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Exploring How Land Tenure Affects Farmers' Landscape Values: Evidence from a Choice Experiment

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Abstract: Values play an important role in farmers' land management decisions, becoming increasingly relevant when designing environmental policy. One key element that influences farming decisions is the land tenure under which farmers and their land are embedded, which represents different sets of rights for farmers. Therefore, the aim of this study was to elicit farmers' values regarding the social and ecological attributes of the landscape, and determine how these values vary according to differences in land rights. We performed this exercise in the two most important land tenure systems in rural Mexico. We carried out a choice experiment to understand preferences for different landscape attributes such as vegetation cover, surface water, terrain slope, and type of property. Then, we probed how these preferences change according to the land rights that farmers hold. We found that surface water was consistently the most important landscape attribute. However, there were clear differences that were related to land rights for some values, such as for example, vegetation cover. Institutional mechanisms such as boundary rules and conflicting values are part of the explanation of these differences. These results provide a bridge to understanding farmers' management decisions, and in the future, improving sustainable development.

Keywords: *ejidos*; agrarian communities; Jalisco coast; natural resources; management decisions; stated preferences

1. Introduction

There is an increasing consensus that values should be considered when designing environmental policy and management strategies [1–4]. When it comes to farming, values play an important role in farmers' decisions regarding landscape management [5–7]. However, across the landscape ensemble, it is difficult to understand the values of critical natural resources (e.g., forests, rivers, fauna, etc.), and people value nature in multiple and sometimes conflicting ways [2,8,9]. This is important, because often, there is public interest in the outcomes of management strategies with respect to nature and their resources [10]. Some public demands on farming include biodiversity conservation, food safety, food quality, and the provision of environmental amenities; however, these demands can be contradictory [11]. Understanding farmers' preferences for different elements of the natural world can help prioritize conservation actions [12] and enhance agricultural development and sustainability [13].

Some studies have shown that landscape elements are valued by farmers according to the roles that they play in the farming strategy [13–16]. Landscapes are the result of interactions between the natural elements (climate, geomorphology, water, vegetation, fauna), the actors that modify that nature, and the institutional and social context in which these actors are embedded. An agrarian landscape is also a series of repetitive and representative elements that are laid out in a similar way showing an agrarian structure [17]. In many parts of Mexico, this agrarian structure is made up by the aggregation of *parcelas*, which has no accurate translation, but for practicality, we will call it plot. This plot is far more complex than the traditional productive plot; it is a small representation of the landscape as a whole—i.e., a mosaic of cultivation areas, forests, and grasslands, among other elements—that is managed by a household that has its land rights. This landscape mosaic represents a human mechanism that, theoretically, helps to maintain and even increase biodiversity [18,19].

Land tenure (who owns the land and who has the rights to use it) is considered a key issue in the maintenance of ecosystem services [20,21], but it is also important for the decisions that farmers can make. Land rights refer to bundles of rights, ranging from access, use, and exclusion, to alienation [22]. These rights represent permissions and restrictions regarding the use and management of the land. Recently, some studies have acknowledged that land tenure arrangements can have effects on the value that farmers place on the landscape, creating heterogeneous sets of values, even in local areas [23,24]. Nevertheless, few studies have incorporated land rights to understand the value attributed to landscape elements or the heterogeneity of values existing between and within communities.

The aim of this study was, firstly, to elicit values through preferences in the social and ecological attributes of the landscape that are considered crucial for sustainable management. We elicited the farmers' landscape values from two land tenure systems in the southern coast region of the state of Jalisco, Mexico. In this region, as in many others around the world, the preservation of ecosystems and their services is in constant conflict with development processes [25–27]. We also aimed to determine how these values vary depending on the land rights that farmers hold. We expected to find differences in the sets of values between farmers related to their level of access to manage the land and its resources. In the following lines, we present an important background to describe land tenure in rural Mexico and the approach that was used for the study. Secondly, we present our study cases and the choice experiment method used and its results, which are later discussed.

