

1 **Will PES Schemes Survive in the Long-term Without Evidence of Their Effectiveness?**

2 **Exploring Four Water-related Cases in Colombia**

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5

6 **ABSTRACT**

7 This paper explores the reasons why payers, intermediaries, and providers engage in PES  
8 even under uncertainty about outcomes, and how they relate to the long term durability of  
9 the scheme. In theory, it is expected that, in face of high uncertainty, payers would leave the  
10 projects if effectiveness cannot be demonstrated and providers would not keep their  
11 conservation practices if no money remains available. Consequently, it is also expected that  
12 PES proponents would do their best to demonstrate ES improvement/maintenance. To  
13 explore these hypotheses we use field data collected from PES schemes in Colombia. Our  
14 results show that payers have additional motivations for engaging beyond ES improvement  
15 (e.g., CSR, green image). These motivations may explain their permanence in the scheme  
16 even without evidence of effectiveness. Water quantity/quality concerns were the main  
17 driver for participation of providers, evidencing that they do not see themselves only as  
18 providers but also as users. Therefore, the lack of evidence of effectiveness could discourage  
19 their permanence. Intermediaries are the ones mostly concerned about presenting evidence  
20 of PES effectiveness for many reasons (e.g. reputation, engaging stakeholders). PES may  
21 survive in the long term due to additional motivations from stakeholders, however, evidence  
22 of effectiveness is still expected.

## 23        **1. INTRODUCTION**

24            The Ecosystem Services (ES) concept has gained strong rhetorical power (Kull et al.,  
25        2015) and is shaping practices among conservationists (Fisher and Brown, 2014). Non-  
26        government organizations and development agencies are increasingly working with  
27        instruments derived from the ES approach such as Payments for Ecosystem Services (PES)  
28        schemes (Ezzine-De-Blas et al., 2016; Grima et al., 2016).

29            Funding from private and public companies has been strategic for several  
30        conservation schemes in Latin America. In order to communicate better with the business  
31        sector so as to attract more funding conservation organizations have been adapting their  
32        discourses towards a more business-like language with the utilitarian arguments of the ES  
33        approach (Fisher and Brown, 2014). In doing so, several of them have ended up using  
34        business jargons, for example, investment portfolio, business case, performance indicator,  
35        return-on-investment (e.g. Boyd et al., 2012; Hanson et al., 2012, 2011). The growing use of  
36        business-like language on ES approaches is frequently supported by the use of predictive  
37        numbers derived from ES modelling (e.g. Crossman et al., 2013; Quintero et al., 2009;  
38        Ruckelshaus et al., 2015; Tallis and Polasky, 2009). Practitioners have also placed strong  
39        emphasis on cost comparison of conservation strategies versus conventional solutions for  
40        the same ends (e.g. 'green infrastructure' versus 'gray infrastructure', see Bennett and Ruef,  
41        2016; Calvache et al., 2012; Postel and Thompson, 2005). Finally, they have given priority to  
42        PES over other policy tools expecting to achieve more effective ES conservation. Along these  
43        lines, there has been a recent increase in the interest of some PES payers to adopt  
44        performance-based payments and thus the need for PES impact evidence (Gammie, 2016).

45            The idea of securing ES provision through payment schemes has been strongly  
46        promoted by some scholars (e.g. Wunder, 2005; Wunder et al. 2008; Ferraro and Kiss, 2002;

47 Ferraro 2011) and propagated in practical discourses towards potential payers. However,  
48 this approach to conservation has been deeply criticized in the literature because of the  
49 implied simplification of social-ecological systems (Kosoy and Corbera, 2010; Muradian et al.,  
50 2010; Norgaard, 2010) and the practical difficulty to prove 'service delivery' (Carpenter et al.,  
51 2009; Lele, 2009; Palmer and Filoso, 2009; Ponette-González et al., 2014). This way of  
52 approaching and practicing conservation implies a control over a service being sold which  
53 may not actually be secured, especially in the case of water-related PES schemes (Barnaud  
54 and Antona, 2014; Kosoy and Corbera, 2010). Examples of targeted services in these cases  
55 are water flow regulation, water quality maintenance, and water provision. So far,  
56 incomplete knowledge about the processes behind water-related services together with a  
57 lack of monitoring best practices in most cases have hindered the evidence of PES impacts  
58 (Bohensky and Lynam, 2005; Carpenter et al., 2009; Lele, 2009; Norgaard, 2010; Palmer and  
59 Filoso, 2009).

60 Discourses based strongly on economic aspects disregarding scientific uncertainty  
61 underlying ES provision can lead to unrealistic expectations from actors involved in these  
62 schemes. If expectations are not fulfilled those schemes may not endure. Under this  
63 perspective, a question remains empirically under-explored: will PES schemes survive in the  
64 long-term if no evidence of their impact on the target ES is achieved? Which motivations  
65 would maintain the long-term participation of providers, payers and intermediaries in the  
66 schemes, even under uncertainty? If uncertainty is large, practitioners cannot prove PES  
67 effectiveness through impact evidence, and payers are only looking for returns in terms of  
68 ES, then they would leave the PES scheme. This hypothesis would align with conventional  
69 views of PES (e.g. Ferraro and Kiss, 2002). As pointed by Wunder (2005, p. 3), "the less  
70 realistic the scientific basis of a PES scheme, the more exposed it is to the risk of buyers

71 questioning its rationale and abandoning payments". Consequently, assuming that  
72 landowners are acting solely as "providers" of a service based on a rational and utility-  
73 maximizer perspective, they would abandon the scheme too as no money is left to pay  
74 them. By the same token, PES intermediaries, for instance, non-government organizations  
75 (NGOs), would lose credibility due to their "unfulfilled promises" of ES delivery and would  
76 have their reputation at risk (Fisher and Brown, 2014). This hypothesis implies that ES  
77 monitoring, evaluation and reporting are strongly needed to produce the right evidence to  
78 keep payers and providers on board (e.g. Naeem et al., 2015).

79           However, if additional motivations, perceptions and values are in place, then the  
80 assumptions made in theory regarding expectations from participants and the importance of  
81 evidence of ES improvement may be questioned. Preliminary evidence suggests that  
82 providers and payers may indeed be motivated by a plurality of reasons. Recent studies have  
83 proposed that intrinsic motivations, for example, a desire to "care for the land" (Méndez-  
84 López et al., 2015, p. 695), or the "warm-glow effect" (Andreoni, 1990), can play a strong  
85 role on conservation schemes engagement by land owners (Ezzine-de-blas et al., 2015; Kits  
86 et al., 2014; Kosoy et al., 2008; Zanella et al., 2014). In the same way, a mixture of  
87 motivations, for example, green marketing or to maintain reputational capital, may be in  
88 place when corporate leaders decide to invest in environmental programs (Babiak and  
89 Trendafilova, 2011; Chin et al., 2013; Ditlev-simonsen and Midttun, 2011; Hemingway and  
90 Maclagan, 2004). Further disentangling the motivations of providers and payers, as well as  
91 intermediaries can not only shed light on alignments and misalignments across each group  
92 of actors, but most importantly contribute to a better understanding of the long-term  
93 sustainability of PES schemes, even in the presence of high uncertainty about their impact.

94            In this paper, we explore motivations and expectations of actors involved in PES  
95 schemes in order to assess the importance of impact evidence in the scheme long-term  
96 durability. We compare the perspectives of three groups involved in four water-related PES  
97 schemes in Colombia: intermediaries, landowners (providers), and major donors (payers).  
98 We focus our questions on whether additional motivations from payers and providers would  
99 play a role in their engagement and permanence in the scheme; if payers demand evidence  
100 of PES impacts on ES provision/maintenance; and if intermediaries feel in the need to  
101 provide evidence of achievements of ES goals through monitoring and reporting.

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## 104 2. METHODS

### 105 Study sites

106 This study was conducted in four water-related PES schemes (here also called payments for  
107 watershed services - PWS) in Colombia:

- 108 1) “Agua Somos” (Chisacá and Mugroso river watersheds - tributaries of Tunjuelo river;  
109 located in Usme, Bogotá D.C.);
- 110 2) Asociación de Usuarios de Agua del Río Bolo – “ASOBOLO” (Aguaclara river  
111 watershed - tributary of Bolo River; located in Pradera and Palmira municipalities,  
112 Valle del Cauca Department);
- 113 3) Compensación por Servicios Ambientales Hidricos Cuenca del Río Cali - “CSAH Cali”  
114 (Felidia and Pichindé rivers watersheds – tributaries of Cali River; located in Cali  
115 municipality, Valle del Cauca Department);
- 116 4) “Cuenca Verde” (Chico river watershed - tributary of Riogrande River; located in  
117 Belmira municipality, Antioquia) (Figure 1).

