at larger spatial scales. New policies are then needed to leverage a massive engagement of landholders and unlock the potential of FLR to re-shape vast extensions of degraded landscapes. One of the critical factors that will likely influence the success of policies to promote FLR is their capacity to provide material benefits to those directly affected, because in developing countries with large numbers of rural poor, reforestation will not be a success unless it also improves livelihoods (Baynes et al., 2015b). Financial impacts to landholders from supplying goods like timber or receiving payments from generating one or more ecosystem services can then make a difference (Edwards et al., 2010; Brancalion et al., 2012). However, the scale of the reforestation effort being contemplated is likely to be far beyond the financial capacity of many governments, NGOs or aid agencies to support its implementation and, thus, to generate material benefits to participants. An alternative or

complementary approach is to take advantage of the power of market forces. If FLR is able to produce EGS with a significant financial value in the market system, it may overcome land opportunity costs of degrading activities dominating landscapes and, consequently, replace them by various forms of reforestation. Although governments alone may not have financial capacity to support the scale of reforestation contemplated by international FLR programs, they can develop policies to support the transformation of FLR into a new economic activity, broadening the basis of financial support for its successful implementation. With this in mind, here we explore the potential of markets and their interaction with policies to leverage investment for FLR in the tropics.

## 2. A role of markets in promoting restoration?

Markets are human constructs, created or collapsed depending on societal incentives and historical contexts. Exploiting markets to achieve social change is a strategy that is more than two centuries old, as exemplified by the sugar-boycott campaign against the British slave trade, which begun in 1787 and finally succeeded more than half a century later (Hochschild, 2005). Notably, in the last decade, NGO pressure on the companies involved in trading and making products from agricultural commodities has resulted in important zero net deforestation commitments from major corporations covering the large component of global trade (Nepstad et al., 2014). The economic value of branding and the importance of corporate image are now so great that the mere threat of bad publicity can change the behavior of multi-billion-dollar corporations.

The challenge is to extend such success from deforestation to reforestation, where the objective is not simply to end negative actions but to create large-scale incentives for positive ones. In southeastern Brazil, for example, agricultural companies have engaged in forest restoration to comply with the national Forest Code, as a pre-requisite to obtaining environmental certification for their products and competitive advantages in market (Rodrigues et al., 2011). However, such conditions might not apply in most areas targeted for FLR. For instance, the current land use(s) or landholders may not be integrated into the international commodities market. At the national level, legal instruments able to promote restoration may not exist or existing legislation may not be enforced. In addition, the costs of restoration may not be compensated adequately by the financial benefits arising from various forms of environmental certification. Therefore, the use of restoration to improve corporate image or access to markets does not seem to be enough to promote FLR at the scale needed to face current environmental challenges.

In other cases, markets alone are not enough, in particular in the presence of so-called “market failures” (Sandler, 1993; Bulte and Engel, 2006; Cabbage et al., 2007). These classic economic problems include information asymmetry, incomplete or absent markets and, crucially, externalities. Externalities describe the benefit or harm that an action taken by one stakeholder has on other stakeholders but is not taken into account by the one making the decision (Fisher et al., 2009). When the externalities are positive (as in the case of EGS provision), the failure to take them into account leads to underinvestment and a suboptimal provision of the service in question (Fisher et al., 2009). FLR also suffers from incomplete or absent markets, in particular related to the EGS provided by restoration. The economy of ecosystem services provision, in particular, is beset by market failures, which calls for governmental interventions such as incentive schemes, regulation and educational campaigns (Gottfried et al., 1996; Cabbage et al., 2007).

Although the power of markets per se can be enough to unlock the potential of FLR to receive private investments, past experiences have shown that most emerging economic activities still require appropriate government support, in terms of credit lines, regulations and policies, to develop. Indeed, markets may not be sufficiently robust or stable to initiate restoration even though the need is significant. In this context it

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