Land Tenure in Rural Mexico

The Mexican Constitution recognizes three forms of rural property: private, *ejido*, and agrarian communities. *Ejidos* and agrarian communities (ACs) are institutions with a mixed system of land tenure between communal and private [28,29]. About 54% of all land in Mexico and around 60% of all forests fall within these land tenure institutions [30,31]. Both were created as outcomes of the Mexican Revolution (1910–1917) involving process of land restitution of pre-Hispanic origin in the case of ACs, and land redistribution to landless peasants in the case of *ejidos*. ACs and ejidos have a common governance structure, in which decisions and rules are made by an assembly comprised of recognized members; in *ejidos*, these members are the *ejidatarios*, and in ACs, these are *comuneros*, although other agrarian subjects with other rights can be found in *ejidos* and ACs [32].

While differences between these two land tenure institutions are complex and often unclear in the legislation [33], we focus on the differences with respect to land rights and the legal capacity to create more land rights. For ACs, land rights are granted to *comuneros*, and the creation of more land rights to all the descendants of *comuneros* is possible; it is also possible to found non-*comuneros*. For their part, *ejidos* have a fixed number of land rights granted to *ejidatarios*, and they can only pass on these rights to one descendant; the non-inheriting descendants of *ejidatarios* often become *posesionarios* (those who possess land). *Posesionarios* are people who have land for cultivation, but do not have rights regarding the common lands and do not vote in the assembly. People without productive land and without rights are the *avecindados* (those who settle). These agrarian subjects make up different land tenure 'statuses' in ACs and *ejidos.*

For this study, we associated the agrarian subjects or 'land tenure status' within the *ejido* and the AC with their corresponding land rights (Table 1). Since *ejidatarios* and *comuneros* have much in common regarding their land rights, we designated them as having community land rights (CLR), which includes rights to use an individual plot and rights to benefit from communal land, as well as the right to participate and vote in the assemblies [22]. In the case of people with land but without voting rights, we designated them as having partial land rights (PLR). In the *ejidos*, they are the *posesionarios*, and in ACs, they are non-*comuneros*. The final category is landless people who usually work for a wage on other people's land or share land for periods of time for subsistence agriculture. In *ejidos*, they are *avecindados*, and in ACs, they are also non-*comuneros*.

Table 1. Land tenure status and its associated land rights from agrarian communities (ACs) and *ejidos*.

	Land Tenure Status	Land Rights and Their Limitations	Other Rights	Designation of Land Rights
Agrarian Communities	*Comunero*	Own a plot and can benefit economically or with other resources from common lands.	Have a vote and a voice in the assembly; motions are accepted by majority vote. Can hold management positions. All descendants can become *comuneros*.	Community land rights (CLRs)
	Non-*comunero*	May be given plots or be landless. Do not benefit from common lands, but can usually obtain forest resources (firewood) with permits.	Do not have a vote or a voice, although they can be present at assembly meetings. Cannot hold management positions.	Partial land rights (PLRs) and landless
Ejidos	*Ejidatario*	Own a plot and can benefit economically or with other resources for common lands.	Do have a vote and a voice; motions are accepted by majority. Only one descendant can become an *ejidatario*. Can hold management positions.	Community land rights (CLR)
	Posesionario	Own a plot but do not benefit from common lands. Can usually obtain forest resources (firewood) with permits for their use.	Do not have a vote or a voice, although they can be present. Cannot hold management positions. May be able to become *ejidatario* if a position becomes free.	Partial land rights (PLR)
	Avecindado	Landless and do not benefit from common lands but usually can obtain forest resources (firewood) with permits for their use.	Do not have a vote or a voice, although they can be present. Cannot hold management positions. May be able become *ejidatario* or *posesionario* if a position becomes free.	Landless

2. Methodology

2.1. Study Site and Cases

The southern coastal region of Jalisco, Mexico has experienced a convergence of local indigenous populations with groups from other places in the country [34,35]. Moreover, in the last century, there have been drastic transformations to the ecosystems as a result of agricultural expansion and the exploitation of forests [27]. On the other hand, scientific research has emphasized the great ecological value and high biodiversity that many ecosystems in the region possess [26,36–38]. This has given rise to the creation of two important biosphere reserves: the Chamela–Cuixmala Biosphere Reserve (CCBR) and the Sierra de Manantlán Biosphere Reserve (SMBR). We worked in two communities in this region: the AC of Cuzalapa and the *ejido* of Pabelo (Figure 1). Due to their differences (history, location of the AC inside the SMBR, and origin), the study of these communities allowed for a comparative case study analysis where the phenomena of interest (i.e., land tenure) is contrasting [39].