118 The selection of schemes was mainly based on data and literature accessibility,  
119 availability and openness of key informants, and the safety in the field. We conducted a  
120 preliminary fieldwork of two weeks in January 2015, followed by a 6-months fieldwork from  
121 January to June 2016. The study was based on semi-structured interviews, questionnaires,  
122 participant observation, and literature review of reports and related documents from the  
123 organizations managing the schemes. We followed intermediaries in their daily work in the  
124 field and office, and attended a major conference with the presence of PWS managers and  
125 payers from three of the studied schemes (June 13<sup>th</sup> to 17<sup>th</sup>, 2016, Bogotá D.C.). Interviews  
126 and questionnaires were applied to three groups: providers, intermediaries, and major  
127 payers. Here we consider PWS intermediaries as “actors who take on roles that connect and

128 facilitate transactions between buyers and sellers” (Huber-Stearns et al., 2013, p. 105). In  
129 the studied cases they are civil society organizations (e.g. water user associations,  
130 environmental non-government organizations). Providers in these schemes are considered  
131 those who live in areas that are strategic for the provision of water resources and have  
132 voluntarily agreed to participate. They are usually small landowners living in the upstream  
133 area of the watersheds. Payers in the four schemes are mostly private companies, public  
134 companies and environmental authorities, although individuals also pay a small contribution  
135 as water users in one of the schemes (ASOBOLO case).

136           Among the four schemes, two of them (Agua Somos and Cuenca Verde) were created  
137 as “water funds” within the frame of the Latin-American Alliance for Water Funds, an  
138 initiative led mainly by the international non-governmental organization (NGO) The Nature  
139 Conservancy (TNC) (Calvache et al., 2012; Goldman-Benner et al., 2012). ASOBOLO, in turn,  
140 is a water user association created in the early-90’s to manage the water resources shared  
141 by different users in the Rio Bolo watershed, mainly from the sugarcane production sector  
142 (Munoz Escobar et al., 2013). In the late-2000’s ASOBOLO joined an initiative also framed as  
143 a water fund together with several other water user associations from the same region,  
144 forming what is now called Fondo Agua por la Vida y la Sostenibilidad (FAVS) (Moreno-  
145 Padilla, 2016). ASOBOLO receives funds from FAVS and other programs such as the  
146 “Conservation Incentives”, a finished 5-years project funded by The Netherlands and  
147 managed by the NGO Fondo Patrimonio Natural (Table 1). The same project incentivized and  
148 funded the creation of CSAH Cali putting together local government agencies and private  
149 sector to fund conservation practices in upstream catchments that provide water to the city  
150 of Cali (See references in Table 1 for additional details).

151           The PWS conservation activities undertaken in the watersheds through the schemes  
152 under study started quite recently; from 2010 onwards (Table 1). In all four schemes,  
153 conservation practices are mostly concentrated in river and spring fencing for protection  
154 against the cattle in upstream lands (Table 2). Some of the initiatives (e.g. ASOBOLO) also  
155 include implementation of live fences and agrosilvopastoral systems, cattle rotational  
156 grazing, and other farm practices to reduce the impact of cattle on the soil of mountainous  
157 areas. In order to set those practices, the intermediaries establish voluntary conservation  
158 agreements with each upstream landowner. The agreements include payments to the  
159 landowners, usually in-kind, including technical assistance to improve productivity in the  
160 farm, materials for the conservation practices, and farm infrastructure improvement. Among  
161 the studied cases, CSAH Cali is the only program that pays also in cash.

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Table 1: Description of the four PWS schemes: literature references, watershed location, intermediaries involved, major payers, year in which conservation interventions started, and number of contracts signed up to June, 2016 (only in the referred watershed).

Scheme References	Watershed, (Department)	Partnership Programs	Intermediary (Catalysts)	Intermediary (Operator)	Major payers <sup>1</sup>	Year	# of contracts in this watershed
<b>Agua Somos</b> (Goldman-Benner et al., 2012)	Chisacá and Mugroso Rivers, tributary of Tunjuelo River (Cundinamarca)	Latin-American Alliance for Water Funds	TNC	Fundación Patrimonio Natural	TNC, EAAB, SDA, Bavaria/SabMiller <sup>§</sup> , Coca-Cola/FEMSA <sup>§</sup>	2013	35 (as of February 2016)
<b>ASOBOLO</b> (Moreno-Padilla, 2016; Munoz Escobar et al., 2013)	Aguaclara river, tributary of Bolo River (Valle del Cauca)	Latin-American Alliance for Water Funds; Conservation Incentives	ASOBOLO ASOCAÑA	ASOBOLO	ASOCAÑA, CVC, Syngenta <sup>§</sup> , RioPaila <sup>§</sup> y Castilla, Mayagüez <sup>§</sup>	2010*	56 (as of June 2016)
<b>Cuenca Verde</b> (Gómez-Ochoa, 2016)	Chico River, tributary of Riogrande Reservoir (Antioquia)	Latin-American Alliance for Water Funds	TNC, EPM	Cuenca Verde	EPM <sup>§</sup> , Postobon <sup>§</sup> , Nutresa <sup>§</sup> , Argos <sup>§</sup> , AMVA, CORNARE	2015	22 (as of June 2016)
<b>CSAH Cali</b> (Fondo Patrimonio Natural et al., 2014)	Felidia and Pinchindé Rivers, Tributaries of Cali River, (Valle del Cauca)	Conservation Incentives	Fundación Patrimonio Natural	AcuaCali.co	The Netherlands government, CVC, EMCali, ASOCAÑA	2013	46 (as of June 2016)

**Abbreviations:** <sup>1</sup>Major payers as mentioned by interviewed intermediaries. In addition to these, there are several others that contribute with smaller funds. AMVA – Area Metropolitana del Valle de Aburrá; ASOCAÑA - Asociación de Cultivadores de Caña de Azúcar de Colombia; ASOBOLO – Asociación de Usuarios de las Aguas Superficiales y Subterráneas de la Cuenca del Río Bolo; CORNARE – Corporación Autónoma Regional de las Cuencas de los Ríos Negro y Nare; CVC - Corporación Autónoma Regional del Valle del Cauca; EAAB – Empresa de Acueducto, Alcantarillado y Aseo de Bogotá; EMCali – Empresas Municipales de Cali; EPM – Empresas Publicas de Medellín; FEMSA - Fomento Económico Mexicano, S.A.B. de C.V.; PN - Fundación Patrimonio Natural; SDA - Secretaria Distrital de Ambiente; TNC - The Nature Conservancy; \*Refers to the year in which activities started in Aguaclara watershed only. ASOBOLO itself was launched in 1993 and started working in other regions first. <sup>§</sup>Those companies are among the 100 biggest industry companies in Colombia.

