



Research article

Estimating water user demand for certification of forest watershed services

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ABSTRACT

Eco-certification is one solution to the common problem of verification of delivery of services in payment for ecosystem services (PES) schemes. Certification incurs costs, which may limit uptake, so it should be able to benefit users of certified services for it succeeds. In part to inform a project targeting expansion of the Forest Stewardship Council's forest management certification to include ecosystem services, we tested market demand for a potential certification scheme for watershed services. Using choice experiments among end-users of water subject to an existing PES scheme in Lombok, Indonesia, we assessed potential business values of certification. Our results suggested that preferred business values included credible information disclosure on improved water quality, reduced flood risk, environmental safeguards, and/or social safeguards of the upstream forests. These preferences indicate potential demand for a certification of forest watershed services designed to provide such information to end users.

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1. Introduction

Forests improve water quality, regulate discharge volumes, and mitigate flood risks (Millennium Ecosystem Assessment, 2005). These ecosystem services from forests are vital to the provision of water for human consumption and irrigation, preventing soil erosion, conserving soil nutrients, and safeguarding property. Payment for environmental services (PES) schemes aim to conserve these services by encouraging service trading between providers (or sellers) and users (or buyers). (Ezzine-de-Blas et al., 2016; Landell-Mills and Porras, 2002; Leimona et al., 2015; Wunder et al., 2008). PES schemes have gained traction globally due to their expected cost efficiency and effectiveness in supporting environmental management and conservation. In practice, however, many PES schemes suffer from weak monitoring systems and thus provide limited information on actual delivery of the intended services to beneficiaries (Muradian et al., 2010; Wunder, 2005; Wunder et al., 2008). The problem of incomplete information prevents PES schemes from optimizing effectiveness and cost efficiency (Muradian et al., 2010).

Certification is a tool that can mitigate incomplete- or asymmetric-information (Dranove and Jin, 2010) on the condition that the certification brand is recognized and associated with robust and credible information (Harbaugh et al., 2011). Responding to the resulting potential market niche for certification in market-based management of ecosystem services, the Forest Stewardship Council (FSC) has explored the feasibility of expanding its existing system to cover water and other ecosystem services (ForCES, 2016; Jaung et al., 2016a, 2016b; 2016c). Applied to wood product markets since the early 1990s, FSC certification is a global scheme certifying adherence to a set of principles and criteria of sustainable forest management (Auld and Bull, 2003; Cashore et al., 2006). Since its emergence, there has been interest in applying FSC certification to a range of ecosystem services, a number of which would logically be produced through environmentally sound forest management (Bass and Simula, 1999; Barry et al., 2012; Kiker and Putz, 1997; Rametsteiner and Simula, 2003).

Several studies examine linkages between FSC certification and water management (Jaung et al., 2016b). The FSC's Principles and Criteria already require adherence to practices that protect watersheds (McDermott et al., 2008; Roberge et al., 2011; Stupak et al., 2011) and encourage compliance with local water regulations (Tikina et al., 2008). Dias et al. (2015) found that compared to non-

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certified forests, FSC-certified forests are associated with better watershed conditions. Despite these findings, the FSC's Principles and Criteria are too general to ensure monitoring of water quality or quantity (van Dam et al., 2010). Quantifying change in those watershed services would require comparison of baseline and actual conditions (Ghosh et al., 2011; Nussbaum and Simula, 2005; Shabman and Stephenson, 2007). The FSC system has not yet incorporated such monitoring capacity. Expanding FSC certification to forest watershed services would likely require adding standards for water monitoring, which could lead to a new type of certification, namely *certification of forest watershed services* (e.g. Jaung et al., 2016c).

Certification of forest watershed services entails both challenges and opportunities. Meijaard et al. (2011; 2014) warn that certifiers would face difficulties in confronting the uncertainties inherent in forest watershed management: buyers and sellers in a PES scheme tend to be geographically close and bounded within watersheds with limited sourcing alternatives such that certification would be unnecessary. Additionally, market demand for certification would be low in government-funded PES schemes where buyer participation is often mandatory. Indeed, Jaung et al. (2016a) find that forest owners had less interest in certification schemes applied to regional service markets (e.g. watershed services) compared to those applied to global markets (e.g. carbon storage). Jaung et al. (2016c) indicate that PES stakeholders would prefer standards that are both scientific and simple, and are concerned about service buyers' difficulties in understanding certification objectives given the many eco-labels in the market. In theory, moreover, buyers should be informed about delivered services before joining PES schemes, which would make information disclosure through certification redundant. Certification development still requires various design decisions such as an introduction of a new label and a degree of its connection with existing forest certification schemes (see Onozaka and McFadden, 2011).