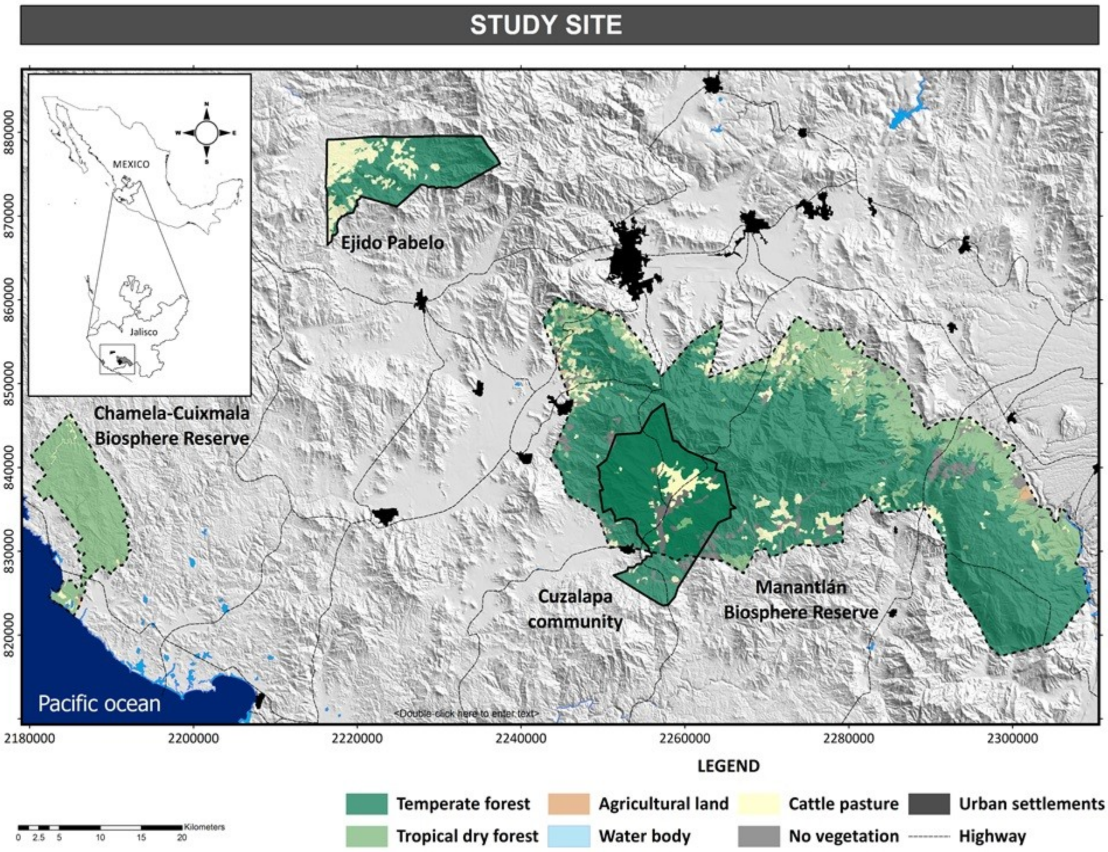

Figure 1. Map of the study site and cases, the *ejido* Pabelo, and the agrarian community of Cuzalapa, with the main land uses/cover and the biosphere reserves.