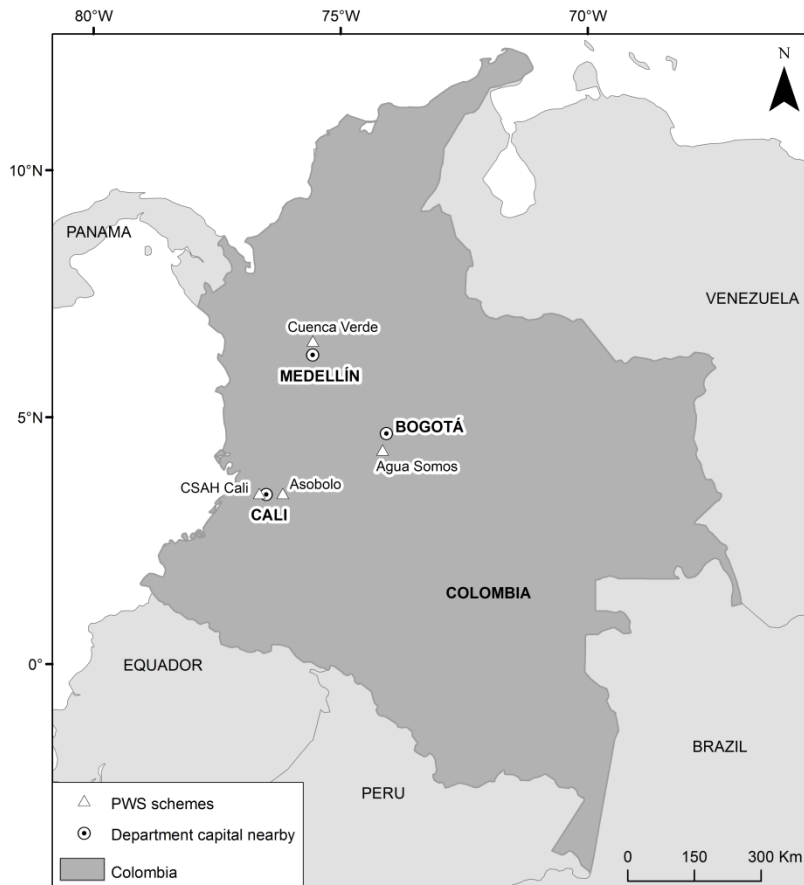
173 Table 2: Target ES, activities performed in the field, type of payment and payments for each PWS scheme.

Scheme	Watershed area	Target ES	Conservation practices Undertaken	Type of Payment <sup>1</sup>	Payments already performed
Agua Somos	Chisacá and Mugroso (8,245 ha) <sup>2</sup>	Water quality and provision, sediment retention	River fencing, tree planting, cattle rotational grazing systems	In-kind	Energy saving wood stove, cattle drinking fountains, materials for fences, seedlings, small-scale poultry systems, improvement of pastures, technical assistance
ASOBOLO	Aguaclara (11,141 ha) <sup>3</sup>	Water flow regulation, sediment retention	River fencing, springs protection, tree planting, forest protection, farm septic tanks, agrosilvopastoral systems, cattle rotational grazing systems, farm live fences.	In-kind	Material for fences, seedlings, septic tanks, financial support for implementing forest reserves, community vegetable gardens, fruit trees, environmental education in schools, capacity building with local associations, technical assistance
Cuenca Verde	Chico (17,172 ha) <sup>4</sup>	Water quality	River fencing, forest protection, springs protection, forest restoration, tree planting	In-kind	Cattle drinking fountains, materials for fences, bridges for cattle, improvement of paddocks, forage for cattle, compost systems, septic tank, seedlings, technical assistance
CSAH Cali	Felidia (6,635 ha) <sup>5</sup> Pichindé (5,272 ha) <sup>5</sup>	Water quality and provision, sediment retention	River fencing, forest protection, springs protection	In-kind and Cash	Cash, materials for fences, seedlings, technical assistance, environmental education projects, vegetable gardens, sewage treatment system

174 Sources: <sup>1</sup>It refers to the type of benefit that has been provided to the land owners who are implementing conservation practices in their properties. <sup>2</sup>Calculated from digital elevation map,  
 175 upstream Chisacá reservoir; <sup>3</sup>CENICAÑA (Centro de Investigación de la Caña de Azúcar de Colombia) technical staff – personal communication; <sup>4</sup>Calculated from digital elevation map, upstream  
 176 confluence with El Hato stream. <sup>5</sup>Fondo Patrimonio Natural et al., 2014.

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Figure 1. Schematic location of the studied water-related PES Schemes

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## 182 Questionnaires and Interviews

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Initial interviews with key informants were used to understand the history and context of each scheme and to support the design of the questionnaires. Questionnaires were structured in questions that combined selection of options, ranking, and degree of agreement with some statements. For questions regarding degree of agreement a Likert scale of 0 (totally disagree) to 5 (totally agree) was applied. Providers answered their questionnaires in the field. Intermediaries answered their questionnaires either directly in the field or online through an internet link sent to their email address after permission requested in person or by phone. Questionnaires for major payers were applied in the field during the interviews, through teleconference meetings or via email after contact by phone, depending on the availability of the respondents. Semi-structured interviews followed the

193 same topics of the questionnaires in a more flexible approach in order to capture each  
194 group's perspectives, differences, opinions, and explanations for their choices and to cross-  
195 check the answers from questionnaires.

196         The structure of the questionnaires started with a session with general information  
197 about the respondent and followed topics such as: motivations to participate in the scheme,  
198 general expectations based on their own roles and perceptions about the functioning of the  
199 scheme and the environmental changes and/or improvements. In addition, the following  
200 topics were added according to each respondent group: (1) providers: role of the payment  
201 as an incentive for entering the scheme; (2) intermediaries: importance of environmental  
202 monitoring, importance of reporting impact evidence, perception of expectations and  
203 demands from payers; (3) payers: water-related environmental services of interest,  
204 importance of evidence of the achievement of the PES goals for the maintenance of the  
205 payment, expectations on impact monitoring and reporting. The initial interviews with the  
206 three groups provided the statements used for the agreement questions and the list of  
207 motivations of providers and payers. After selecting the motivations from the list with the  
208 option of adding new ones, these two groups ranked up to three of their most important  
209 motivations. We then analyzed all answers in a lumped way.

210

### 211 **Characteristics of questionnaires' respondents**

212         **Intermediaries group:** 25 individuals answered the intermediaries' questionnaire.

213 The questionnaire included intermediaries working not only in the study sites reported here  
214 but also in additional PES schemes in Colombia. Three respondents were involved in  
215 schemes in Colombia and in other Latin-American countries as part of an international  
216 program. Most of the respondents were from NGOs. Other respondents included:

217 representatives of local water users' associations, representatives of other civil associations,  
 218 researchers and technicians belonging to local research centers involved in monitoring PES  
 219 schemes, and one representative from a regional environmental authority. Table 3  
 220 summarizes the characteristics of the respondents and their organizations in terms of the  
 221 roles played in the scheme in which they are involved as intermediaries.

222

223 Table 3: Individual role and organizational role of intermediaries' respondents.

<b>Individual Role in the Scheme</b>	<b>n (%)</b>	<b>Organizational Roles in the Scheme</b>	<b>n (%)*</b>
Supporting Technician	9 (36)	Design	15 (60)
Manager	6 (24)	Support	14 (56)
Scientist in charge of research	5 (20)	Implementation	10 (40)
Mixed role: scientist/technician	2 (8)	Management	4 (16)
Mixed role: manager/technician	2 (8)	Evaluation	1 (4)
Other	1 (4)		

<b>Professional Background</b>	<b>n (%)</b>	<b>Organizational Roles related to Monitoring</b>	<b>n (%)*</b>
Biologist	7 (28)	Funding	15 (60)
Economist	4 (16)	Getting secondary data from third parts	15 (60)
Agricultural engineer	4 (16)	Direct monitoring of env. indicators	14 (56)
Forest engineer	2 (8)	Logistics for monitoring in the field	13 (52)
Agronomy engineer	2 (8)	Processing monitoring data and report	13 (52)
Sanitary engineer	1 (4)	No role on monitoring	1 (4)
Environmental engineer	1 (4)		
Social worker	1 (4)		
Environmental manager	1 (4)		
Oceanographer	1 (4)		
Environmental technician	1 (4)		

224 Total of respondents: 25. \* Non-exclusive roles, i.e. the organization may perform different  
 225 roles in the same scheme.

226

227 **Payer's group:** 15 individuals answered the payers' questionnaire. Respondents belonging to  
 228 the payers group were representatives of several types of organizations/firms, including:  
 229 two public water supply companies; private companies from the beverage, sugarcane and  
 230 dairy production sectors, a restaurant, a health clinic, a lawyers firm, an infrastructure  
 231 company and one service company; and one development organization acting as payer.  
 232 Respondents reported both in kind and cash investments to the scheme (Table 4). The  
 233 following types of financial participation were reported: annual payments (n=6); every 3-6  
 234 months (n=3); a one-time payment (n=2); punctual payments through projects in the form of

235 contracts with the intermediaries (n=3); no payments in cash (n=2). Most of the payers are  
 236 users of the water from the watershed that they are paying for conservation (Table 4).

237

238 Table 4: Use of water from the watershed by the 15 paying organizations and type of  
 239 payment provided to PES schemes (non-exclusive categories).

