Payments for pioneers? Revisiting the role of external rewards for sustainable innovation under heterogeneous motivations

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Highlights

- Individuals have diverse, complex motivations to adopt pro-environmental behaviour.
- Acknowledging this heterogeneity is key for cost-effective conservation policies.
- We uncover 3 motivational perspectives for silvopasture adoption in a tropical forest context.
- Payments may not be the most appropriate incentives for pioneers regarding adoption.

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1 Introduction

When deciding whether to adopt pro-environmental practices, individuals confront trade-offs with multiple other activities in which to invest their resources and effort. In this process of decision-making, the profit maximising rationale is intertwined with other motivational drivers of human behaviour (Calle et al., 2009; Noppers et al., 2014). Even an apparently homogeneous microcosm such as a small rural community in the frontier of a tropical forest is composed of individuals whose behaviour is driven by a high diversity of goals and values (Bathfield et al., 2013). People have diverse ways of interpreting the same phenomena (Bennett, 2016) and, due to heterogeneous motivations, goals and preferences, the response of individuals to the same types of incentives may vary remarkably (Bolderdijk et al., 2012; van der Werff et al., 2013). This motivational diversity can partially explain the unpredictability or ineffectiveness of external interventions[1] for environment and development (Kline and Wichelns, 1998); it can induce highly variable behavioural responses and, plausibly, undesired outcomes of policy instruments.

Among different policy instruments to favour sustainable productive systems, policies based on economic incentives and market transactions are increasingly being promoted. However, the suitability and the superiority of market-based instruments over other types of incentives is heatedly questioned and contested, particularly when they are aimed at encouraging innovative activities (Kemp and Pontoglio, 2011) such as silvopasture (an agroforestry system that integrates cattle farming). In the case of Payments for Ecosystem Services (PES), key debates refer to their political legitimacy (Corbera and Adger, 2004), long-term effectiveness and efficiency (Muradian et al.,

1 Here we understand the notion of external programs as those designed and implemented by organisations outside of the recipient community.

2013; Sierra and Russman, 2006; Wunder, 2006), potential interactions with social norms (Villamor and van Noordwijk, 2011), effects such as crowding intrinsic motivations for conservation (D'Adda, 2011; Midler et al., 2015; Narloch et al., 2012), and interwoven efficiency and equity impacts (Corbera and Pascual, 2012; Narloch et al., 2011; Pascual et al., 2014, 2010).

Remarkably, the theory underlying PES relies on an implicit major assumption of rationality associated with utility-maximising behaviour; it is assumed that agents predominantly act upon a simple cost-benefit rationale (Ferraro, 2001; Ferraro and Kiss, 2002). Such characterisation of human beings may be adequate to predict behaviour in contexts involving innovation that is more profitable financially, decisions driven by self-interest, and/or activities predominantly framed in a market economy (Heyman and Ariely, 2004). However, this model may fall short when additional motivations or goals have a considerable role as drivers of behaviour (Edwards-Jones, 2007; Steg et al., 2014). Some examples of such additional motivations are giving higher importance to long-term benefits or to livelihood security, or having a strong social interest relative to self-interest (Gsottbauer and van Den Bergh, 2011).

Much effort and care are put into designing targeting approaches of PES to maximise environmental additionality under constrained program budgets (Alpizar et al., 2015; Wünscher and Engel, 2012). We argue that such a targeting effort may fail if the heterogeneity of participants' motivations towards pro-environmental behaviour is not adequately considered. This is especially the case if PES are to be adaptable to each stage of the diffusion process (Rogers, 1962), particularly for PES to stimulate what motivates early adopters, or so-called pioneers, innovators or visionaries of pro-environmental behaviour (Baumgart-Getz et al., 2012; Egmond et al., 2006). Yet a balance needs to be kept between the precision and the transaction costs of a policy.

While the importance of heterogeneous motivations has been long recognised in environmental policy (Kline and Wichelns, 1998), few studies use information about heterogeneity of motivations in order to explain behavioural decisions and adoption of sustainable agricultural

innovation (with exceptions such as Blazy et al., 2011; Läpple and Kelley, 2013). This paper uncovers the diversity of motivations that influence active pro-environmental behaviour (as opposed to passive conservation) of smallholders that participate in a programme for sustainable land use through the adoption of silvopasture. The study is contextualised within a voluntary project for fodder tree cultivation in a community in the buffer area of a Biosphere Reserve in the state of Chiapas, in tropical Mexico.

In order to analyse the heterogeneity of perspectives regarding adoption of silvopasture, we use Q methodology, a systematic approach to understand subjective perspectives. Beyond the Q analysis, we also contrast these perspectives with observed data about livelihood strategies and with individuals' short-term adoption within the silvopastoral project. The results shed light on the potential for different forms of external rewards to effectively incentivise those farmers that are more likely to adopt and continue silvopastoral practices. Our analysis of the diverse motivations for pro-environmental behaviour provides important insights for designing adaptive environmental conservation policy that promotes the adoption and continuation of social-ecological innovations.

2 Case study

2.1 Silvopastoral systems and their adoption in the tropics

Extensive overgrazing, including at small scales, is a threat to soil and forest conservation in the frontier of biodiversity-rich tropical forests (Geist and Lambin, 2001). Deforested land in mountainous areas degrades under strong rainfall in the wet season and compacts under grazing (Valdivieso-Pérez et al., 2012). This degradation affects ecosystem functions (including the system's capability to buffer primary forests) and increases the likelihood of severe perturbations such as floods and landslides (Richter, 2000).

Silvopasture is a type of agroforestry that involves fodder-tree cultivation in pastureland. This approach has a double benefit: it rehabilitates the landscape and provides feed for cattle also during

dry season, when the lack of pasture in some areas is critical. It is considered an adequate compromise between conservation objectives and livelihoods in social-ecological systems characterised by an important livestock component (Broom, 2013; Murgueitio et al., 2011). Its implementation requires preventing cattle from accessing the trees for a period that ranges between half to a few years, until the trees are strong enough to survive animal browsing.

Many decentralised projects to promote silvopasture have recently been implemented in tropical forest margins to rehabilitate landscapes while promoting sustainable livelihoods. A remarkable initiative has been RISEMP, a multi-site programme carried out by regional research institutions in three Latin American countries, funded by the World Bank and reported in various studies (e.g. Garbach et al., 2012; Montagnini and Finney, 2011; Van Hecken and Bastiaensen, 2010). Pagiola and colleagues (2008, 2007) find that the impact of PES in the adoption of silvopasture is complex, one reason being that the effect of PES in such systems may be different depending on recipients' motivations and interests.

Silvopasture has long been a successful management system in a number of traditional agroecosystems (e.g. Iberian *dehesas*) and it holds much promise for areas in which cattle farming is a more recent phenomena (such as recently colonised tropical forest frontiers). Nevertheless, its diffusion has been slower than envisaged in economic and environmental performance assessments (Cubbage et al., 2012; Gutiérrez et al., 2008), and this lack of adoption has received little attention in the literature.

The literature about factors affecting agroforestry adoption is mostly focused on explicitly measurable farm, household and personal characteristics, amenable to adoption probability analysis (Pattanayak et al., 2003), but not on stakeholders' perspectives. In addition, the literature is scant with regards to silvopasture adoption beyond observable characteristics (with the exception of Calle et al., 2009; Frey et al., 2012; Hayes, 2012). The relationship between cognitive variables and behavioural intention is abundantly addressed in social-psychology theory, yet its empirical

95 application to agroforestry adoption and conservation practices in farming is scarce (Lokhorst et al.,
96 2011; McGinty et al., 2008).