These two communities have similar biophysical characteristics and highly biodiverse ecosystems. Cuzalapa has around 1560 inhabitants [40]; it is considered to be of Nahua origin and one of the oldest communities in the region, although there has been a process of cultural change and now, the current majority are not considered indigenous [34,41]. There are approximately 261 *comuneros*, and, on average, the family size is four to five members; this means that approximately one-third of the families do not have *comunero* status. In Cuzalapa, it is usual to find *comuneros* without land, as well as sale or rental of land for long periods. Also, some farmers share lands for cultivation with landless people [42]. Many locals that have land for cultivation or plots are not *comuneros* (having partial land rights). The total area is approximately 24,000 ha, of which around 80% is forest. Most of this area is within the SMBR, 65% is in the buffer zone, and 10% is in the core area. This implies that there are continuously enforced restrictions on both the clearance and use of forests that fall within the reserve. The main productive activities are subsistence agriculture and cattle ranching. Recently, some of their communal forests have entered the payment for environmental services (PES) program.

The *ejido* of Pabelo is in the upper part of the Cuitzmala and the San Nicolas River basins (Figure 1). It has a population of approximately 1073 inhabitants [40] and approximately 272 households. There are 164 *ejidatarios*, 151 *posesionarios*, and around 20 to 40 *avecindados* in the *ejido*. Some households hold more than one *ejido* right, while some *ejidatarios* do not live in the *ejido*. The *ejido* has an area of 14,347 ha, of which around 60% is covered by forest. The main productive activity is cattle ranching, and there are high levels of migration, mostly to the United States. The common forest area is internally divided in an informal manner between some of the *ejidatarios* who use it as pastureland. The distribution of benefits and the administration of forestry activities are handled by the *ejidatarios* through the assembly. Part of their common forest is in the PES program, too.

2.2. Stated Preferences and Choice Experiments

We used a choice experiment (CE) to assess farmers' valuation of the landscape. The CE is a stated preferences method that seeks to capture the total economic value of a good being valued [43]. Stated preference valuation are popular methods for goods outside the market [21]. They have been designed to measure the intensity of individuals' preferences in quantitative ways, very often in terms of willingness to pay (WTP). CEs have been used to understand farming decisions [44] as well as many other environmental goods [45]. A CE takes a good (e.g., the landscape) and breaks it into pieces or attributes (e.g., vegetation, rivers, slopes) to understand the value of these pieces. People choose between goods with different characteristics made by the attributes' differences (e.g., levels of vegetation: deforested or forested) to capture the marginal welfare values associated with these differences in the good expressed in coefficients or WTP [43]. Performing a CE also entails a ranking of the different attributes and attribute levels included in the design obtained by the absolute numbers or the size effect of each coefficient. This allows the priorities of people to be recognized to determine whether these priorities are the same across different groups of people. CEs give the opportunity to understand some of the trade-offs and gain insight into different attributes of environmental goods for decision-making [46–48].

2.3. The Choice Experiment Design and Its Attributes

Five landscape attributes were included in the CE: (1) vegetation cover (three levels), (2) terrain slope (three levels), (3) water availability (three levels), (4), type of property regime (two levels), and (5) the price (six levels). Each level represented the variation of the attribute; these are presented in Table 2. The attributes and levels included and valued in the experimental design of CEs are often those most likely to be affected by policy decisions [43]. In the current study, these attributes were selected based on previous local studies about farming and natural resource management strategies in both communities [34,42,49,50], as well as a pilot study with farmers in nearby locations of the same region (n = 36).

Table 2. The attributes and levels for the choice experiment design.

Attributes	Vegetation Cover	Terrain Slope	Surface Water	Type of Property	Price
Levels *	*All forested* Half-forested All deforested	*Very sloped* Sloped Plain	*Permanent* Seasonal No water	*Mixed* Private	$130,000 to $1,400,000

* The levels of each attribute in italics are the reference levels (dummy variables) against which the other attributes were estimated in the models and represent alternative specific constants (ASCs).

These attributes were considered due to their relevance to biodiversity conservation and their integration with farmers' productive strategies [49]. In the case of the terrain slope, this attribute determines different opportunity costs for agriculture production, with plain terrains being frequently highly valued. We also included the social attribute of the type of property regime to see whether people prefer private properties or a mixed property regime between communal and private, as *ejidos* and ACs are. Finally, we included the surface water attribute, as it was recurrently mentioned by respondents in our pilot survey. Our payment vehicle for this CE was the price of the plots; the price range was also inquired about in the pilot survey.