Use of water from the watershed	n (%)	Type of payment provided for the scheme	n (%)
Incorporated in products	7 (46.7)	Cash*	13 (86.7)
Public water supply	4 (26.7)	Materials (e.g. construction, technology)	3 (20)
Private water supply	3 (20)	Logistic Services (e.g. transportation)	2 (13.3)
Use of water for industrial processes	4 (26.7)	Technical assistance (e.g. laboratory, GIS support)	4 (26.7)
No use of water	2 (13.3)	Other types	3 (20)
Other	1 (6.7)		

240 Note that cash could be used by the intermediaries to cover implementation costs (materials, staff...) and/or converted into in-kind  
 241 payments. The only case where cash was entirely disbursed as such to the providers is the CSAH Cali.

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243 **Providers group:** 72 individuals from a total of 159 providers (45%) from the four PES  
 244 schemes answered the providers' questionnaire. The distribution of respondents in the four  
 245 schemes was: 12 respondents out of 35 providers from Agua Somos (34%); 30 respondents  
 246 out of 56 providers from ASOBOLO (54%); 18 respondents out of 22 providers from Cuenca  
 247 Verde (82%); 12 out of 46 respondents from CSAH Cali (26%) (Table 5).

248 Landowners living in farms inherited from relatives are the majority of respondents.

249 A small fraction is not owners but long-term tenants. Most of the respondents have lived  
 250 their entire life in the region, some of them in the nearby city. They are usually farmers who  
 251 depend on agricultural production as their main income. Cattle ranching is the most  
 252 common use of land. Table 5 summarizes the main characteristics of the respondents among  
 253 providers.

254

255 Table 5: Main characteristics of questionnaire respondents among providers and their land  
 256 properties.

Scheme	Characteristics of providers' respondents				Avg. number of years with signed PES agreements
	Number of Respondents n (%)	Average farm size (median) [ha]	Most Common type of property	Main land use	
Agua Somos	12 (48)	18.7 (7.1)	Inherited	Cattle ranching, potato crops	2.2
ASOBOLO	30 (54)	8.8 (3.3)	Acquired	Cattle ranching, fruit production	4.5
CSAH Cali	12 (26)	19.4 (4.5)	Acquired	Fruits and herbs production, leisure, tourism	3.8
Cuenca Verde	18 (82)	41 (8.5)	Inherited	Cattle ranching	1.1
CSAH Cali	12 (26)	19.4 (4.5)	Acquired	Fruits and herbs production, leisure, tourism	3.8

### 257 3. RESULTS

258 This section presents the results grouped in four core topics: (1) motivations to engage in a  
 259 PES scheme from payers and providers' perspective; (2) importance of reporting PES impacts  
 260 from the intermediaries and payers' perspectives; (3) payment upon evidence of PES  
 261 impacts; (4) environmental indicators of interest.

#### 262 1. Motivations to engage in a PES scheme

263 **Payers:** during the interviews, payers reported different motivations to engage in PES  
 264 schemes. The most frequently mentioned was the protection of water resources from which  
 265 they depend directly or indirectly. In addition, several interviewees have mentioned that  
 266 their companies have environmental and social responsibility policies and that the schemes  
 267 fit into their goals. A representative of a multinational company emphasized that there is a  
 268 new generation of businessmen with a newer mentality towards environmental issues such  
 269 as climate change and water resources. According to him, with potential water shortages in

270 the future, companies cannot count only on efficient use anymore - there must be combined  
271 strategies.

272 Interviewees from two different water supply companies had different perspectives  
273 regarding the conservation schemes. The first mentioned that the scheme was a way to  
274 compensate the municipalities from which they have been withdrawing water for decades.  
275 Now there was a need to invest back in these communities and, therefore, the focus of their  
276 participation was the social aspect more than the environmental one. The representative  
277 from the second company, on the other hand, emphasized the protection of water resources  
278 as the fundamental reason as the company is in charge of the water treatment and  
279 distribution service as well as electricity supply from hydropower. Legal requirements were  
280 also mentioned: Colombian Law n. 99/1993 requires that energy supply companies pay a tax  
281 to environmental authorities and municipalities.

282 Several schemes in Colombia have been set in regions with long term environmental  
283 conflicts of different levels, for example, the Valle del Cauca where sugarcane producers are  
284 great water users. In other regions, small landowners are in conflict with environmental  
285 authorities and water supply companies over land use in upstream areas due to impacts on  
286 springs and creeks. Therefore, from the perspective of many companies acting as payers,  
287 their participation is also a way to reduce conflicts by investing back in those communities.

288 The questionnaires confirmed several aspects mentioned during the interviews. ES  
289 improvement (e.g. better water quality, better regulation of flows) was selected as one of  
290 the motivations by all respondents from the payers group (n=15) (Table 6). The second most  
291 selected motivation was corporate socio-environmental policy (n=12). Following, corporate  
292 image/green marketing and improvement of private-public relations (e.g. with local  
293 communities) were selected by 7 respondents each.



294 Table 6: Motivations selection and ranking by payers (absolute values followed by  
 295 percentage relative to total of answers). First value column refers to the number of times  
 296 the motivation was selected in the list, including when they did not count among the most  
 297 important ones. The following value columns refer to the number of times the motivation  
 298 was ranked as first, second and third most important. Total number of answers is shown in  
 299 the headings.

id	Motivation	# selections total=15 n (%)	# selected 1 <sup>st</sup> total=15 n (%)	# selected 2 <sup>nd</sup> total=12 n (%)	# selected 3 <sup>rd</sup> total=11 n (%)
A	ES improvement	15 (100)	10 (66.7)	3 (25)	0
B	Corporate social-environmental responsibility (CSR)*	12 (80)	4 (26.7)	4 (33.3)	1 (9.1)
C	Corporate image, i.e. green marketing	7 (46.7)	0	0	5 (45.5)
D	Improvement of private-public relations	7 (46.7)	0	0	2 (18.2)
E	Part of the fundamental goals of the organization	3 (20)	1 (6.7)	0	0
F	Part of a mitigation process of our production chain	3 (20)	0	2 (16.7)	1 (9.1)
G	Restoration of areas affected by the organization.	2 (13.3)	0	1 (8.3)	0
H	Sustainability index in stock market	3 (20)	0	0	0
I	Taxes deduction	2 (13.3)	0	1 (8.3)	0
J	Demanded by shareholders	2 (13.3)	0	1 (8.3)	1 (9.1)
K	Environmental compensation required by law	1 (6.7)	0	0	1 (9.1)
L	Environmental investment required by law	1 (6.7)	0	0	0
M	Part of the organization' duties according to the law	1 (6.7)	0	0	0
N	ES was already part of their business tradition	1 (6.7)	0	0	0
O	Facilitate environmental certification	0	0	0	0
P	ES is incorporated in business	0	0	0	0

300 \*Corporate Social Responsibility here is understood as “context-specific organizational actions and policies that  
 301 take into account stakeholders’ expectations and the triple bottom line of economic, social, and environmental  
 302 performance (Aguinis and Glavas, 2012, p. 933).”

303

304 In sequence, payers’ respondents ranked the first, second, and third most important  
 305 motivations for them (Table 6). The first most important motivations were: ES improvement  
 306 (n=10), corporate social responsibility (n=4), and ES as part of the goals of the organization  
 307 (n=1). The second most important motivations were: corporate social responsibility (n=4), ES  
 308 improvement (n=3), and impact mitigation (n=2). Restoration of areas affected by the  
 309 organization, taxes deduction and shareholders’ demands were selected as second most  
 310 important motivation by one respondent each. The third most important motivations were:

311 corporate image/green marketing (n=5), improvement of private-public relations (n=2),  
312 corporate social responsibility (n=1), mitigation (n=1), compensation required by law (n=1),  
313 and shareholders' demand (n=1).

314           Although not identified as initial motivations by all respondents, the following items  
315 were indicated by some of the respondents during interviews as non-expected benefits  
316 gained after their engagement in PES schemes: better private-public relations, better  
317 corporate image, tax deductions, internal sustainability indicators, sustainability index in  
318 stock markets, environmental awareness.