There are, nonetheless, some opportunities for a forest watershed certification scheme. In a prior Lombok study, PES stakeholders considered certification of forest watershed services as a potential tool to improve their capacity to manage watersheds and provide buyers with information on improved water quality and incorporation of social and environmental safeguards (Jaung et al., 2016c). These stakeholder perceptions corroborate the fact that, in practice, PES schemes suffer from low stakeholder capacity and incomplete information about ecosystem service delivery, and rely on assumed correlations between upstream reforestation and improvements in downstream watershed services. (Ferraro, 2008; Hanley and White, 2014; Muradian et al., 2010; Wunder et al., 2008). Thus, certification of forest watershed services might benefit existing PES schemes by ensuring monitoring of service delivery and disclosure of the resulting information to buyers.

Buyer demand is a key indicator through which to assess the feasibility of applying certification of forest watershed services to improve a market-based water PES scheme. First, buyer demand determines acceptable price premiums attached to certified services and therefore affects decisions of service sellers (in this case forest owners) on whether to obtain certification (Jaung et al., 2016a). This study defines price premiums for certified services as a difference between prices (or demand) of services and certified services. Second, demand for certification represents buyers' perception of its benefits, and is thus a factor in a cost-benefit analysis of certification. Even in a publicly-funded watershed PES scheme, buyer demand for certified watershed services would affect government decisions on whether or not to adopt certification and how much to charge (Whittington and Pagiola, 2012). To date, nevertheless, no study has empirically tested the existence of end-user demand for certification of watershed services generated

through forest management. To address this gap, this study used a choice experiment to estimate the demand for certification among buyers of water already paying a price premium levied as part of a PES scheme in West Lombok, Indonesia.

2. Specifying attributes of certification to assess buyer demand

One way to evaluate market demand for certification of forest watershed services -which after all is still only a concept rather than an existing scheme that can be studied-is to elicit stated-preferences of actual service buyers for the expected features (or attributes) of the certification scheme. From the buyer perspective, the attributes of certification would include benefits, credibility, and price. This study breaks down and analyzes these attributes as 1) types of disclosed information on provision of watershed services; 2) types of disclosed information on forest safeguards; 3) types of standard developers; and 4) prices of certified watershed services. To disclose such information, certification would need standards to manage and monitor watershed services and forest safeguards, an auditing system to validate and verify service sellers' adherence to those standards, and an information delivery system such as a certificate, online registry, and label. Development of these system components still faces many challenges, but this study assumes these components exist for the purpose of eliciting the stated preferences of buyers.

Disclosure of information on the provision of watershed services is an expected benefit of certification complementing a watershed PES scheme. The types of information that service buyers would require include the degree to which PES schemes fulfill goals of improving water quality, increasing quantity delivered, or reducing flood risk (Landell-Mills and Porras, 2002; Wunder, 2005; Escobar et al., 2013). In practice, many PES schemes fail to deliver such information to buyers (Ferraro, 2008; Muradian et al., 2010; Wunder et al., 2008), causing incomplete or asymmetric information exchange between buyers and sellers (Ferraro, 2008; Hanley and White, 2014). This weakens buyers' capacity to influence PES schemes (i.e. buyer-side conditionality), increases transaction costs, and undermines the cost efficiency of PES (Ferraro, 2008; Hanley and White, 2014; Wunder, 2015). Certification is a conventional means to disclose incomplete information in markets (Busch, 2011; Dranove and Jin, 2010), which might improve PES schemes.

Disclosure of information on forest safeguards is another expected benefit assuming the scheme relies on the FSC system. FSC forest management certification incorporates social, economic, and environmental perspectives of sustainable forest management (Auld and Bull, 2003; Cashore et al., 2006). Information on forest safeguards is a primary business value (or market benefit) of the FSC, as it increases confidence of buyers concerned about environmental degradation by indicating that wood products are produced through sustainable forest management (e.g. Thompson et al., 2010).

The institutional nature of the standard developer (e.g. an NGO vs. a governmental body) is a potential certification attribute as it could affect the credibility of the certification system. An expansion of FSC certification to forest watershed services might be based on case-by-case regional watershed standards, following the precedent of the FSC expansion to non-timber forest products (NTFPs) (Pierce et al., 2008). Different PES schemes involve different stakeholder groups (Landell-Mills and Porras, 2002; Wunder et al., 2008), who lead or collaborate in standard development. For example, standards may be based on watershed standards developed by international organizations (e.g. Alliance for Water Stewardship), watershed regulations instituted by local governments (e.g. water quality trading programs in the US), watershed

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