For an optimal design, we used an orthogonal main-effects array to reduce the number of combinations of attributes. The candidate array had 36 different choice combinations of the attribute levels, which were also divided into six blocks, with six decision events per block to minimize the task for each respondent. Every decision event was made up of a choice of purchase between two alternative plots of 10 ha with different characteristics and an opt-out option (buy neither). An example of one of the 36 choice cards is presented in Figure 2. For the design of the choice experiment and cards, we used the package 'support.CEs' in R [51].

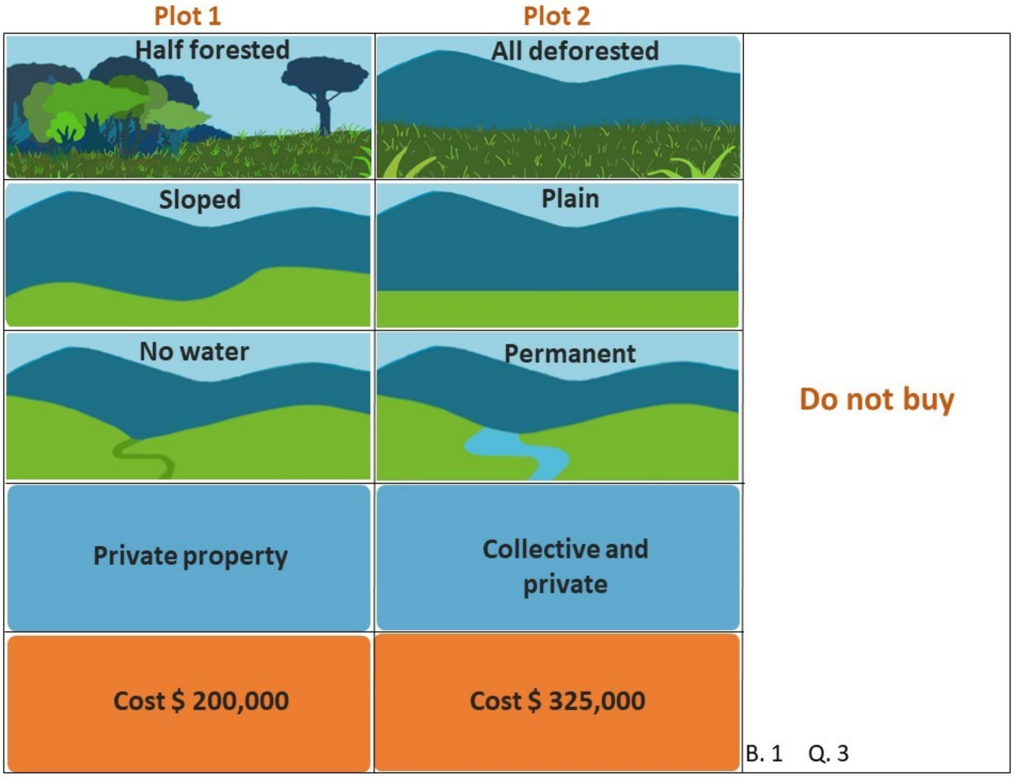

Figure 2. Example of one of the 36 choice cards with different plot characteristics presented to respondents.

2.4. Survey

A team of five previously trained people conducted the surveys over a period of 15 days. A total of 199 surveys were taken: 101 in Cuzalapa, and 98 in Pabelo. The participants in the main localities of these two communities were randomly selected. In order to ensure accuracy in the information, we asked to survey the head of the family where possible. In the CE exercise, the respondent was introduced to a hypothetical situation where they were asked: if they had the money, would they be willing to pay for one of the alternative plots presented? Respondents were also asked about their current management practices and productive activities on their lands (if applicable) as well as other sociodemographic aspects and their land rights (Supplementary Material: Survey format S1). The sample size was determined by multiplying the choice events by the number of respondents [51]; in our case the result of this operation was 1194.