319           **Providers:** during the interviews, providers mentioned several motivations for  
320 engaging in the conservation scheme. Among the mentioned ones, they have said that the  
321 scheme represented progress to them and that it provided learning experience. Many have  
322 mentioned the environmental consciousness as a motivation for engaging, relating it to the  
323 protection of water resources and some concerns with future dry seasons. Some  
324 interviewees mentioned that they want to protect water resources that are strategic for  
325 their farm for the sake of those who will inherit it. Personal conviction and economic  
326 incentives (even in the in-kind form) were also mentioned as motivations. Interviews and  
327 participant observation led to the reflection that the main motivations can be interpreted as  
328 an intention to stay in the territory maintaining or improving their livelihoods.

329           Interviews with Agua Somos providers showed that similar initiatives had already  
330 been undertaken in the region some years ago and that helped them to feel motivated to  
331 participate in Agua Somos. It was reported that when some landowners first started  
332 engaging with Agua Somos, others observed the benefits gained by them through the  
333 program and decided to participate, a behavior also observed by Goldman-Benner et al.  
334 (2012) and described as a social spillover effect. Participants that engaged later also had the

335 chance to observe the commitment of the intermediary actor with the first participants  
336 allowing them to feel more confident in the process.

337 Additional benefits later perceived by some of the providers were the farm and  
338 landscape aesthetics. Several interviewees mentioned that the farm looks better managed  
339 and not abandoned when receiving the interventions proposed by the intermediaries, which  
340 could be interpreted as an expression of perceived added value to the property. River fences  
341 were also pointed as beneficial for avoiding accidents with the cattle such as when the cows  
342 fall from steep areas. Other interviewees mentioned that the planted trees would favor  
343 avoiding high temperatures during the day by providing shadow for the cattle. Several  
344 interviewees mentioned the importance of protecting the springs in their farms for their  
345 own sake. One interviewee translated that into a clear statement: “a farm without water has  
346 no value”. Extra income provided by the fruit trees planted in one of the schemes was also  
347 mentioned as perceived benefit. From participant observation, it was possible to realize that  
348 several reasons reported by providers were being disseminated by intermediaries during  
349 negotiations as a way to create environmental awareness.

350 Providers were asked what they know about the reasons why some landowners  
351 decided *not* to engage in the schemes. Several interviewees reported that those who are not  
352 participating believe that the fenced land (e.g. for riparian forest recovery) would be later  
353 expropriated and taken from their control. Others pointed that resistant landowners were  
354 worried about not being able to use the water for their cattle anymore.

355 The questionnaire phase started with a list of statements that were taken from the  
356 interviews. Providers were asked whether they agree with statements connected to their  
357 motivations and expectations in participating in the scheme (Table 7). Answers supported  
358 the notion of an existing interest in water resources conservation (item B) but also to a

359 desire to improve their livelihoods (item A and C). Results from items D and E showed that  
360 the majority of providers would have participated in similar conservation schemes even  
361 without direct economic benefits for themselves (in kind or cash payments), confirming  
362 other statements in which it becomes clear that providers understand the protection of  
363 water resources as a beneficial for themselves anyway. Most providers also recognize that  
364 the effects of the schemes will require some years to be observed (item F).

365 From a list of potential motivations extracted from interviews, respondents were  
366 asked to select those that they had. More than half of respondents pointed to the  
367 expectation of a beneficial effect of the scheme on the water quality/quantity (Table 8, item  
368 C) and half of respondents indicated a concern with water resources conservation (item A),  
369 which may be explained by the importance attributed to water as a factor of production.  
370 Almost half of the respondents reported the potential for improvement of farm productivity  
371 as one of their motivations (item B). 37% of respondents also reported to have been  
372 concerned with conservation even before the proposition of the scheme (item D). Only 6  
373 among 71 providers (8.6%) reported that one of the motivations to engage was that the  
374 economic incentives proposed by the intermediaries caught their attention (item K). More  
375 common motivations than economic incentive were: enjoying the idea of having a protected  
376 forest in the farm (item E); shadow provided by trees for the cattle (item F); and farm's  
377 aesthetics (item G) (Table 8).

378 Concerns with water resources conservation figured out as the first most important  
379 motivation for 30% of respondents, while improvement of farmers productivity assumed the  
380 same position for 25.7%. Expectations with improvement of water quality/quantity assumed  
381 the second place as most important motivation for 20% and third place for 27.5% of  
382 respondents (Table 8).

Table 7: Summary of providers' answers to agreement questions.

id	Agreement Statement	# Answers	Totally Disagree	Partially Disagree	Neither Agree nor Disagree	Partially Agree	Totally Agree
			n (%)				
A	This conservation project will improve a lot the productivity conditions of my farm.	71	3 (4.3)	0	11 (15.7)	25 (35.7)	31 (44.3)
B	I have always been interested in water resources conservation, even before this project.	72	2 (2.8)	0	6 (8.3)	12 (16.7)	52 (72.2)
C	Environmental concerns are important, but it is more important to obtain the benefits of the scheme for my farm.	72	12 (16.7)	8 (11.1)	25 (34.7)	12 (16.7)	15 (20.8)
D	I would participate in any environmental project, even without economic benefits.	71	1 (1.4)	2 (2.8)	5 (7.0)	21 (29.6)	42 (59.2)
E	I would have participated in this scheme, even without having received any economic incentive for that.	72	1 (1.4)	3 (4.2)	5 (6.9)	25 (34.7)	38 (52.8)
F	Detection of the desired effects of the scheme on water quality/quantity will still require some years.	73	1 (1.4)	1 (1.4)	4 (5.5)	11 (15.1)	56 (76.7)

385

386

387

388 Table 8: Ranking of providers' motivations. First number column shows the total number of  
 389 times the motivation was included among the three most important ones and percentage  
 390 among respondents. Next number columns report the number of times the motivation was  
 391 ranked as first, second and third most important.

#	Motivation ("I engaged in the scheme because...")	# ranking selections (N=70)	# selected 1 <sup>st</sup> (N=70)	# selected 2 <sup>nd</sup> (N=70)	# selected 3 <sup>rd</sup> (N=69)
		n (%)			
A	... I began to feel concerned with water resources conservation	35 (50.0)	21 (30.0)	11 (15.7)	3 (4.3)
B	... I thought the scheme would improve my farm's productivity	30 (42.9)	18 (25.7)	6 (8.6)	6 (8.7)
C	... I thought the scheme would improve water quality/quantity	44 (62.9)	11 (15.7)	14 (20.0)	19 (27.5)
D	... I was already concerned with conservation before this scheme	26 (37.1)	8 (11.8)	7 (10.0)	11 (15.9)
E	... I like the forest and I wanted to have a bit in my farm	20 (28.6)	4 (5.7)	9 (12.9)	7 (10.1)
F	... With more trees my cattle would have more shadow	14 (20.0)	2 (2.9)	6 (8.6)	6 (8.7)
G	... I believed the farm would appear more organized/beautiful with the interventions proposed	11 (15.7)	4 (5.7)	4 (5.7)	3 (4.3)
H	... I like that others are concerned with our community	13 (18.6)	1 (1.4)	7 (10.0)	5 (7.2)
I	... In our community we all are interested in participating in environmental projects	3 (4.3)	1 (1.4)	0 (0)	2 (2.9)
J	... My neighbors were already in the scheme	4 (5.7)	0 (0)	4 (5.7)	0 (0)
K	... The economic incentives caught my attention	6 (8.6)	0 (0)	1 (1.4)	5 (7.2)
L	... Of other non-mentioned motivations	3 (4.3)	0 (0)	1 (1.4)	2 (2.9)

392

## 393 2. Importance of evidence of PES impacts

394 **Intermediaries:** During the questionnaire phase, intermediaries were asked whether they  
395 feel it is important to report/communicate actual PES impacts on water-related ES (e.g.  
396 water turbidity reduction, river discharge increment, etc.) to payers (Table 9). 96% of  
397 respondents (n=24) totally agreed that it is important. Following, they were asked whether  
398 they feel that payers expect them to demonstrate PES impacts on water-related ES. The  
399 question did not include the expectation over indicators of activities performed (e.g. number  
400 of planted trees), but only indicators regarding water-related ES. 68% of respondents (n=17)  
401 totally agreed, while 24% (n=6) mostly agreed. Following, intermediaries were asked  
402 whether they agree that demonstrating PES impacts on the target water-related ES was  
403 important for the reputation of their organizations (Table 9). Among respondents, 68%  
404 (n=17) totally agreed and 20% (n=5) mostly agreed. These answers highlighted the  
405 importance attributed by the intermediaries to the effective communication processes  
406 among stakeholders.