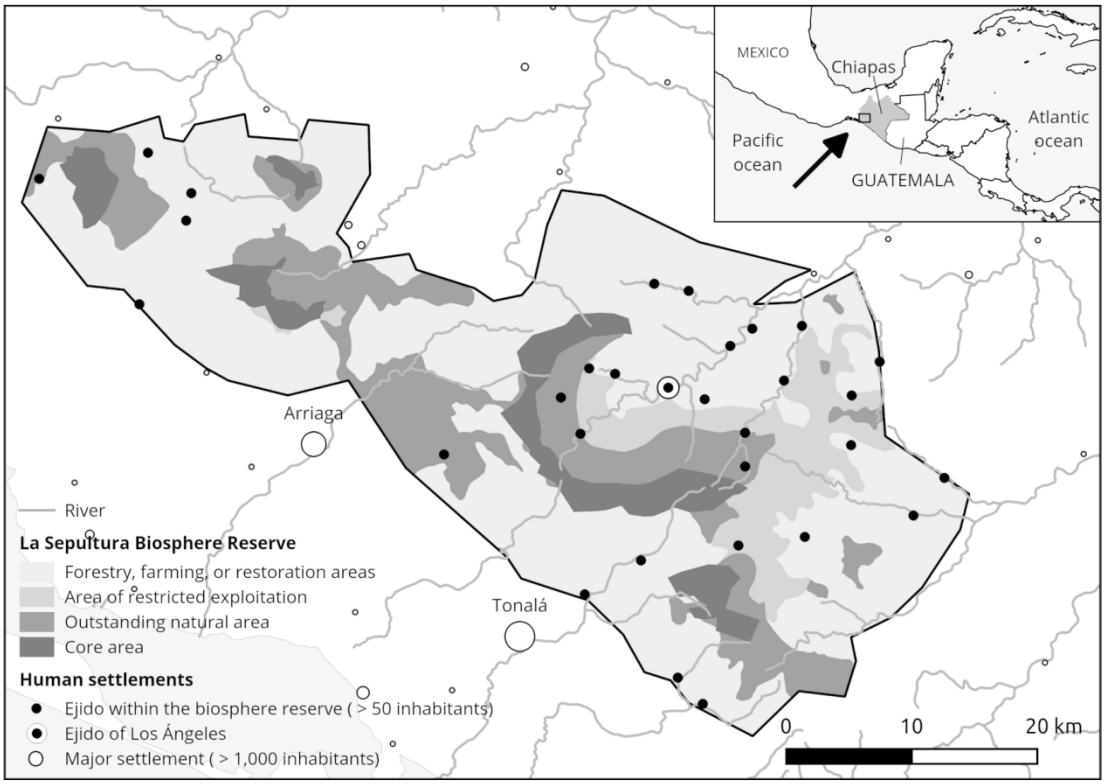
97 **2.2 Encouraging silvopasture in Chiapas**

98 Chiapas had the largest total loss of forest per year among Mexican states in the 1990s
99 (Céspedes-Flores and Moreno-Sánchez, 2010) and the second largest in the 2000s (Hansen et al.,
100 2013). There is little evidence of a forest transition leading to forest recovery (García-Barrios et al.,
101 2009; Vaca et al., 2012). The reasons for this permanent deforestation are epitomised in the case
102 study explained below.

103 In the Pacific side of Chiapas, La Sepultura Biosphere Reserve lies on the mountain range that
104 stems from the Andean spine (Figure 1). In the buffer zone of the reserve (the area within the
105 reserve limits but located outside of the core and the outstanding natural area), lower areas and
106 South-oriented slopes are highly deforested. The landscape surrounding human settlements is highly
107 anthropized and faces an increasing risk of soil erosion (Valdivieso-Pérez et al., 2012) due to
108 unsustainable farming practices. Predominant livelihood activities in the buffer area include the
109 production of the traditional Mexican *milpa* (based on maize and beans), livestock and shade-grown
110 coffee farming, the latter ecologically restricted to only certain areas.
111

Figure 1: Location and zonification of La Sepultura Biosphere Reserve in Chiapas, Mexico.

Note: 167,310ha. Sources: CONANP (2006) and INEGI (2012). Made with QGIS (2016).



Among the various small communities (*ejidos*) in La Sepultura, Los Ángeles is a representative one with a population of over 800 people (Trujillo-Vázquez, 2009) distributed in approximately 200 households. The land property regime is a hybrid between the traditional *ejido* communal lands and customarily recognised private land. Since the community settled down in the 1960s, the surrounding forest was progressively cleared for maize first, and converted to cattle farming afterwards (Sanfiorenzo-Barnhard et al., 2009; Valdivieso-Pérez et al., 2012). Following the North American Free Trade Agreement, farming activities began to diversify. With the protection of the area in 1995, farming expansion was restricted. Cattle farming became a preferred livelihood option, mostly limited by financial capital and land ownership. Cattle farming is seen as less risky than cash-crop agriculture because the latter is highly dependent on rainfall and on the

123 price of chemical inputs. However, this preference is also heavily influenced by variations in
124 international market prices (García-Barrios et al., 2009).

125 As in the rest of Mexico, households in La Sepultura currently have access to a diverse range
126 of external payments for different purposes, as well as to incentives from various sources in order to
127 promote new sustainable livelihood activities. External PES-like schemes are increasingly viewed
128 by authorities as a cost-effective approach to tackle a range of policy issues (Muñoz-Piña et al.,
129 2008). In the case study, many such payment schemes coexist for cattle and agricultural extension,
130 for carbon capture projects, and for hydrological ecosystem services.[2] Distribution and
131 conditionality for such diversity of payments differ across programmes. Farmers are driven by
132 different motivations to participate in these payment schemes (Shapiro-Garza, 2013).

133 In Los Ángeles, the research institute El Colegio de la Frontera Sur (ECOSUR) implemented
134 a pilot voluntary and participatory project since 2007 (see García-Barrios, 2012) to encourage cattle
135 farmers to plant native fodder trees in small pasture plots of their own. The project provided
136 incentives in the first year in the form of fencing material and training (Trujillo-Vázquez, 2009). In
137 2008, after a first group of 22 volunteers had planted saplings, the local office of the National
138 Commission of Protected Areas (CONANP) provided additional budget for fencing material for 22
139 more participants, who became part of the group under joint institutional coordination. In 2009, a
140 total of 68 smallholders participated, and CONANP supported these efforts with additional material
141 and cash payments distributed at the group's own criteria (further details are given in Zabala, 2015).

2 The main payment programmes are 'Oportunidades' from SEDESOL (Mexican national secretariat for social development), Procampo (Mexican national programme for direct support to farms) and Progan (Mexican national programme to encourage cattle productivity) from SAGARPA (Mexican department of agriculture, livestock, rural development, fisheries, and food), PESH (Mexican national programme for payments for hydrological services) and Proarbol from CONAFOR (Mexican national commission on forestry), and carbon capture projects by Ambio (Mexican NGO).