2.5. Econometric Model and Estimation

CEs allow people's interests and values as stated in choice situations to be elicited [52]. This technique is used to estimate attribute utilities based on an individual's response to combinations of multiple decision attributes [45,53]. The theory assumes that the total utility of a good (U) for a given person i choosing option j is derived from the observed utility (V) that the attributes of the good possess (Z), the specific characteristics of the person (S), and a random component or unobserved utility (ε):

$$U_{ij} = V(Z_j, S_i) + \varepsilon(Z_j, S_i)$$

The good with the highest utility will also have the highest probability of being chosen [52]. Logistic regressions can be used to estimate the probability that one alternative is selected over another [54], where the error terms are assumed to have a Gumbel distribution or type 1 extreme value. Based on this model foundation, we fitted conditional logit (CL) models to assess the value of each attribute level following Aizaki [51]. CL models predict the probability of an individual i making a particular choice j from the choice set as a function of the set of attributes included in the CE. Model coefficients quantify the value given to each attribute level relative to an alternative specific constant (ASC), which is a combination of attribute levels that constitute the baseline for valuation. Furthermore, monetary figures or the WTP for the non-monetary attributes can be obtained by the next function, $-b_{nm}/b_m$ where b_{nm} is the estimated coefficient of the non-monetary attribute, and b_m is the monetary attribute coefficient or payment vehicle, which in our case is the average price of the plots people are willing to pay for, using the Krinsky and Robb method [51].

In order to calculate the relative differences between the five attributes included in our CE (vegetation cover (*VEG*), terrain slope (*TER*), water availability (*WAT*), type of property (*PRO*), and the price (*PRI*)), we fitted the following model:

$$logit(p_{ij}) = \beta_i^{ASC} + \beta_i^{VEG} * VEG_{ij} + \beta_i^{TER} * TER_{ij} + \beta_i^{WAT} * WAT_{ij} + \beta_i^{PRO} * PRO_{ij} + \beta_i^{PRI} * PRI_{ij} + \varepsilon_{ij} \quad \text{(MODEL I)}$$

In order to assess whether the values of attributes included in MODEL I were affected by differences in the land rights of the respondents, we fitted a second model for each community including the interaction of land rights (*LR*) with landscape attributes as follows:

$$\begin{aligned} logit(p_{ij}) = \ & \beta_i^{ASC} + \beta_i^{VEG} * VEG_{ij} + \beta_i^{TER} * TERR_{ij} + \beta_i^{WAT} * WAT_{ij} + \beta_i^{PRO} * PRO_{ij} + \beta_i^{PRI} * PRI_{ij} + LR \\ & * (\beta_i^{VEG*LR} * VEG_{ij} + \beta_i^{TER*LR} * TERR_{ij} + \beta_i^{WAT*LR} * WAT_{ij} + \beta_i^{PRO*LR} * PRO_{ij} + \beta_i^{PRI*LR} * PRI_{ij}) + \varepsilon_{ij} \end{aligned} \quad \text{(MODEL II)}$$

Models were fitted using the function 'clogit' in the 'support.CEs' library of R [51], and models were fitted independently for the two communities.

Given the complexity of MODEL II and because not all of the interactions that are included may be relevant, we proceeded to reduce this model using an information theory approach [55]. We fitted all the possible subsets of models from MODEL II that included one to five different interactions between LR and the attributes included in the CE. The selected best models were those that minimized the Akaike Information Criteria (AIC). Alternative models with a difference in AIC (ΔAIC) of <2 to that of the best model were also considered [55]. Model reduction was done using the function 'dredge' in the 'MuMIn' library for R [56]. Finally, to assess whether the best model was significantly better than the simplest model with no interactions (MODEL I), we performed a likelihood ratio test that contrasted the two models for each location.

3. Results

3.1. Socioeconomic and Demographic Characteristics of the Sample

The main characteristics of the sample are presented in Table 3. Both communities had similar samples according to the ages and genders of the interviewees, although the most frequent age interval in Cuzalapa AC was from 41 to 50 years, and in Pabelo *ejido*, it was from people older than 60 years. On average, the household unit was composed of four to five members in Cuzalapa and three to four in Pabelo. In both communities, around 61.8% of the household units had children and/or young members (less than 21 years old). Also, in both communities, the great majority of the respondents had some level of primary school education, with a lesser group having undergone secondary education.

Table 3. Demographic, socioeconomic, and plot characteristics of the sample.