407 Interviews confirmed the intermediaries' concerns on proving the effectiveness of  
408 their schemes in terms of water-related ES indicators. Interviewees expressed that they are  
409 concerned about demonstrating PES impacts on ES not only for the sake of their reputation,  
410 but also because: (1) they want to keep payers on board, (2) they want to attract more  
411 potential payers by demonstrating the effectiveness of their schemes, (3) they want to keep  
412 good relations with the providers who entered the scheme motivated by environmental  
413 awareness, (4) they feel personally engaged with the cause and want the schemes to be  
414 successful. It was also observed in the field that NGOs and civil associations employ several  
415 technicians and managers to work in the PES scheme and lack of funding would mean  
416 unemployment for many of them. Therefore, evidence of an effective conservation scheme

417 also supports more stable working conditions. Another reason mentioned by interviewees  
 418 from one intermediary organization is that their organization portrays itself as a “science-  
 419 based” NGO, therefore, evidence of ES outcomes is important for them to keep their  
 420 tradition and image.

421

422 Table 9: Summary of intermediaries’ respondents answers to agreement questions.

id	Agreement Statement	# Answers	Totally Disagree	Partially Disagree	Neither Agree nor Disagree	Partially Agree	Totally Agree	
			n (%)					
A	It is important to communicate PES impacts/outcomes to those who are supporting and paying this scheme	25	0	0	0	1 (4.0)	24 (96.0)	
B	Those who are supporting and paying this scheme expect us to demonstrate PES impacts	25	0	1 (4.0)	1 (4.0)	6 (24.0)	17 (68.0)	
C	Those who are supporting and paying this scheme only pay under the condition of PES impacts being demonstrated	25	6 (24.0)	2 (8.0)	9 (36.0)	4 (16.0)	4 (16.0)	
D	I think that demonstrating PES impacts is important for the reputation of those in charge of the schemes	25	0	1 (4.0)	2 (8.0)	5 (20.0)	17 (68.0)	
E	PES schemes are too new to be able to generate impacts that could be detected on water-related ES	25	1 (4.0)	1 (4.0)	7 (28.0)	1 (4.0)	15 (60.0)	

423

424 **Payers:** payers’ respondents were asked how much they agree that their organizations  
 425 require regular reports of environmental indicators monitoring from PES intermediaries  
 426 (Table 10, item E). Most respondents totally agreed (n=9, 60%). Respondents were then  
 427 asked how much they agree that they only require reports about the activities performed by  
 428 the PES intermediaries, but not about the impacts of these activities on the environmental  
 429 services of interest (item F). Most of the respondents disagreed (66.7%), while 26,6% agreed.  
 430 These answers were similar to those obtained in several interviews with payers and  
 431 intermediaries. However, although payers are interested in checking out the actual PES  
 432 outcomes in terms of ES, several of them were aware that it would take longer to see the

433 effects of the scheme and that monitoring could be expensive, counterbalancing their  
 434 expectation of receiving full reports about the impacts of these activities on ES.

435

436 Table 10: Summary of payers' answers to agreement questions.

	Agreement Statement	# Answers	Totally Disagree	Partially Disagree	Neither Agree nor Disagree	Partially Agree	Totally Agree
			n (%)				
	We believe that ES will improve with the PES scheme	15	0	0	1 (6.7)	5 (33.3)	9 (60)
	The most important motivation for engaging was the improvement of environmental service	15	0	0	2 (13.3)	2 (13.3)	11 (73.3)
	We only pay under the condition of PES impacts being demonstrated	15	6 (40)	2 (13.3)	1 (6.7)	5 (33.3)	1 (6.7)
	If PES impacts on environmental services are not proven with the time, we would stop paying for the scheme	15	4 (26.7)	2 (13.3)	2 (13.3)	4 (26.7)	3 (20)
	We require reports with monitoring results of PES impacts on environmental services regularly	15	1 (6.7)	1 (6.7)	1 (6.7)	3 (20)	9 (60)
	We only require reports of activities performed, not of PES impacts on environmental services	15	7 (46.7)	3 (20)	1 (6.7)	2 (13.3)	2 (13.3)

437

### 438 3. Payment upon evidence of PES impacts

439 **Intermediaries:** intermediaries were asked whether they agree that payers pay (or will keep  
 440 paying) under the condition that PES managers provide proofs of PES impacts on ES (Table  
 441 9). This question raised no clear consensus: 36% of respondents (n=9) neither agreed nor  
 442 disagreed, while those who mostly or totally disagreed summed 32% (n=8), and the same  
 443 was obtained for those who mostly or totally agreed (32%, n=8). During the interviews,  
 444 questions regarding this point also raised uncertainty among intermediaries. However, most  
 445 of them expressed that although reporting progress in terms of PES impacts on water-  
 446 related ES was important and required by payers, payers do not appear to be willing to leave



447 the scheme in case no proof was delivered. When questioned about potential reasons,  
448 several interviewees pointed that although payers were interested in the ES, they also  
449 engaged in the scheme because of other motivations. Table S1 presents their opinion about  
450 potential motivations from payers (separated in two categories only, private and public  
451 companies).

452 Interviews revealed that intermediaries understand that large companies acting as  
453 payers, in general, are aware that several factors are *not* under control on a conservation  
454 scheme and that the outcomes may not be the expected ones. Even so, they would be able  
455 to handle it through other investments in case they depend on these water resources. For  
456 example, in case reduction of turbidity is not achieved for a certain water source they could  
457 pay for new water treatment facilities to overcome the issue. According to one  
458 representative from an intermediary, not achieving the ES goals would not be a major issue  
459 for big companies; for instance, he mentioned, if a beverage company does not obtain  
460 better water quality, any additional cost on water treatment required for production would  
461 be passed to consumers through an increase in price. The respondent did not mention any  
462 effect that it could have on the competition with other beverage companies.

463 Therefore, according to the intermediaries, other benefits that big payers have while participating in  
464 PES projects would explain their permanence in the schemes, such as stating their  
465 commitment with environmental projects each year in a corporate sustainability report.  
466 Intermediaries did not express the same perception for small payers.

467 Some intermediary representatives also expressed that their responsibility over  
468 providing clear evidence of ES benefits out of the conservation practices are limited by the  
469 fact that payers usually pay for conservation but they do not pay for research or monitoring.

470 Therefore, payers would not be in the position to demand clear evidence from  
471 intermediaries.

472 **Payers:** Payer's representatives were then asked how much they agree that their  
473 payments were conditional on evidence of ES improvement to be provided by intermediaries  
474 (Table 10, item C). The question divided respondents; 8 out of 15 respondents disagreed  
475 (53.3%) and 6 of them agreed (40%), while 1 neither agreed nor disagreed. Average value for  
476 this question was 2.53, indicating a trend towards disagreeing. Following, payers were asked  
477 how much they agree that their organizations would leave the scheme in case no ES  
478 improvement is proven over time (item D). This question also divided respondents. 4  
479 respondents totally disagreed, 2 mostly disagreed, 1 neither agreed nor disagreed, 4 mostly  
480 agreed, and 3 totally agreed. Average value reached for these answers was 3.0, indicating  
481 that answers were slightly balanced towards agreeing with the statement.

482 During interviews, payers indicated in their answers that ES improvement is  
483 important and is the main driver for their engagement. However, most of them have  
484 entered the scheme for additional reasons, confirming the results presented in Table 6 and  
485 interviews with intermediaries. Several interviewees expressed that they would not stop  
486 paying in case ES improvement is not proven. Reasons for that included: (a) some  
487 understanding that water flows in a watershed is a result of complex processes and  
488 monitoring is costly; (b) payers invest part of their money for environmental compensation  
489 and other legal requirements and, therefore, engaging in a PES scheme fits those  
490 requirements; (c) additional motivations pay-off; (d) big companies are somehow used to  
491 fund risky investments and PES costs are not large enough to compromise their budget. One  
492 water supply company representative stated that evidence of ES outcomes is highly  
493 important, but they are aware, from their own experience, that a good hydrologic

494 monitoring system is too expensive. Interviewees from another water supply company  
495 attributed less importance to evidence of ES outcomes, in part because their participation in  
496 the scheme was much more a response to a social demand than to the need of improving  
497 watershed conditions.