142 Participants were required to plant the trees in order to receive material and payments, but
143 there was no real conditionality because success in the establishment of fodder trees did not
144 influence the reward received. The actions carried out to cultivate the trees, and the resulting
145 number of trees and their height and quality were monitored for each of the plots (Trujillo-Vázquez,
146 2009).[3] The reasons behind the highly variable performance are unclear and scarcely related to age
147 or to the caring activities carried out (Trujillo-Vázquez, 2009).

148 **3 Q methodology**

149 Q is a structured methodology (also known as Q technique or Q-sort) to explore complex
150 problems in which distinct human perspectives are involved. This exploration is done by identifying
151 different patterns of thought existing within a group on a topic of interest, and this identification
152 needs not be based on a preliminary hypothesis (Brown, 1980; Watts and Stenner, 2012). Patterns
153 of thought are described through a set of statements that represent the whole set of possible opinions
154 around a topic. The statements are given to a purposely selected sample of respondents. Each
155 respondent sorts them on a grid with several columns that typically represent an ordinal scale from
156 *most agree* to *most disagree*.

157 The analysis reduces the responses down to a few perspectives (the *factors*) that best represent
158 all the views found in the group. These factors are the weighted average response of respondents
159 grouped by similarity (for details, see Zabala, 2014; Zabala and Pascual, 2016). Factors depict the
160 view of an archetypical respondent who would best represent that factor, although they do not
161 necessarily describe any specific real respondent. The view of each respondent will usually be more
162 closely related to one factor than to the rest.

3 In each plot, a median of 62 trees were grown (including saplings that were found about to die), which had a cumulative median height of 8.2m per plot (Trujillo-Vázquez, 2009; Zabala, 2015)☒.

This methodology is increasingly being used across disciplines, particularly in social-environmental studies and ecological economics, and for different purposes, such as policy evaluation or participatory processes. It is used to identify typologies such as conservationist opinions about market-based instruments (Sandbrook et al., 2013, 2011), farmer environmental perspectives (Davies and Hodge, 2012), opinions about new environmental legislation (Buckley, 2012), stakeholder views on energy from biomass (Cuppen et al., 2010), sustainability discourses (Barry and Proops, 1999), perceptions about the uses of forest (Nijnik et al., 2010; Rodríguez-Piñeros and Mayett-Moreno, 2014) and, more recently, on semi-subsistence farmers' motivations to conserve agrobiodiversity (Nordhagen et al., 2017).

3.1 Q-set: statements and their structure

A comprehensive sample of statements was built based on expert consultation, in-depth interviews with four farmers, previous literature, and after extensive fieldwork gathering quantitative and qualitative data on livelihoods, as well as questionnaires about stated preferences on silvopastoral practices conducted on 103 heads of households. The selection of statements follows a hybrid approach by including both naturalistic (directly from respondents' communication) and ready-made statements (expert formulated; McKeown and Thomas, 2013). The initial sample contained 66 statements.[4]

The final set of 26 statements (Listed in the Appendices) cover five topics that are most relevant to explain farmers' perspectives with respect to adopting silvopasture, based on literature and on prior fieldwork. These topics are as follows: (A) importance of external payments in livelihoods, (B) environmental and conservation values, (C) personal attitudes towards work and

4 In order to select the statements from the initial sample, the 66 statements were classified into six topics: silvopastoral (14 statements), subsidies/ programmes (16), land/ forest conservation (33), future generations (5), livelihood (30) and cattle (20). The topics were not mutually exclusive. These statements were given a relevance score of 0-3 by the authors, which aided in the final selection of 26 statements.

184 livelihoods, (D) beliefs and preferences about cattle farming and land use, and (E) preferences and
185 trade-offs between planting fodder trees and other livelihood activities, including perceptions about
186 potential benefits of fodder trees.[5]

187 The total number of statements was low in comparison with other Q studies in order to ease
188 the sorting process for respondents, some of whom read slowly due to lack of practice. However,
189 the statements selected covered sufficiently the topics explored in this research and provided
190 sufficient variability in the responses, as explained in the results.

191 **3.2 Respondent selection and administration of Q method surveys**

192 The statements were designed and administered in Spanish (original versions shown in the
193 Appendices). Everyone in the research team were native speakers. The wording was adapted after
194 pilot testing with experts in the local context and with trusted members of the community, in order
195 to ensure that the statements were concise and clear, and that their meanings did not overlap.

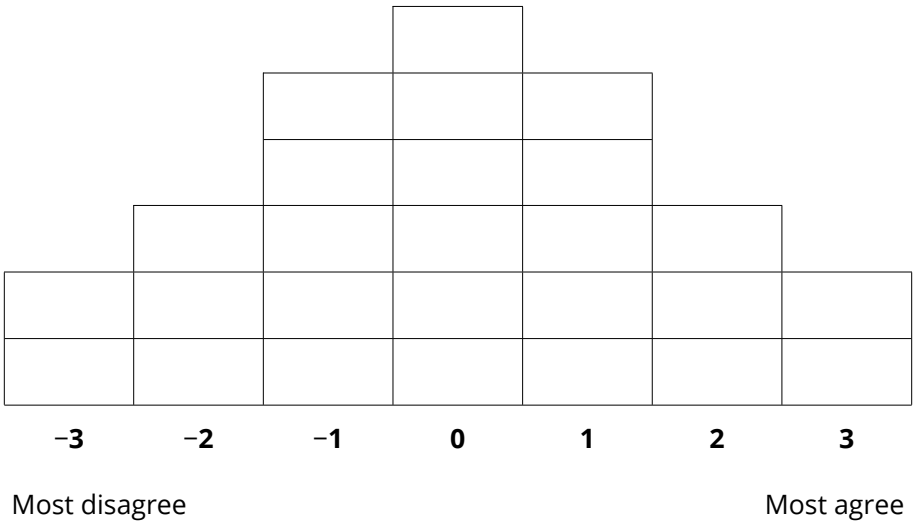
196 The method was individually administered to 32 heads of households, all of them participants
197 in the fodder tree planting project described above and for whom secondary data on involvement
198 and short-term adoption were available (Trujillo-Vázquez, 2009). Respondent selection followed
199 maximum-variability sampling to include a diverse spectrum of smallholders, by using a factorial
200 design based on observed variables. From the 68 individuals who participated in the fodder tree
201 planting project, we shortlisted individuals with highest, lowest and median values of a subset of
202 key variables: cattle specialisation, levels of income, land and livelihood diversity, and level of
203 short-term adoption. All respondents were male, because culturally in this context the male head of
204 household makes and implements decisions over land use. We excluded non participants because

5 Each statement was also classified in three further vectors: attitudes, preferences, perception or trade-offs; whether they refer to the present or the future; and whether they refer to respondents themselves, their descendants, or non-human life.

205 we were interested in the motivations affecting the level of adoption (i.e. their interest, compromise
206 and effort), not simply in the motivations to participate (i.e. their initial interest). Respondents were
207 interviewed individually face-to-face in August 2010 and January 2011. From those sampled (36),
208 one decided to stop sorting the statements after the survey had started due to fatigue, and three were
209 not available at the time of the survey.

210 Each respondent divided the statements into three piles of *agreement*, *disagreement* and
211 *neutral*, based on their own views. Next, respondents sorted the statements in a board with a
212 standard pyramidal shape of seven columns representing an ordinal scale (Figure 2). Respondents
213 sorted the statements according to their own agreement: from most agree to most disagree. Finally,
214 respondents briefly explained the reason for sorting the statements in the most extreme positions.

