

Evaluating incentive-based programs to support forest ecosystem services

THEMATIC SECTION
Forest Ecosystem Services

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Forests are the most widespread terrestrial ecosystem on Earth. In 2015, natural forests accounted for 93% (3.7 billion ha) of this global forest area (FAO 2016), albeit only 26% of these are primary forest (i.e. old-growth or ancient woodland). Since 1990, 31 million ha of primary forest have been modified or cleared, and a net loss of 129 million ha of natural forest has occurred (–0.13%/year) (FAO 2016). This deforestation has largely been in tropical South America and Africa, where forests have been cleared and converted for agricultural uses, resulting in habitat loss and carbon emissions.

Sustaining forest ecosystem services (FESs) and thus conserving forest health and biodiversity are major challenges (Innes & Nikolakis 2014), yet the degradation of forests threatens their productive capacity, accelerates biodiversity loss and undermines the resilience of dependent human communities (Trumbore *et al.* 2015). While deforestation is typically viewed as the driver of forest degradation, climate change is also changing tree distribution, forest structure and forest health, with enhanced risk of infestation and pathogens (Liebhold & Wingfield 2014). There is a pressing need to develop appropriate institutional responses and instruments to sustain the resilience and productivity of forests, and to learn from successful approaches so that these can be adapted and implemented at broader scales.

The current FES Theme highlights the state of the practice on mechanisms to resolve forest degradation and restore forest productivity (e.g. market-based approaches such as payments for ecosystem services [PES]), and presents papers that intersect across a range of disciplines from around the globe. The insights from these papers contribute to scholarly knowledge and can guide the development and implementation of mechanisms to sustain FES in practice.

FOREST GOVERNANCE: STATIC RESPONSES TO DYNAMIC CHALLENGES

Forests have been typically managed by centralized governments that rely on command and control-style regulations to achieve centrally determined policy goals, focused on either production (timber) or conservation values. Regulation, backed up with sovereign coercion and sanction, has proven inefficient for dealing with dynamic changes such as those impacting forests. The growing array of demands on

forests from private and public users has resulted in a trend for more participatory forest governance, increasingly involving local communities and indigenous peoples in management decisions (Nikolakis *et al.* 2016). This more participatory governance reflects a shift in how power is exercised in society, with governments now coordinating autonomous and self-governing networks of public and private actors to achieve collective outcomes (Rhodes 1996; Stoker 1997). Governments still use regulation to steer these networks, but incentives and market-based approaches are now used more frequently to achieve collective and individual-level goals, such as resolving complex environmental problems (Stavins 2003).

The adoption of market-based mechanisms to support FESs has accelerated over the last two decades; in theory, these programmes establish a monetary value for FESs, which are typically ignored in the marketplace because of missing markets or buyers, and then recognized through payments from private or public purchasers to the FES providers (land and forest owners). What distinguishes these market-based approaches from other economic instruments for addressing environmental problems (such as taxes) is that they are voluntary, incentivized practices that efficiently maintain and deliver FESs, and produce welfare gains for those undertaking such activities.

Hundreds of market-based programmes to manage FESs are now functioning globally, including for water quality, carbon sequestration, restoration, landscape aesthetics and biodiversity (Kemkes *et al.* 2010). In 2015, forests that were designated to protect FESs represented 31% of the total global forest area (FAO 2016). Data from practice on the design features that support the principles of efficiency, effectiveness and equity have shown mixed results from market-based FES initiatives (Landell-Mills & Porras 2002; Pagiola *et al.* 2002; Porras *et al.* 2008; Wunder *et al.* 2008). Among the successes, incentive-based FES programmes have reduced conversion of broadleaf tropical forest into agricultural land (Keenan *et al.* 2015; MacDicken 2015) and slowed net forest loss from 0.18% of total forests in 1990–2000 (10.6 million ha) to 0.08% (6.5 million ha) during 2010–2015. The emphasis on incentive-based approaches in the ‘Reducing emissions from deforestation and forest degradation in developing countries, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries’ (REDD+) programmes is a reflection of how useful and, in turn, legitimate these market-based instruments

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have become in addressing deforestation, conversion and the maintenance of FESs. But questions remain around how these market-based programmes can support principles of equity and address complex problems such as forest health.

ARTICLES IN THE FES THEME

The implementation of incentive-based programmes for FESs, such as REDD+, has accelerated globally, outpacing the systematic evaluation of these programmes. This creates gaps in understanding, particularly regarding the benefits and costs of these programmes, which could in turn inform institutional and policy design.

The papers in this FES Theme are inter-disciplinary, cover diverse geographic regions and offer insights for designing incentive-based FES programmes, including: optimizing land use and understanding interactions between different FESs to support the principles of effectiveness and efficiency; bottom-up governance design and multi-stakeholder processes to support adaptive policy and social learning; motivations for private actors to engage in incentive-based programmes; understanding trade-offs between FESs, biodiversity values and livelihoods, as well as those between effectiveness, efficiency and equity, when scaling-up incentive programmes; individual and household-level access to FESs and how these influence policy design; and the effects of tax subsidies on afforestation and the production of FESs.

Bremer *et al.* (2016) examine incentives for land-use impact carbon storage in southern Ecuador Andean *páramos* (grasslands). Although afforestation is the most common response for carbon storage, grasslands with infrequent burning offer optimal approaches here, particularly when accounting for above-ground biomass and soil carbon, as well as other ecosystem services such as water and biodiversity. It is important for incentive-based programmes to be adaptive in order to account for improved information and to integrate scientific knowledge into policy decisions.