498 For one water supply company, the PES scheme was part of a whole strategy on  
499 conservation that was already established in the company's core functioning. Therefore,  
500 even if the PES scheme does not achieve the expected outcomes, other internal  
501 conservation projects would play a role on satisfying environmental concerns. Another  
502 respondent from a beverage company expressed that although the outcomes of such  
503 schemes were highly uncertain their company already had environmental concerns as part  
504 of their core values. Moreover, as in any other investment, companies are used to take risks  
505 and deal with uncertain situations.

506

#### 507 4. **Environmental and social indicators of interest**

508 **Payers:** payers representatives received a list of potential environmental and social  
509 indicators and were asked to choose the ones that their organization had required reports  
510 from intermediaries. In addition, they had the option of adding new ones to the list. In  
511 sequence, they were asked to choose the first, second and third most important indicators  
512 (Table S2). All 15 respondents selected the indicators, however just 12 indicated their first,  
513 and 9 chose their second and third most important ones. The most selected indicators were  
514 A to E. While indicators A to D refer to the conservation practices performed in the field (e.g.  
515 area under vegetation protection, number of planted trees, number of protected springs), E  
516 refers to a social indicator (number of families receiving payments). None of these five  
517 indicators is related to the ES outcomes, i.e. the ES maintenance or improvement obtained

518 from the conservation practices. However, when asked about their first most important  
519 indicator, 33.3% of respondents (n=4) said river discharge increment (item G), would be their  
520 choice. Area under vegetation protection (item A) follows as first choice for 25% of  
521 respondents (n=3). Area under vegetation protection and sediment load reduction (item I)  
522 were chosen as second most important motivation by 2 respondents each. Number of  
523 planted trees (item B) was chosen by 4 respondents (44.4%) as the third most important  
524 motivation.

525           The fact that the most important indicators selected by payers are not about ES  
526 outcomes but are rather proxies associated to farmer's land use practices and their impact  
527 on the land/vegetation could be due to three potential explanations drawn from interviews:

528           (i) Payers strongly believe in a positive interaction between vegetation protection  
529 and water-related ES maintenance;

530           (ii) payers are more inclined to use those indicators as numbers to their annual  
531 sustainability reports for their clients, government, shareholders or local community; for  
532 that matter indirect indicators of conservation, i.e. proxies, would be sufficient;

533           (iii) at least part of the payers are aware that ES monitoring is not easy to perform  
534 and is expensive, therefore, they would rely on proxy indicators as metrics for PES  
535 effectiveness.

536           As one of the payers from a water supply company reported on an interview: "Impact  
537 indicators are more important, i.e. those who reflect the benefit of the activities performed,  
538 however it is not always possible to get them due to information availability issues or the  
539 cost of getting information. Therefore, we should seek a balance in those terms (Bogotá,  
540 June 2016)." These results apparently contradict a comment made by one PES manager that  
541 said, "business men who are investing in those payments schemes expect that scientists

542 could come with an equation that would tell them for every dollar spent how much water  
543 quality improvement they will gain in return (Medellín, February 2015).”

544

#### 545 **4. DISCUSSION**

##### 546 **5. Who is interested in evidence of PES environmental impacts?**

547 **Intermediaries** are concerned about getting impact evidence of their schemes on ES  
548 for several reasons, most of them linked to their wish to keep their *modus operandi*.  
549 Evidence of ES improvement or maintenance would support keeping payers on board,  
550 attract more payers in the long term, sustain conservation jobs, and maintain trust  
551 relationships with both payers and providers. These concerns are seen on interviews,  
552 questionnaires and are similar to those found in the practitioners’ literature (e.g. Bremer et  
553 al., 2016; Higgins and Zimmerling, 2013). Intermediaries are also clearly concerned about  
554 their reputation as PES managers and are aware that providing evidence of PES impacts on  
555 ES is a central issue on this matter. This result is consistent with the one obtained by Fisher  
556 and Brown (2014) regarding the use of the ES concept and its derived tools by conservation  
557 practitioners. The cases analyzed provide some evidence that personal values also play a  
558 role on the intermediaries’ concerns with the evidence of PES impacts. Most of the  
559 interviewed representatives feel personally engaged with the local communities in which  
560 they work and with the environmental issues, and want the schemes to be effective.

561 **Payers** do expect evidence of environmental benefits achieved by the scheme in  
562 terms of ES and expect intermediaries to perform monitoring and report its results. Answers  
563 from both payers and intermediaries’ perceptions about payers’ demands pointed to this  
564 direction. However, when it comes to express the most important indicators for them,  
565 payers would mostly point to proxy indicators, for example, total area protected or number

566 of planted trees, instead of selecting more indicators linked to the target ES, for instance,  
567 the decrease of nitrogen and phosphorus concentration on water. Potential reasons may  
568 include the importance of indicators mostly for the sake of corporate sustainability reports  
569 in which specific indicators are not needed, or due to an assumption that proxy indicators  
570 are directly related to the desired effect in the targeted ES.

571 **Providers** are also interested in the PES impacts. Questions regarding motivation to  
572 engage in the scheme were able to capture their interest in the ES itself, instead of solely the  
573 payment, either in cash or in kind, for performing conservation practices in their properties.  
574 Most of them pointed water resources conservation as one of the most important  
575 motivations and declared that they would engage in the scheme even without economic  
576 incentives. This does not necessarily mean that providers are not interested in economic  
577 benefits, as at least half of the interviewees reported being motivated by increases in  
578 productivity; however, these results contradict the simplistic idea of a “service provider” as  
579 proposed in the literature (Wunder, 2005) and give clear indication that the so-called  
580 providers understand themselves as ES beneficiaries too and are willing to cooperate for  
581 conservation in case they receive technical and material support for that. Other recent  
582 studies in Latin-American cases have pointed to similar results. Bremer et al. (2014) showed  
583 that in Ecuador, landowners were motivated to participate in the program for a variety of  
584 reasons, including a “high value placed on the water provisioning services of the páramo  
585 [ecosystem] (Bremer et al. 2014, p. 122).” Intrinsic motivations have been also found in  
586 parallel with utilitarian arguments among landowners in other Latin-American cases. For  
587 instance, (Kosoy et al., 2008) found that indigenous groups participating in conservation  
588 schemes in Mexico had religious reasons in addition to the concerns with the forest  
589 provision of benefits. They considered forests as "sacred" places, with caves and other sites

590 being used as temples (Kosoy et al., 2008, p. 2080). In another study, a desire to “care for  
591 the land” was found as one of the main motives for participation in PES schemes in Mexico  
592 (Méndez-López et al., 2015, p. 695).

593 In part, the results found in the present study could be a consequence of the  
594 discourses held in the field by intermediaries while negotiating with landowners. Most of the  
595 intermediaries in the studied cases do not frame the proposed conservation practices as  
596 something that would only benefit downstream users but most of them emphasize the  
597 benefits that conservation will also have for those who live upstream. They argue that  
598 protecting water bodies, like springs and creeks, is fundamentally important for the  
599 providers themselves. During interviews, it became clear that providers tend to assume that  
600 the conservation practices are good for their own sake. In fact, the same water resources are  
601 shared and used by all, although distributed unevenly throughout the watershed.

## 602 **6. Why those schemes keep working if there is no evidence of improvement of** 603 **the target ES yet?**

604 Most of respondents from the three groups in all four schemes perceive the lack of  
605 evidence as a matter of time, because the schemes under study are relatively new and that  
606 the monitoring process is still incipient. They understand that the watershed would require  
607 more time to respond to the conservation practices undertaken. Still, most of the  
608 respondents from both providers and payers groups showed that they believe the scheme  
609 will produce beneficial ES outcomes. This may be explained by the presence of the common  
610 belief that “more forest leads to more water quantity” and better water quality (Kosoy et al.  
611 2007, p. 451) in the discourses from both providers and payers, according to the interviews.