Figure 2: Q methodology distribution for this study



215

216 **3.3 Analysis of factors**

217 The analysis in Q methodology reduces responses to a few main types of perspectives (named
218 'factors' in Q methodology). This is done by means of multivariate analysis, in which respondents
219 are correlated instead of variables (see details in Brown, 1980; Zabala and Pascual, 2016).

220 We retained three factors after assessing a number of standard criteria in Q (see e.g. Watts and
221 Stenner, 2012) [6] and as a parsimonious compromise. Together, the three factors explain 54% of the
222 variability in the views of respondents, a percentage that is consistent with other Q studies (e.g.
223 Buckley, 2012; Lansing, 2013). Responses were selected as *defining* (*flagged*) for a given factor
224 following the standard criteria in Q: those with higher factor loadings in a given factor and with
225 significantly different factor loadings in comparison to other factors. Four respondents were not
226 flagged because they had relatively high loadings in two or three factors, implying that they shared
227 features from more than one view simultaneously.

228 In addition, we implemented a novel analytic approach of bootstrap re-sampling in Q in order
229 to obtain more precise levels of confidence of the results and to enhance the accuracy of the
230 interpretation (see details in Zabala and Pascual, 2016). The bootstrap approach produces variability
231 (spread) measures specific to the scores of each statement for each factor (standard errors that show
232 their relative stability) and more accurate point estimates. The bootstrap was run in 3,000 steps
233 using PCA and varimax rotation, and using the package 'qmethod' (Zabala, 2014) for R statistical
234 language (R Core Team, 2016).

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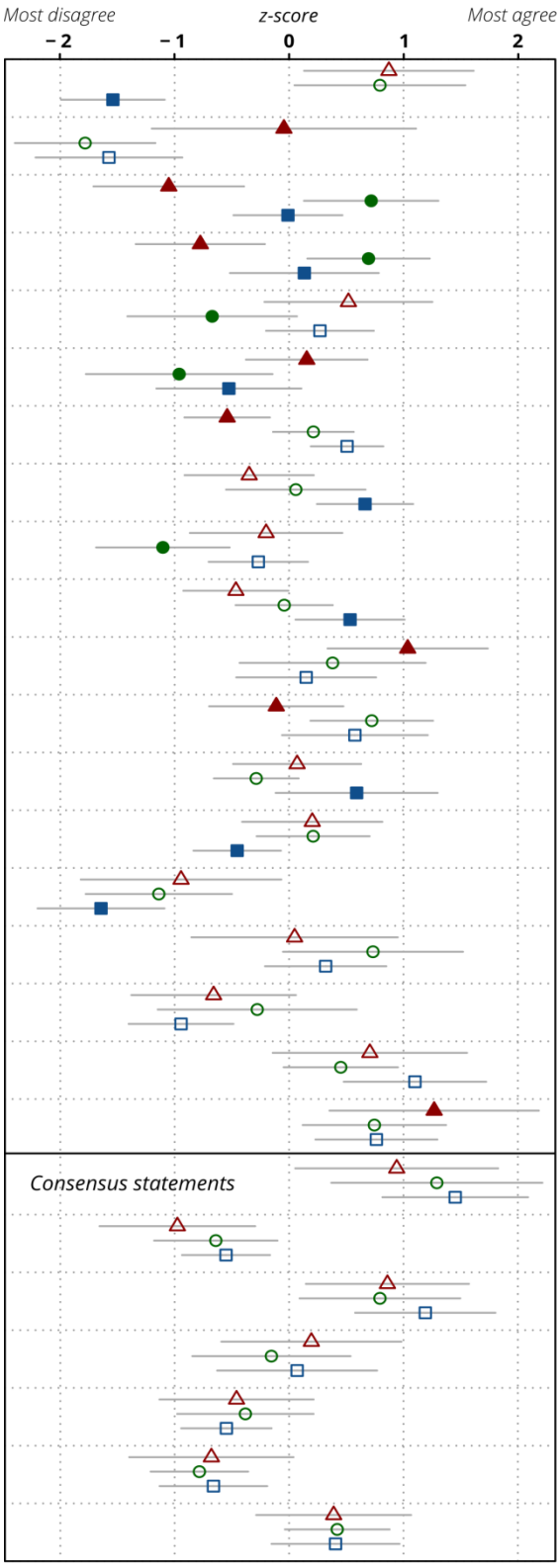
6 The first six factors have eigenvalues higher than two and more than one defining respondent, while the first twelve have eigenvalues higher than one. The scree plot indicates that three or four factors would be adequate. The third factor explains 13% of the variance and the fourth and fifth factors explain 12% and 10% respectively. A fourth factor is defined by only three out of the 32 respondents, one of whom defines it in the opposite direction (high negative loading). Importantly, a preliminary interpretation of this fourth factor suggests that the view represented would be very similar to the first factor, with a few traits shared with the second one. We also ran a sensitivity analysis of the final results by selecting from two to eight factors, in order to see whether any of the results changed noticeably in the first few factors. Moderate changes are found in the fourth factor, and significant changes in the fifth and subsequent factors. We also run a sensitivity analysis to identify highly influential respondents. A single highly influential case is found, but we decided not to exclude it from the subsequent analysis.

4 Results and interpretation

The analysis yields three main results: the respondents' factor loadings (Appendices), the overall factor characteristics, and the statements' factor and z-scores (Figure 3). The overall characteristics (explained variability and number of defining Q-sorts) indicate that the first factor is highly representative of over a third of the sample and explains a quarter of the total variability in the responses (25% of the total variability explained, 13 defining Q-sorts). The other two factors also explain a substantial amount of the variability (factor 2, 17%; factor 3, 13%), and all factors are represented by a considerable number of defining Q-sorts (factor 2, 8 defining Q-sorts; factor 3, 7).

Figure 1: Statements selected for Q sorting, bootstrap estimates of their z-scores and distinguishing statements (filled symbols)



1. **Self-sufficient pioneer**
2. **Environmentally-conscious follower**
3. **Payment-dependent conservative**

Statement

15 We need more external payments so that my children do not need to go to live elsewhere.

21 If the government does not give me payments, taking care of the forest does not benefit me.

12 My land is 'getting tired'.

17 If I had more money, I would plant fodder trees instead of increasing my cattle.

6 I could increase my benefits in cattle farming without degrading the land.

18 In dry season there is no alternative other than releasing my cows free into the mountain.

20 It is convenient to weed my fodder tree plot even if I have other tasks, to produce more fodder.

4 I can maintain my family with my own work, external payments are just an aid.

8 I participate in all external programmes that bring income.

22 I try new things in my job.

1 My children and grandchildren will work the same land that I cultivate now.

11 I analyse my costs and benefits and thereafter I work on the most beneficial activity.

2 I prefer two hectares of pasture than one hectare of fodder trees.

13 Benefits from cattle production are larger than loses from its related land degradation.

23 I would rather live by external payments than by working my land.

16 It is more convenient for me to invest money in improving my pastures than in buying cows.

26 In order to dedicate one hectare to fodder trees during two years, I would need more land.

19 With more training I could improve very much my work in cattle farming.

24 I need to improve my pasture, otherwise cattle feed will run out in a few years.

9 It is more convenient for me to cultivate my own food than buying it.

7 Cultivating fodder trees involves a lot of effort and little benefit.

10 Conserving the forest is responsibility of the landowner.

3 The knowledge to earn more is what is of most interest to me from external programmes.

5 With tree planting programmes I receive more money in return for my work.

14 It takes too long for fodder trees to grow.

25 I can earn more as a cattle-farmer if I allow wild animals to live in the forest.

Note: Ordered from most distinctive (top) to consensus, based on z-score differences. Error bars show the standard error from the bootstrap. Filled symbols indicate that the statement is distinguishing for the given factor.