		AC (n = 101)	*Ejido* (n = 98)	All (n = 199)
Age (years)				
	20–30	15	18	33
	31–40	15	17	32
	41–50	29	18	47
	51–60	22	18	40
	>60	20	27	47
Gender				
	Male	59	47	106
	Female	42	51	93
Family unit				
	Family members (μ)	4.4 (2.0)	3.6 (1.7)	4.0 (1.9)
	Children/young (%)	62	61	62
Education				
	None	7	6	13
	Primary	59	67	126
	Secondary	25	19	44
	Higher	10	6	16
Land rights				
	Community land rights	37	32	69
	Partial land rights	38	21	59
	Landless	26	45	71
Productive activities				
	Cattle raising (%)	47	54	50
	Agriculture (%)	68	37	53
	Day laborer (%)	17	27	22
	Housewife (%)	26	39	32
	Non-farm (%)	29	19	24
Land area *				
	0 ha [1]	29	39	68
	1–5 ha	19	9	28
	6–25 ha	25	18	43
	26–60 ha	13	11	24
	>60 ha	10	12	22
Plot characteristics				
	Have pasture (%)	85	97	91
	Have crops (%)	89	53	71
	Have forest (%)	60	58	59
	Have river/stream (%)	94	86	91

* These intervals are based on what the local people consider to be very little land, little land, enough land, and a lot of land. Fourteen respondents did not indicate their land amount [1]. The number of landless people does not equal the number in the zero-hectares category, because some people share land for periods of time.

As would be expected, landless respondents formed a larger proportion of the sample in the *ejido* than in the AC, but surprisingly, the proportion with partial land rights was higher in the AC. Together, landless people and those with partial land rights greatly outnumbered those with full community land rights in both communities. In regard to productive activities, in Cuzalapa, agriculture is the most common activity, followed by cattle raising, while in Pabelo, cattle raising is the most important. The modal group with respect to individual land holdings was 6–25 ha, but the biggest population group by far had 0 ha in both communities. Finally, among people with land in Cuzalapa, 94% had rivers or streams flowing within their plots, 89% had some crops, 85% had some pasture, and 60% had some forest. In the Pabelo *ejido*, 86% had rivers or streams flowing within their plots, 97% had pasture, 52% had crops, and 58% had forest. From these results, it is evident that in Cuzalapa, people are much more agriculturally-oriented, and in the Pabelo *ejido*, they are more oriented toward livestock production, although, as the figures show, the plots are multi-functional.

3.2. Preferences for Landscape Attributes

Table 4 shows the resulting models for the Cuzalapa AC and Pabelo *ejido*, respectively. These models show that surface water availability was the most valued attribute. In both the AC and the *ejido*, not having water had the greatest negative effect (disutility) on plot preference, while having just seasonal water was also negatively valued, albeit not as strongly. The other attributes came after water availability and their ranking depended on the community.

Table 4. Conditional logit models from the AC and the *ejido*.

Attributes		Cuzalapa (Agrarian Community)			Pabelo (*Ejido*)		
		Rank	Coef (SE)	WTP	Rank	Coef (SE)	WTP
	ASC	nr	2.74 (0.23) ***	4,152,690	nr	3.14 (0.27) ***	2,564,650
Vegetation Cover	*All forested*						
	Half-forested	5	0.17 (0.13)		7	−0.02 (0.18)	
	All deforested	6	−0.12 (0.15)		3	−0.44 (0.19) *	−366,480
Terrain Slope	*Very sloped*						
	Sloped	4	−0.28 (0.16)		6	−0.04 (0.19)	
	Plain	7	0.06 (0.15)		5	0.05 (0.18)	
Surface Water	*Permanent*						
	Seasonal	2	−0.95 (0.13) ***	−1,450,290	2	−1.28 (0.15) ***	−724,520
	No water	1	−2.51 (0.19) ***	−3,814,540	1	−3.70 (0.27) ***	−2,275,490
Type of Property	*Mixed*						
	Private	3	−0.45 (0.11) ***	−693,630	4	−0.23 (0.13)	
Price (units = 1000)			−0.0006 (0.0001) ***			−0.001 (0.0002) ***	
Model information							
	Adj. Rho ^{2}		0.3			0.39	
	AIC		923			784	
	Events		606			588	
	Valid n		1818			1764	

The results of each level and attribute in the form of a ranking, including estimated coefficients (Coef) with their standard errors (SE) and the willingness to pay (WTP). *, *** = significance levels at 95% and 99.9%, respectively. The WTP presented has a confidence interval of 95%, or otherwise no WTP is presented. All WTPs are expressed in Mexican pesos (MXN) for a plot of 10 ha. ASC = alternative specific constant. AIC = Akaike Information Criteria.