612 An additional explanation for the perseverance of such schemes relies on the extra  
613 benefits it brings to actors. It appears that PES fit well into the agenda of several of them,

614 mainly of the intermediaries and payers. Intermediaries benefit from this approach due to  
615 the central role they must play to sustain such a scheme as several tasks involved in the PES  
616 design and implementation are required, such as property rights verification, constant visits  
617 to the field, and one-by-one negotiation with local farmers (Vatn 2010). As noted by Pham et  
618 al. (2010), intermediaries also act as information providers, mediators, watchdogs,  
619 arbitrators and bridge builders, among a series of other functions. Vatn (2010, p. 1247)  
620 concludes that “this explains why in PES schemes the intermediary is the dominant agent —  
621 whether the state, firms or NGOs of various kinds. The intermediary defines the good,  
622 establishes the group of ‘sellers’ and ‘buyers’ and even often set a predefined price.”

623 In parallel with that, the strong presence of the ES approach in the global  
624 conservation agenda since MEA (2005) means that more funding through international  
625 cooperation is available for this type of approach (Fisher and Brown, 2014). Among the  
626 studied cases, there was government funding from The Netherlands and US, and  
627 development banks. In addition, PES have been recently assuming an important position in  
628 the environmental institutional configuration of Colombia through several laws and decrees  
629 (Rojas-Sanchez, 2014). It has been promoted as a national conservation strategy that  
630 culminated with the announcement (7<sup>th</sup> July 2017) of the new “Payment for Environmental  
631 Services Policy” by the Colombian Ministry of Environment and the National Department of  
632 Planning PES schemes are expected to escalate (MINAMBIENTE, 2017). Thus, working with  
633 the ES approach could mean more funding available for the conservation business and,  
634 therefore, more jobs.

635 From the payers’ side, although ES improvement was the first motivation to enter the  
636 scheme for more than half of respondents, additional motivations play a strong role. These  
637 include, for example, fulfilling corporate socio-environmental policy requirements,



638 improving corporate image and local relations, and complying with legal environmental  
639 requirements. These additional payers' motivations could explain a potential permanence of  
640 payers in the schemes even without evidence of PES impacts on the target ES.

641         Although the literature on why firms engage in PES schemes as payers is almost non-  
642 existent, there are several papers discussing the reasons behind the adoption of corporate  
643 socio-environmental policy (CSR), which respondents pointed as one of the main reasons for  
644 the adoption of PES. Hemingway and Maclagan (2004) discussed the hypothesis of  
645 managers' personal values influencing the adoption of CSR practices by their companies.  
646 They proposed that cultural factors, such as religious beliefs and moral values of managers,  
647 could play an important role. Vives (2006) presented a survey covering more than a  
648 thousand small and medium firms in Latin America that had implemented responsible  
649 practices of a variety of types. The major motivations found by Vives were increment profits,  
650 but also religion/ethics, motivating workforce, and building relationships. In a survey with  
651 corporate leaders, Ditlev-Simonsen & Midttun (2011) found that branding and reputation  
652 were the primary CSR drivers among Norway companies. Babiak & Trendafilova (2011)  
653 studied the motives behind the adoption of environmental management practices as part of  
654 CSR among U.S. sports leagues. They found that strategic and legitimacy motives, connected  
655 to the need to address institutional pressures and social expectations, were among the main  
656 drivers of the CSR adoption. Executives also associated these choices with increasing chances  
657 for financial collaborations with sponsors that were interested in environmental issues.  
658 Thus, although economic motives exist, social norms are also important. Indeed, as pointed  
659 out by organizational sociology scholars, organizations are particularly attentive to what  
660 other organizations do when adopting certain practices (Houglund et al., 1980). Firms may  
661 experience pressure from organizations upon which they depend, emulate other

662 organizations because of their success, or just follow the advice of professional associations  
663 from their sector (DiMaggio and Powell, 1983). Exploring the extent to which such  
664 “institutional isomorphism” applies to PES programs may have implications also for our  
665 understanding of their endurance.

666

667 **7. Will PES schemes survive in the long term if there is no evidence of the**  
668 **expected environmental outcomes?**

669 The results indicate that providers from the studied cases are willing to take part on  
670 some costs to adopt conservation practices, for example, by setting aside part of their arable  
671 land for vegetation protection, if there is an incentive for that, i.e. if they are not the only  
672 ones to bear the costs. As one interviewee expressed, “I have always been concerned with  
673 conservation and I expect that with the economic incentives I can dedicate my land to  
674 protect water springs without affecting my income for that”. As most providers are engaging  
675 motivated mainly by water resources conservation, if the desired environmental impact is  
676 not met in the long term, there is a chance that they would drop out from the scheme not  
677 because of lack of economic incentives, but mostly because their expected benefits in terms  
678 of ES were not achieved. Under this assumption, evidence of PES environmental outcomes is  
679 therefore important not only to keep payers on board, but also providers.

680 When intermediaries were asked if payers would only pay under the condition of PES  
681 impacts being demonstrated they showed no consensus. This result is consistent with the  
682 one obtained from the payers. When asked if they would stop paying in case the ES  
683 improvement is not achieved with the time, payers also showed no consensus, with answers  
684 relatively balanced along the scale. This lack of consensus could be due to the relative  
685 importance attributed by each payer to the additional motivations they have to participate.

686 In addition, it may also reflect the ability of the payer to bear the risk: bigger payers would  
687 be less worried about the ES outcomes, while small payers would be more keen to check if  
688 the investments in conservation are giving returns. Although the small sample payers in this  
689 study do not allow for a clear conclusion regarding this latter possibility, it provides an  
690 interesting hypothesis for further research.

691 The question of whether PES schemes will survive or not in the long term remains  
692 dependent on additional empirical research, however the present study demonstrates that  
693 several motivations are behind the engagement of providers, intermediaries and payers in  
694 PES schemes. Therefore, the perceived additional benefits the actors have while  
695 participating in such schemes may partly explain the future long-term maintenance of this  
696 conservation approach even under lack of evidence of their impacts.

## 697 **8. Limitations of this study**

698 We believe the results presented here can shed some light on the issue of the long-  
699 term durability of PES schemes; however, it is worth mentioning that the scope of this study  
700 is limited to the four cases presented and, therefore, more research would be needed to test  
701 similar hypotheses in the field. In addition, the low response rate obtained among payers is  
702 of some concern, as in the studied cases they are usually managers of large organizations  
703 and have a limited time for interviews or questionnaires. However, several firms that  
704 responded the questionnaire are among the largest ones in Colombia and their funding for  
705 conservation is expressive. A second concern refers to the accessibility to the field in this  
706 type of scheme. As intermediaries are the ones who know exactly who the schemes'  
707 providers are and where they live, it is very hard to perform interviews and questionnaires  
708 without the presence of at least one manager or technician belonging to the intermediaries  
709 group. We believe that in occasions in which it is not possible to avoid their presence while

710 interviewing, answers from providers may be partially biased as some of them would be  
711 concerned with not threatening the trust relationship developed with the intermediaries.  
712 Whenever it was possible, questionnaires were conducted without the practitioners  
713 presence, and double-check of answers was performed through interviews. An additional  
714 point is that interviews and questionnaires are only able to capture declared points of view,  
715 however, communicated content is frequently different from actual behavior. Finally, we are  
716 aware that the use of Likert Scale can introduce biases to the answers; in order to address  
717 this, we built questionnaires based on preliminary interviews and additional interviews were  
718 undertaken in order to confirm first answers or to receive explanations on the choices made.  
719

## 720 **5. CONCLUSION**

721 There is not a straightforward answer for whether PES schemes will survive in the  
722 long term in the absence of evidence of their environmental benefits. What it is clear is that  
723 the lack of evidence has been already a matter of criticism from the scientific community  
724 and a matter of concern among PES intermediaries. In this paper, we explored four water-  
725 related PES schemes in which became clear that the evidence of environmental outcomes is  
726 important not only for those who pay for the schemes but also for intermediaries and the  
727 so-called providers. However, as PES schemes have important indirect benefits, mainly for  
728 the intermediaries and payers, there is a chance that those schemes will survive the lack of  
729 effectiveness evidence in the long term if that depends solely on these groups' wishes. Still,  
730 as providers understand themselves also as ES beneficiaries in these water-related schemes,  
731 and even if most of them understand that ES changes may take some time to be observed,

732 the lack of evidence of PES environmental outcomes in the long run could discourage their  
733 permanence in the schemes.

734

735

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