243

244 The statement scores are the main results used for interpretation. The z-scores are the
245 "weighted average of the values that the respondents most closely related to the factor give to a
246 statement" (Zabala & Pascual 2016). Statement z-scores suggest how the archetypical respondent
247 for each factor would sort the statements. The z-scores are presented here in a novel, synthetic dot-
248 chart format (Figure 3). For example, this figure shows that factor 3 disagrees with statement 15 in
249 a distinctive manner in comparison to factors 1 and 2, while it agrees with statement 21 much more
250 than the other factors do.

251 The interpretation of factors is based on the statement results: their salience within each factor
252 and their distinctive position comparing to that of other factors. Statements that have significantly
253 different scores across factors are distinguishing statements (in Figure 3, statements in which the
254 horizontal distance between markers is large) and they represent an issue of clear disagreement
255 among factors (e.g. statement S12). Statements with the lowest differences in scores across factors
256 are of consensus (markers which are very close to each other; e.g. S25) and indicate common
257 ground and shared understandings of the issue, or otherwise taboos.[7] As standard in Q, factors are
258 named based on their qualitative interpretation. The justification for these names is given in the last
259 paragraphs of each factor interpretation below.

260 **4.1 Comparison of factors with observed characteristics**

7 We also analysed the results of statements according to their topic (letters A-D in table of statements in Appendices): calculating the means and standard deviation of z-scores for each topic, in order to see if any one topic was predominant (high absolute averages) or controversial (high deviations) within a given factor, and to compare the responses across factors. This did not yield remarkable insights for this study.

In addition to the standard Q analysis, the factors are compared with observed characteristics of individuals: key livelihood and socio-economic variables and short-term level of adoption as monitored in the fodder tree planting programme (data from Zabala, 2015 and Trujillo-Vázquez, 2009). This comparison has the purpose of describing how these characteristics relate to the factors within the given sample and has descriptive merit rather than inferential, due to the size and purposive nature of the sampling.

The comparison was done by means of correlation coefficient tests between the factor loadings —that quantify the similarity of each participant with each factor— and the additional variables. Table 1 shows the correlation test results for these livelihood variables, including specialisation in cattle farming, in other livelihood activities, dependence on external payments, and endowments.[8]

8 In addition, we run ANOVA test for differences among groups according to the level of income (measured in four categories). These tests give no significant results, suggesting that there are no differences in terms of income among the perspectives.

Table 1: Comparison of factors and key observed variables

Variable	1. Self-sufficient	2. Environmentally-conscious	3. Payment-dependent
Benefits from cattle farming (%)	–0.33*	–0.38*	0.37*
Benefits from wage labour (%)	–0.05	0.40*	–0.24
Benefits from commerce (%)	0.08	0.08	–0.34*
Benefits from external payments (%)	0.06	–0.06	0.09
Livelihood diversity (number of activities)	–0.13	0.06	0.05
Total land owned (Ha)	–0.17	–0.39*	0.26
Experience with cattle farming (years)	–0.43*	–0.23	0.46*
Age	–0.12	–0.16	0.21
Number of youth in the household	0.38*	–0.12	–0.08
Adoption	0.24	0.23	–0.18
Number of defining Q-sorts by level of adoption:			
No plants	6	3	6
Some plants	3	4	1
Many plants	4	1	0

Note: Values correspond to Spearman correlation coefficients between variables and factor loadings for each factor, except for the number of defining Q-sorts by level of adoption. Significance:* $p < 0.1$. Sample $N = 32$. For the last variable (level of adoption), counts of individuals defining the factor (*flagged*) are given.

273

274 The level of short-term adoption is defined for this study as the outcomes of growing fodder
275 trees, measured as cumulative height of tree per plot. Adoption was measured one year after the
276 planting of the saplings (Trujillo-Vázquez, 2009) and in the case study is a satisfactory
277 approximation for biomass. This measure was used to categorise farmers into three groups: those
278 with many plants, with some plants, and with none. Table 1 (last three rows) shows the contingency
279 table of defining Q-sorts by the category of short-term adoption in which they fall.

280 More specialisation in cattle farming distinguishes factor 3 from the rest (in both years of
281 experience and percentage of benefits from cattle). Respondents related to factor 3 appear to have
282 more land, although this is not significant. Dependence on subsidies (external payments) does not
283 significantly distinguish factors, neither does the diversity in livelihood strategies. The comparison

284 of defining Q-sorts with categories of adoption suggests a pattern: most of those who had many
285 plants are definers of the first factor, and most of those who define the third factor had no plants.

286 **4.2 Interpretation of results**

287

288 There is a general consensus that food self-sufficiency is desirable (S9), that conserving the
289 forest is the responsibility of the landowner (S10), and that fodder trees do not take much time and
290 effort to grow (S14). By contrast, major disagreements refer to the importance given to external
291 payments, preferences on cattle farming, and perception about land. Factors 1 and 3 are opposite in
292 their view of external payment schemes (S15, S21). Cattle farming is a topic of remarkable
293 disagreement (topic D in Appendices); there is no consensus with regards to any of the seven
294 statements. The overall perception about land degradation is salient in opposite ways for the second
295 and the third factors (S12). Each factor show distinct preferences towards planting fodder trees
296 (S17, S2, S16): high preference (factor 2), disengagement (factor 1) and low preference (factor 3).
297 Attitudes towards innovation and self-sufficiency are rather distinct for the three factors too (S22).
298 The following interpretation of the different types of smallholders' perspectives (factors) is
299 structured around three main themes: (i) preferences about investing in increasing the cattle herd,
300 improving pasture, and planting fodder trees; (ii) the reasons why silvopastoral practices are
301 adopted; and (iii) whether such practice would be continued beyond the experimental period.

302 ***4.2.1*** **The *self-sufficient pioneer***

303 The first factor represents an individual who is pragmatic, self-sufficient, and an innovator.
304 He[9] is confident about his capability to maintain his family in an autonomous way and without
305 depending on external financial help (S15, S4, S23). He gives the lowest importance to external

9 The description uses male nouns throughout because all the interviewees were men, as explained in Section 3.2 , and it refers to perspectives held by individuals, rather than by a collective (*they*).

306 payments in comparison to the other two factors, and clearly rejects them as being necessary for the
307 family; PES may not be motivational. He is proactive about learning by experimenting with new
308 practices in order to improve his livelihood (S22), and he considers that he could improve very
309 much his work in cattle farming with further training (S19). He has no clear preference between
310 investing in more cattle or in planting fodder trees, but he would much prefer to invest in better
311 pasture (S2). He thinks it is convenient to take care of the fodder tree plot even though he has other
312 work to do, and does not perceive land availability as a constraint (S20, S26).

