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Analysis

Rethinking Monitoring in Smallholder Carbon Payments for Ecosystem Service Schemes: Devolve Monitoring, Understand Accuracy and Identify Co-benefits

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ABSTRACT

Monitoring is a key aspect of payments for ecosystem services (PES) schemes, providing a basis for payments. PES monitoring however presents challenges, including in balancing technical accuracy with cost, local equity and legitimacy. This is particularly true in smallholder carbon PES, where managers have limited resources and capacity. Here we explore ways to improve monitoring in smallholder projects. We looked at two well-established projects in Uganda and Mexico, and appraised five monitoring methodologies: two remote sensing and three field measurement approaches. Each methodology varied in data resolution, methodological complexity and degree of local participation. We collected quantitative and qualitative information on four aspects of performance: accuracy; costs; local equity; and local legitimacy. We show that methodologies with greater data resolution and local participation performed better in all four aspects, while greater methodological complexity was not associated with significantly improved performance. We conclude that monitoring in smallholder and other types of PES may be improved through: 1) devolving analyses to the local level; 2) communicating to stakeholders a distinction between 'applied' and 'scientific' accuracy; and 3) documenting and communicating the diverse functions of monitoring, referred to here as co-benefits – a contrast to simple 'monitor and pay' conceptions of PES.

1. Introduction

Payments for Ecosystem Service (PES) schemes are increasingly advocated (Milder et al., 2010), although questions remain about their conceptual validity (Kosoy and Corbera, 2010; Kronenberg and Hubacek, 2013) and technical feasibility (Guerry et al., 2015; Naeem et al., 2015). PES are conceptualised as payments to providers of ecosystem services, conditional on delivery of an ecosystem service, often resulting from maintaining a particular land use (Engel et al., 2008). Monitoring ensures conditionality, with providers only paid when they satisfy contractual land use conditions (Corbera et al., 2007; Sommerville et al., 2009; Fisher, 2013). Early conceptions of PES present it as a pure economic incentive focused solely on the technical monitoring of ecosystem service delivery to trigger payments (Ferraro and Kiss, 2002; Ferraro, 2011; Benson and Jafry, 2013). However it is argued that, in practice, managing trade-offs in monitoring, and optimising monitoring to be accurate, cost-efficient and locally effective remains a key challenge (Fisher, 2013; Meijaard et al., 2014; Naeem et al., 2015). Through this paper we contribute to a more nuanced appreciation of these terms and consider options through which they may be promoted.

One of the origins of this challenge is the need for reductionist approaches to monitoring in complex landscapes. Smallholder carbon PES (SCPES), where farmers plant trees to sequester carbon, exemplifies this challenge, given the need for such schemes to deal with diverse smallholders in diverse landscapes. SCPES projects deploy different remote sensing, activity-based and field ecology measurement methods to monitor impacts of land use, although links between land management and ecosystem service provision are often uncertain (Ascough et al., 2008; Fisher et al., 2009; Meijaard et al., 2014). Attempting to overcome this uncertainty, monitoring often becomes complex (i.e. dependent on complex technologies and technical expertise) and costly (Baker et al., 2010; Meijaard et al., 2014), so becoming geared towards an external technical audience, and less comprehensible to local actors (Peskett et al., 2011; Fisher, 2013; Leach and Scoones, 2013; Lovell, 2015).

This drift towards complex monitoring may create trade-offs between accuracy, costs, equity and legitimacy. The aforementioned compromise between technical complexity and local transparency is one example of a broader trade-off between perceived accuracy on the one hand, and local equity in distributional outcomes (i.e. how monitoring affects participating smallholder income) (Brown, 2003) and legitimacy in decision

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making (i.e. whether monitoring decisions are perceived as fair and acceptable to smallholders) on the other (Adger et al., 2003). Similarly, more complex monitoring may increase costs, reducing SCPES revenues to existing providers and lowering incentives for potential new providers (Engel et al., 2008; Berry and Ryan, 2013). Yet, conversely, if simpler monitoring is less precise, this may also lower revenues: due to the principle of conservativeness, less precise monitoring will intentionally underestimate the provision of ecosystem services to ensure that certified services are not false (Hamburg, 2000), in turn reducing services available for sale (Berry and Ryan, 2013; Watson et al., 2013). Understanding how to manage trade-offs in local legitimacy, local equity, cost and accuracy is thus integral to improving the success of PES schemes. This is particularly true for smallholder and community carbon projects in the tropics, which have very limited resources and capacity, and the growing number of REDD + projects searching for robust and cost-effective monitoring (Chhatre et al., 2012; Torres and Skutsch, 2015; Bayrak and Marafa, 2016).

The available literature on smallholder and community forestry, and ecological monitoring, provides some preliminary insights on managing trade-offs between accuracy, costs, equity and legitimacy. For example, a wide literature suggests that local participation does not itself guarantee local equity in carbon and other types of PES schemes, with equity in outcomes also being heavily dependent on local context, as well as individual financial, human, natural, physical and social capital (Brown, 2003; Corbera and Brown, 2008; Peskett et al., 2011; Fisher, 2013; Martin et al., 2014; Pascual et al., 2014; Calvet-Mir et al., 2015; Hendrickson and Corbera, 2015; Kariuki and Birner, 2016). On monitoring specifically, local participation in monitoring can change or perpetuate existing land and resource access arrangements, and so have varied (positive or negative) impacts on local equity, justice and social change (Van Rijsoort and Jinfeng, 2005; Petheram and Campbell, 2010; Osborne, 2011; Funder et al., 2013; Hendrickson and Corbera, 2015). For example, Staddon et al. (2014, 2015) argue that, even in participatory community monitoring, external 'scientific' approaches dominate and local elites can continue to benefit disproportionately.