The motivations for private sector actors to engage in REDD+ programmes remain largely voluntary (Laing *et al.* 2016); carbon and co-benefits of REDD+, such as for biodiversity conservation and livelihoods, are important to the corporate social responsibility agenda of private actors. However, REDD+ programmes will likely remain localized; they are difficult to scale up, and resolving the problem of information is important to REDD+ development among private actors.

In 19 Nepalese community forests, analysis of trade-offs between livelihoods, plant diversity and carbon values for REDD+ programmes reveals that forests with high carbon values have low plant diversities and low forest product values, but there are synergies between high forest product value (particularly firewood and fodder) and plant diversity (Rana *et al.* 2017). Because carbon will not reduce the flow of forest resources to some communities and will not protect plant diversity, an integrated forest management

approach is required to conserve multiple ecosystem values and livelihoods.

In eastern North America, there are clear trade-offs in an intensive management yield scenario, with enhanced timber volumes but diminished carbon and habitat quality values (Carpentier *et al.* 2017). Adopting a multiple harvest system has therefore better supported the provision of multiple FESs from the temperate forest types involved.

While forest conservation has focused on the modification of forest values through incentive-based FES programmes often aimed at resolving the ‘tragedy of the commons’, more bottom-up governance approaches have also been effective at building community support and integrating diverse forest values (Kopnina 2017). Yet incentive-based FES programmes are typically imposed on communities (think REDD+); attention to ecological and social justice is key to protecting and advancing these objectives in incentive-based FES programmes (Kopnina 2017).

Calvo-Rodriguez *et al.* (2017) identify gaps and trends in quantification of the FESs provided by Neotropical dry forests, where policy typically treats these highly fragmented forests as ‘wet’ and undervalues their biodiversity value. Quantification has been mostly on carbon and water FESs, and less on biodiversity and soil FESs. Moving forward, and in light of projected climate impacts, understanding interactions between soil and water FESs is extremely important to conserving the FESs of Neotropical dry forests.

A governance risk assessment of REDD+ in 13 countries shows that the institutional architecture of REDD+ from supranational to regional and local scales is complex and enhances the risks of inefficiency, ineffectiveness and inequity (Loft *et al.* 2017). In evaluating the governance systems against an ideal type of policy process, the key forms of risk in these programmes are the external context (such as markets or sovereign risk), which is difficult to control for, and the REDD+ mechanism itself, which can be resolved through design and social learning processes such as multi-stakeholder processes.

In the Ecuadorian Amazon, direct forest conservation incentives for newly titled smallholders significantly reduce deforestation, while these programmes are an important livelihood strategy on marginal agricultural lands (Jones *et al.* 2017). This is encouraging given the role of smallholders in deforestation elsewhere in the humid tropics, and hybrid public-private governance approaches are complementary to incentive-based deforestation programmes (Jones *et al.* 2017).

A study in Madagascar of the interaction of wildlife FESs and food security demonstrates that the distribution of and access to FESs varies at communal, household and individual scales (Golden *et al.* 2016). Thus, in developing conservation and FES strategies, it is important to map the distribution of the benefits and disaggregate the beneficiaries in order to provide a more accurate assessment of the social and economic costs to local peoples at different scales.

An *ex ante* assessment explores the effects of expanding the Peruvian Amazon National Forest Conservation Program for

Climate Change Mitigation more broadly, and considers the outcomes for conservation cost-effectiveness, income effects and distributional equity (Börner *et al.* 2016). In upscaling the programme across the Peruvian Amazon, factors such as heterogeneity in land use, forest type and economic returns create significant trade-offs between conservation cost-effectiveness, poverty alleviation and equity outcomes. The trade-offs can be resolved through design arrangements that address cost-effectiveness and equity outcomes together; assuming deforestation is avoided if PES payments are greater than opportunity costs, adoption of per-household transfer, instead of forest stock-based payments, increased conservation cost-effectiveness and distributional equity outcomes (Börner *et al.* 2016).

Across 18 counties in the USA, higher net returns from forestland derived through a tax subsidy led to enhanced carbon sequestration and production of FESs (Cho *et al.* 2017). Thus, tax subsidies may be an efficient and effective approach in some jurisdictions in order to promote afforestation and the production of FESs.

CONCLUSION

Drawing on interdisciplinary papers on the design of incentive-based FES programmes from diverse regions and across operational and higher-level governance scales, the FES Theme helps resolve the gap between the development of incentive- and market-based approaches to support FESs and their evaluation. A variety of approaches have been implemented, with varying degrees of success. The present examples particularly inform scaling-up programmes and improving the essential understanding of the inherent trade-offs between efficiency, effectiveness and equity. Governance and design problems are being systematically identified and, in some cases, resolved. The use of incentive-based programmes to support FESs is increasing, either through public or private sector payments, and the lessons expressed here are informative and instructive. Although timber production stubbornly remains the most profitable use of forests, these programmes are changing the nature of forest economics in many countries. As incentive-based programmes become more sophisticated and the true value of FESs is calculated with greater accuracy, the hegemony of timber production is being challenged. It seems only a matter of time before forests are recognized as having greater economic value when left standing than when felled.

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