313 The characteristics that would make this person successfully adopt and continue silvopasture
314 are his pro-activeness to experiment with innovative practices, his willingness to learn in order to
315 improve his performance, and his remarkable preference to remain self-sufficient and independent
316 from external payments.

317 This type is identified as a *pioneer* within a diffusion process, that is, an initial adopter or
318 innovator. This identification is based on his distinctive response to statement S22 and to
319 indications of better performance in the pilot project. Despite not being significantly associated with
320 age, he typically has a young family and fewer years of experience with cattle farming (Table 1).
321 This is a sign of youth and of needing to secure an income in the medium term, and therefore of
322 potentially more receptiveness to innovations.

323 ***4.2.2 The environmentally-conscious follower***

324 This factor represents an individual that is conservationist, other-regarding, concerned about
325 the future, and a follower in the context of adoption of livelihood innovations. He has the highest
326 degree of environmental awareness and shows concern about soil degradation (S12, S6). He also
327 has a higher preference for fodder trees than the other two factors (S17, S2). He prefers to invest in
328 fodder trees more than in pasture, and remarkably more than in stocking more cattle. For such an
329 individual, the awareness of environmental problems may be an important driver of pro-
330 environmental behaviour.

His perception about the importance of external payments is ambiguous. While he shares the *self-sufficient pioneer*'s views on payments (S21), he expresses a clear need for external payments in order for his descendants to eke out a livelihood (S15). This might be due to pessimism about the future, founded on his perception about land being degraded, and presumably about the lack of employment elsewhere.

While this type of farmer is more receptive to PES-like incentives, his actions may be strongly motivated by a higher awareness about the need for environmental conservation (S12). Thus we define this factor as *environmentally-conscious*. His environmentalist views are supported by the engagement with two further assertions: that the payments provided are not the only reason for participating in external programmes and that, during the dry season, releasing cattle into the forest is not the only alternative (S8, S18). Therefore, this type of farmer may be genuinely more environmentally concerned than the other two, either intrinsically (subsequent to his experience) or because he has internalised the discourse externally introduced by conservation institutions.

The *environmentally-conscious* factor is characterised by having a relatively higher level of income from off-farm activities, possessing less land and deriving a lower share of benefits from external payment schemes (Table 1). He is motivated to conserve land but he does not feel as self-sufficient and capable as the pioneer. He is also not as proactive in trying new livelihood activities (S22). Thus we interpret this factor also as a *follower* regarding the adoption of silvopasture.

4.2.3 The *payment-dependent conservative*

The third factor represents an individual that is conservative, payment-dependent, rent-seeking, and late adopter or laggard with respect to innovations. He believes that his livelihood is highly dependent on external payments, emphasising most strongly the need for payments in order to live, both for his current livelihood and for his children's future (S15, S4). He emphasises that he may not be able to sustain his family without these payments and would also require PES to take care of the forest (S21).

He believes that his descendants will work on the same land (S1), and that he will probably not produce enough animal feed if he sticks to current practices (S24). Yet, he does not perceive that his land is currently degrading (S12). He asserts that he can get more benefits from cattle without damaging the land, and that during the dry season he cannot do anything other than release his cattle into the forest (S6, S18). He also has the lowest preference toward fodder trees; his investment preference between pasture and fodder trees is ambiguous (S2), but he clearly prefers direct purchase of cattle than investment in fodder trees (S17). He considers that it is not convenient for him to weed the fodder tree plot (S20), although he acknowledges that planting fodder trees does not involve much effort (S7).

Because he is not keen on trying new practices (S22), this individual is likely to be a late adopter of innovative practices. Because he states high dependence on external payments (which are a form of immediate, easy income) he can be described as rent-seeking, therefore PES may encourage his participation in conservation programmes. However if the payment stops before the practice yields further benefits, he may possibly abandon it (Pagiola et al., 2007).

Smallholders with this perspective have a significant positive correlation with cattle specialisation and with more years of experience in cattle farming (Table 1). They are also associated with a lower share of benefits from off-farm activities.

5 Discussion: reconsidering the role of external rewards in the context of heterogeneous motivations

5.1 The diversity of motivations for adoption of silvopasture

The three main perspectives uncovered in the case study are largely consistent with the roles predicted in the theory of diffusion of innovations, according to their general attitude: pioneers, followers and late adopters (Läpple and van Rensburg, 2011; Rogers, 1962). The perspectives are also relatively consistent with other typologies found in the literature on adoption of sustainable

agricultural practices. Most studies that investigate typologies of potential adopters identify at least one perspective of *environmentalists* (Brodt et al., 2006; Valdivia et al., 2012), *active adopters* moved by environmental awareness (Morris and Potter, 1995), or *ecosophists* (Vartdal 1993 in Padel, 2001). These types are substantially similar to the *environmentally-conscious follower* identified here. The *payment-dependent conservative* may be related to previous types such as those characterised by their resistance to adopt (Barnes et al., 2011; Morris and Potter, 1995), *production maximisers* (Brodt et al., 2006), and *passive adopters* (Morris and Potter, 1995), who are not moved by conservation concerns.

The first perspective in this study (*self-sufficient pioneer*) is the most novel one in the social-environmental literature, because this type of farmer is a likely adopter of sustainable innovation but is motivated by the potential livelihood benefits that the practice might bring, rather than strictly by environmental reasons. In previous literature, counterparts closest to this perspective are found in categories such as *networking entrepreneurs* (Brodt et al., 2006) and, roughly, *pragmatic organic* (Darnhofer et al., 2005).

In addition to the distinction of roles based on diffusion, the Q results provide a rich description of perspectives in terms of topics relevant to silvopasture adoption and to interventions, particularly the perceptions on incentives and towards conservation. The data suggest that none of the three perspectives has a clearly favourable predisposition to adopt silvopasture. Yet each perspective also has distinct reasons why they might potentially adopt silvopastoral systems. These reasons are the latent motivations that can be stimulated to increase adoption. Finding specific incentives to stimulate these motivations may be instrumental for policy design.

The *self-sufficient pioneer* may adopt only if the practice is believed to be novel and connected with potential broader livelihood improvements, despite the perceived risks. He sees no need for external economic incentives in order to experiment. In contrast, the motivation of the *environmentally-conscious follower* could be associated with normative or moral concerns driven

405 by a long-term notion of human-land interactions. The *payment-dependent conservative* may adopt
406 in a first phase if there is a clear external monetary support involved, or otherwise at a later stage
407 when realising that the early adopters corroborate the economic benefits of the practice. In the case
408 study, it is important to note that the *payment-dependent conservative* is linked to cattle
409 specialisation; thus those who have arguably a stronger impact over the land are also those less
410 likely to change.

411 The main characteristics of the *self-sufficient pioneers* and *payment-dependent conservatives*
412 are generally consistent with two types of potential adopters identified by Pagiola et al. (2007).
413 These authors indicate that PES are not needed by farmers for whom silvopasture is profitable
414 enough to justify adoption, while for those for whom silvopasture is not profitable at all, adoption
415 happens only while the payment lasts.

416 In sum, the *self-sufficient pioneers* and the *environmentally-conscious followers*—who are
417 more receptive to adopt silvopastoral practices—are less motivated by immediate external
418 economic incentives. Likely, they may be highly responsive to other interventions such as sharing
419 information, purporting the benefits of the practice transparently, or facilitating experimentation.
420 These interventions can, for example, raise the *self-sufficient pioneers*' expectations of benefits,
421 understood in a broad sense, or reduce the perceived risk involved in experimentation.