Another potential trade-off with regards to costs and accuracy is that there are divergent views on whether increased methodological complexity and cost (to both farmers and intermediaries) should necessarily result in more robust monitoring. The large literature on particular PES-related methodologies (Brown, 2002; Wollenberg et al., 2012; Geijzendorffer and Roche, 2013; Porras et al., 2013; de Araujo Barbosa et al., 2015; Bustamante et al., 2016) generally assumes that more complex monitoring will be more accurate (e.g. see the 'Tier' approach in IPCC, 2006). This issue is illustrated by Baker et al. (2010), Cacho and Lipper (2006) and Meijaard et al. (2014) all of whom point to the problem of the complexity and cost of technology and expertise in carbon PES. Studies have begun to question whether the relationship between complexity and accuracy is linear by showing that the relationship does not hold within methods such as field measurement (Danielsen et al., 2008; Danielsen et al., 2013; Brofeldt et al., 2014) and remote sensing (Hill et al., 2013; Mitchard et al., 2014). Additionally, field tests have shown that field ecology measurements (one step in overall monitoring) by local community members can be less costly to projects (in terms of labour) than, and similarly accurate to, those taken by technical intermediaries (Holck, 2007; Danielsen et al., 2008; Brofeldt et al., 2014). The literature also therefore suggests potential to manage trade-offs in PES monitoring through rationalising methodological complexity, costs to smallholders and intermediaries, and perceptions of accuracy.

Another example of a trade-off stems from that fact that perceptions, expectations, assumptions and methods of monitoring vary depending on who demands the monitoring (Meijaard et al., 2014), which may in turn affect how trade-offs in PES monitoring should be managed. For example, carbon PES monitoring is generally an upwardly accountable process, targeted towards a technical audience, and subsequently buyers (Fisher, 2013). Yet, as discussed above, there is apparent disagreement amongst stakeholders on what represents robust or fair monitoring. Additionally, carbon PES is increasingly claimed to be associated with a range of environmental and social 'co-benefits', where other outcomes (in addition to carbon sequestration) are targeted and achieved through a single carbon project (Anderson and Zerriffi, 2012). This may lead to local stakeholders perceiving a project and its benefits differently to external stakeholders. Understanding how monitoring is perceived by different stakeholders (Table 2), and addressing any apparent misconceptions, is thus also integral to achieving accuracy, local equity and legitimacy in PES monitoring.

Our aim is therefore to examine the accuracy, cost, equity and legitimacy performance of five monitoring methodologies of varying complexity (Table 1) used to measure carbon sequestration in smallholder forestry interventions, and the perceptions of these methodologies amongst four key actors: smallholders, local intermediaries, technical experts, and buyers (Table 2). We draw lessons for PES monitoring from two case studies of agroforestry SCPES projects in Uganda and Mexico, which have sold certified carbon offsets for the voluntary carbon market since 2003 and 1997 respectively. The two projects provide good examples because, while SCPES (and these two projects in particular) provide some of the oldest examples of PES, research on specific smallholder monitoring methodologies is limited to general aspects of conditionality (Fisher, 2013) and specific technological aspects (Rosenstock et al., 2013; Seebauer, 2014). Additionally, smallholders tend to be a poorer socioeconomic group who collectively safeguard a wide range of ecosystem services from landscapes, and so may increasingly be targeted by PES (Milder et al., 2010; Daw et al., 2011). Finally, with limited economies of scale, optimisation of monitoring is particularly pertinent to smallholder projects to keep costs down (Wunder et al., 2008; Rosenstock et al., 2013). Although PES design (and therefore monitoring) will differ with the scale, technological context and objectives of the project (Farley and Costanza, 2010), lessons from SCPES schemes may be valuable for PES more generally.

The three research questions framing this study are:

1. How does the choice of monitoring methodology affect perceptions of local equity in outcomes, and legitimacy in decision making?
2. How do costs and accuracy vary with the complexity of the monitoring methodology?
3. How do perceptions and expectations of monitoring vary amongst different actors?

In answering these questions we discuss how data resolution, personal interaction, local labour, and potential PES income are key mechanisms for optimising monitoring in our cases. We then elaborate on why PES monitoring may benefit from ecosystem service analyses by local (as opposed to external) actors, better communication of uncertainty and accuracy to stakeholders, and greater recognition of the diverse social functions of monitoring (in contrast to narrow conceptions of PES as simple 'monitor and pay' interventions).

2. Study Sites and Methods

2.1. Study Sites

Our cases, 'Scolel'te' in Mexico and 'Trees for Global Benefits' in Uganda, sell carbon offsets certified by the Plan Vivo Standard (Plan Vivo, 2013). Both projects involve smallholders: a landholder reliant on household land and labour (Plan Vivo, 2013). Scolel'te has been active in the Mexican state of Chiapas since 1994 (certified since 1997), is administered by the local intermediary AMBIO, and currently supports over 1200 smallholders. Trees for Global Benefits has been running in southwest Uganda since 2003 and is administered by Ecotrust Uganda, engaging over 4800 smallholders. The comparative maturity of these projects provided research respondents with an unusually long duration of experience of being monitored in PES.

We applied five monitoring methodologies to the same 31 agroforestry plots in 2015 to estimate with each methodology the change in