422 **5.2 Incentives for social-ecological innovation and potential policy strategies**

423 Designing PES in a manner that disregards the multiple motivations that drive participants'
424 livelihood decisions may have an unexpected impact on policy performance. For example, the
425 *payment-dependent conservative* may try the innovative activity attracted by the expectation of
426 income gains in the short term. After the pilot stage, if the viability and the benefits of the
427 sustainable practice are realised, payments may not be necessary for any of these types of
428 individuals; continuation and diffusion of the practice would occur normally. In this case, initial
429 payments would possibly not imply an increase in overall adoption rates but instead a more

uniform, accelerated adoption process, because more *payment-dependent conservatives* would participate at earlier stages of the scheme. Instead, if the budget of the external programme is exhausted before the activity is perceived as viable and beneficial, then it is expected that the *payment-dependent conservative* will discontinue because his main motivation to adopt the practice would disappear (Pagiola et al., 2007). In such a situation, the programme may fail to induce a sustained adoption of the sustainable innovation, probably eroding the permanence of the policy impacts.

Contrary to what much of the literature on PES suggests, voluntary participation in conservation programmes may occur regardless of the uncertain balance between investment and return or of net financial opportunity costs (Kosoy et al., 2007). Payments that cover the opportunity cost might be more correlated with adoption rates in contexts of commoditised market relationships; in these contexts, farmers' profit-maximising rationale translates into their effort being proportional to the economic incentive (Heyman and Ariely, 2004). However, in contexts of wider social exchange and longer term perceptions of human-land interactions, additional motivations may underlie the voluntary adoption of conservation activities, meaning that uptake may not be related to payment levels alone (Heyman and Ariely, 2004; Muradian et al., 2010). More general behavioural motivations include moral or internal motivations and values (Bowles, 2008; Lokhorst et al., 2011; Mzoughi, 2011), such as exploration, looking for innovations, curiosity for experimentation, personal fulfilment, or avoiding becoming an outcast. These are motivational drivers that might go a long way compared to immediate pecuniary returns.

Conservation programmes designed to fit an assumed short-term market-transaction mindset and self-interested behaviour can generate a misfit (Brown, 2003) between the design and the recipients' behavioural motivations at the implementation stage (Bowles, 2008). This can potentially result in the erosion of the longer term permanence of the sustainable activity (Muradian et al., 2013). It is argued that this misalignment might be due to decisions and behaviour being context-

455 dependent (Clot et al., 2015). However, environmental psychology also indicates that such
456 behavioural motivations have certain patterns that are not context-dependent and are more complex
457 than those envisaged by rational assumptions (e.g. Osbaldiston and Schott, 2012), as suggested by
458 our empirical data.

459 A plausible policy strategy could be to target the distribution of incentives, not necessarily
460 payments, to so-called *pioneers*, who are intrinsically more motivated towards experimentation and
461 for whom a short-term payment is a secondary interest. The type of external incentive to catalyse
462 the pioneers' motivations could be, for example, providing a transparent and convincing
463 informational strategy (Calatrava and Franco, 2011; Egmond et al., 2006) that emphasises the
464 innovative aspect of the new technique and its potential to benefit adopters in social, economic and
465 ecological ways. In turn, this requires providing adequate, clear and comprehensive information
466 about the advantages and disadvantages of the new practice. Reinforcing it through multiple
467 authoritative and trusted sources may reduce the uncertainty involved (Garbach et al., 2012).
468 Further, pioneers may arguably see their motivation spurred if their leading action is socially
469 rewarded (Heyman and Ariely, 2004), for instance by acknowledging their service to the
470 community, or by promoting them as educators or demonstrators in a process of constructive
471 communication with other potential adopters (Atwell and Schulte, 2009; Egmond et al., 2006).

472 Targeting pioneers specifically may be challenging not only due to the difficulty of
473 identifying these individuals but also for equity and fairness perception concerns. A selective
474 distribution of an incentive could be perceived as unfair by the rest and negatively affect the
475 effectiveness of the program as a result (Pascual et al., 2014). Both hurdles may be overcome by
476 designing the intervention with characteristics that implicitly attract mostly the so-called pioneers
477 and with conditions that are not appealing to the payment-dependent, so that pioneers self-select
478 themselves. This design could be realised by providing incentives that specifically tackle needs that
479 are important for the early innovators but do not directly provide rent, such as information, capacity

480 building or approaches to reduce uncertainty. Later interventions could be based, for example, on
481 catalysing trust between pioneers and followers by enhancing social networks or social influence
482 (Abrahamse and Steg, 2013), or facilitating interaction to encourage the flow of knowledge from
483 early adopters (Baumgart-Getz et al., 2012; Morris et al., 2000). Alternatively, unfairness
484 perceptions might be reduced if the recipients of incentives are selected through applications to
485 demonstrate suitability, as if it were a selection for a job position (Knight et al., 2010).[10]

486 Targeting may also be achieved by designing a dynamic and adaptive program. For example,
487 in a first phase, no information would be provided about prospective payments or other similar
488 incentives, but rather about proven potential benefits of the practice, so that mostly pioneers would
489 volunteer to participate. In a second phase, small payments might be introduced to attract new
490 participants among those who are potentially followers but are undecided. In a third phase, when
491 the benefits of the activity begin to realise and both pioneers and followers have already adopted the
492 new practice, further payments might be necessary to accelerate the participation of late adopters.
493 This dynamic approach that adapts incentives in stages in order to match diffusion roles
494 complements the recognised need for adaptability and flexibility of PES (Pascual et al., 2014).

495 **6 Conclusions**

496 In order to be flexible and adaptive, incentive-based policy instruments such as PES require *a*
497 *priori* understanding of the key underlying behavioural motivations of individuals who participate
498 in conservation initiatives. However, to date there is a paucity of empirical research that can serve
499 as a model for cost-effective identification of the heterogeneity of such motivations.

500 In this paper we uncover the heterogeneity of motivations among participants in a PES-like
501 project to encourage sustainable silvopastoral practices in a tropical forest frontier in Mexico. We

10 The idea of calls for applications was put forward by Knight in a presentation of the fieldwork used for the study cited.

have connected the theory of incentive-based conservation programmes to promote the diffusion of pro-environmental behaviour, with a case of a scheme to encourage silvopastoral adoption in a small community in Chiapas. We provide empirical evidence about the importance of understanding the attitudinal fabric of a small and otherwise seemingly homogeneous community. Our study provides further evidence to support that applying Q methodology facilitates the exploration of diverse viewpoints and motivations for the adoption of sustainable practices in a wide range of socio-cultural contexts (e.g. Nordhagen et al., 2017). Ascertaining such motivations can help identify pioneers in a diffusion process, who can play a key role as catalysts for the adoption of innovative practices.

Our findings contribute to acknowledging the importance of careful design of PES schemes where people's motivations are likely to be heterogeneous. We find evidence to support that PES design needs to discourage rent-seeking strategies driven by short-term financial benefits (Kronenberg and Hubacek, 2013). We argue that uncovering the latent diversity of motivations for adoption of sustainable practices is key for the cost-effective design of PES schemes and to avoid rent-seeking strategies that could undermine their effectiveness in the medium to long term. Analysing the motivations of non-participants and of individuals in other locations with potential for implementing silvopastoral systems may inform further how to best encourage adoption of such practices.

Based on our findings from Chiapas in the context of the silvopastoral adoption program, we derive two general implications for the design of voluntary payment schemes such as PES. First, a higher cost-effectiveness and a more permanent behavioural change toward adoption of the environmental innovation can be achieved by designing conservation programmes in a way that they deactivate or minimise rent-seeking strategies, which are the ones most likely to discontinue

525 the activity once the budget supporting the programme ceases.[11] Second, a stronger emphasis on
526 engaging so-called *self-sufficient pioneers* from the outset may also enhance cost-effectiveness.

527 Accordingly, PES-like schemes may be designed in a way that they implicitly attract
528 individuals genuinely interested in the conservation activity first (which may also include so-called
529 *environmentally-conscious followers*). These individuals are more likely to strive for successful
530 environmental performance and may have a boosting effect in getting the rest to adopt, when the
531 demonstration of the private benefits from the activity is sufficient to motivate others. The *self-*
532 *sufficient pioneers* may be encouraged by catalysing their latent motivations to adopt the pro-
533 environmental practice. It has to be taken into account though, that for this type of individual
534 financial stimuli may not be the most appropriate incentive and can be insufficient (Läpple and
535 Kelley, 2013) or even counterproductive to foster adoption and continuation in the longer term, due
536 to the potential to crowd-out intrinsic motivations (Bowles, 2008; Midler et al., 2015).

537 Complexity in social-ecological systems is due to many factors, not least to the heterogeneity
538 of preferences and motivations of key actors that manage land. Assuming that the behavioural
539 drivers of these actors are homogeneous (due to their similar socio-cultural and economic
540 background) blinds us from the richness of their motivations. Any policy intervention in such
541 contexts must account for the diversity of behavioural motivations, otherwise it is likely that its
542 effects may be minimal if not counterproductive to the original goals.

11 The continuation of pro-environmental behaviour after a payment-based intervention has been questioned in the literature, and some evidence has been provided (Reutemann et al., 2016). However, further empirical research is needed to understand the long-term impact.

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Appendices

Table A1: Original statements in Spanish. *Key for topics: (A) importance of external payments in livelihoods; (B) environmental and conservation values; (C) personal attitudes towards work and livelihoods; (D) beliefs and preferences about cattle farming and land use; and (E) preferences and trade-offs between planting fodder trees and other livelihood activities, including perceptions about potential benefits of fodder trees.*

ID	Topic	Statement	Original statement in Spanish
1	C	My children and grandchildren will work the same land that I cultivate now	*En las tierras que trabajo, trabajarán también mis hijos y nietos*
2	E	I prefer two hectares of pasture than one hectare of fodder trees	*Prefiero 2 hectáreas de pasto de corte que 1 hectárea de mataratón o guash*
3	A	The knowledge to earn more is what is of most interest to me from external programmes.	*Lo que más me interesa de los programas es lo que aprendo para ganar más dinero*
4	A	I can maintain my family with my own work, external payments are just an aid	*Puedo mantener a mi familia con mi propio trabajo. Los subsidios sólo ayudan*
5	E	With tree planting programmes I receive more money in return for my work	*Con los programas de plantar árboles recibo más dinero por mi trabajo*
6	D	I could increase my benefits in cattle farming without degrading the land	*Podría obtener más ganancias de criar ganado sin por ello estropear la tierra*
7	E	Cultivating fodder trees involves a lot of effort and little benefit	*Sembrar bastante mataratón o guash significa mucho esfuerzo y poco beneficio*
8	A	I participate in all external programmes that bring income	*Participo en todos los programas que traen recurso*
9	C	It is more convenient for me to cultivate my own food than buying it	*Me conviene más producir mi propia comida que comprarla*
10	B	Conserving the forest is responsibility of the landowner	*Conservar el bosque es responsabilidad del dueño del terreno*
11	C	I analyse my costs and benefits and thereafter I work on the most beneficial activity	*Hago las cuentas de lo que mejor me sale y me dedico a ello*
12	D	My land is 'getting tired'	*Mis terrenos se están cansando*
13	D	Benefits from cattle production are larger than loses from its related land degradation.	*Lo que da el ganado es mucho más de lo que pierde la tierra*
14	E	It takes too long for fodder trees to grow	*El mataratón y el guash para forraje tardan demasiado en crecer*
15	A	We need more external payments so that my children do not need to go to live elsewhere	*Es necesario que me den más subsidios para que mis hijos no tengan que ir a vivir a otro sitio*
16	D	It is more convenient for me to invest money in improving my pastures than in buying cows	*Me conviene más invertir dinero en tener mejores pasturas que en tener más vacas*
17	E	If I had more money, I would plant fodder trees instead of increasing my cattle	*Si tuviera más terreno, le sembraría mataratón o guash en lugar de aumentar mis vacas*
18	D	In dry season there is no alternative other than releasing my cows free into the mountain	*En secas no hay otro remedio que soltar las vacas al monte*
19	D	With more training I could improve very much my work in cattle farming	*Con más capacitación, podría mejorar mucho mi trabajo con el ganado*
20	E	It is convenient to weed my fodder tree plot even if I have other tasks, to produce more fodder.	*Me conviene deshierbar mi parcela de mataratón o guash aunque tenga mucho trabajo, para tener más forraje*
21	A	If the government does not give me external payments, taking care of the forest does not benefit me	*Si el gobierno no me da subsidios, no me beneficia cuidar el bosque*
22	C	I try new things in my job	*Pruebo cosas nuevas en mi trabajo*
23	A	I would rather live by external payments than by working my land.	*Prefiero vivir de los subsidios que del trabajo en mis tierras*

24	D	I need to improve my pasture, otherwise cattle feed will run out in a few years	*Necesito mejorar mis potreros porque si no se acabará el alimento para mis vacas en unos años*
25	B	I can earn more as a cattle farmer if I let other wild animals live	*Puedo ganar más como ganadero si dejo vivir a los otros animales del bosque*
26	E	In order to dedicate one hectare to fodder trees during two years, I would need more land	*Para excluir una hectárea de mataratón o guash por dos años, necesitaría más terreno del que tengo*

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Table A2: Factor loadings and flagged Q-sorts *(indicated with stars)*

Respondent	1. Self-sufficient	2. Environmentalist	3. Payment-dependent
1	-.16	-.12	.45 *
2	-.11	.32	.39 *
3	.10	.08	.58 *
4	.23	.54 *	.36
5	.64 *	.20	.18
6	.12	.02	.70 *
7	.50 *	-.04	.35
8	.66 *	.19	.35
9	.22	.52 *	.35
10	.41	.30	.36
11	.70 *	.28	.34
12	.29	.29	.42 *
13	.32	.14	.63 *
14	.69 *	.08	-.02
15	.60 *	.20	-.02
16	.54 *	.25	.11
17	.08	.24	.47 *
18	.29	.60 *	-.03
19	.52	.47	.24
20	.15	.62 *	.13
21	.43	.50 *	.25
22	.30	.57 *	.07
23	.59 *	.22	.06
24	.35	.37	.37
25	.49 *	.25	-.06
26	.61 *	.44	.00
27	.43	.45	.21
28	.73 *	.23	.08
29	.38	.67 *	.04
30	.39 *	.14	.05
31	.00	.60 *	.01
32	.42 *	.34	.20