The type of property had a statistically significant effect on farmers' valuation in the AC, with private property being negatively valued, i.e., respondents preferred plots with a mixed property regime. In the *ejido*, private property was also considered a disutility, although it was not statistically significant. On the contrary, the vegetation cover significantly affected valuation in the *ejido*, but not in the AC (Table 4). In the *ejido*, both half-deforested and fully deforested plots had negative values (significant in the case of fully deforested plots). The AC coefficients for half-deforested and fully deforested plots were not significant. The terrain slope showed no significant effect on valuation, although plain terrain was valued positively. The price had a negative and significant effect on valuation. Finally, the ASC had a very positive and significant value, since the baseline plot had some preferred state of the attributes, such as for example, permanent water.

3.3. The Effects of Different Land Rights on the Preferences of Landscape Attributes

We found significant interactions between different land rights and the valuation of some landscape attributes. Relevant models from different interactions between land rights and attributes with delta values (ΔAIC) that were <2 are presented in Table A1 (Appendix A). The best reduced models with the most significant interactions for both communities are presented in Table 5. In addition, these models were significantly different from the models without interactions at $p < 0.001$. The effect of land rights varied between communities. For the AC, land rights significantly affected the value of vegetation cover, terrain slope, and price; while for the *ejido*, it only affected the valuation of vegetation cover.

Table 5. Preferences of landscape attributes from the AC and the *ejido* related to different land rights.

Attributes		Cuzalapa (Agrarian Community)			Pabelo (*Ejido*)		
		Rank	**Coef (SE)**	**WTP [a]**	**Rank**	**Coef (SE)**	**WTP**
	ASC	nr	2.81 (0.24) ***	3,554,900	nr	3.17 (0.28) ***	2,561,240
Vegetation Cover	*All forested*						
	Half-forested	10	0.18 (0.15)				
	: CLR				3	−1.07 (0.38) ***	−863,930
	: PLR				5	0.36 (0.29)	
	:Landless				7	−0.08 (0.36)	
	All deforested				4	−0.44 (0.19) *	−357,660
	: CLR	3	1.02 (0.31) ***	1,295,250			
	: PLR	6	−0.37 (0.23)				
	: Landless	7	−0.32 (0.36)				
Terrain Slope	*Very sloped*						
	Sloped	8	−0.28 (0.16)		9	−0.03 (0.19)	
	Plain				8	0.03 (0.18)	
	: CLR	11	0.07 (0.31)				
	: PLR	9	0.21 (0.23)				
	: Landless	4	−0.63 (0.35) $^{+}$				
Surface Water	*Permanent*						
	Seasonal	2	−1.04 (0.14) ***	−1,315,970	2	−1.29 (0.15) ***	−1,043,590
	No water	1	−2.66 (0.20) ***	−3,366,790	1	−3.76 (0.27) ***	−3,032,880
Type of Property	*Mixed*						
	Private	5	−0.52 (0.12) ***	−659,720	6	−0.23 (0.13)	
Price (units = 1000)						−0.001 (0.0002) ***	
	: CLR		−0.0007 (0.0003) *				
	: PLR		−0.0004 (0.0002)				
	: Landless		−0.0004 (0.0003)				
Model information							
	Adj. Rho ^{2}		0.32			0.39	
	AIC		900			777	
	Events		606			588	
	Valid n		1818			1764	

The results of each level and attribute in the form of a ranking, including estimated coefficients (Coef) with their standard errors (SE) and the willingness to pay (WTP). $^{+}$, *, *** = significance levels at 90%, 95% and 99.9% respectively. [a] For the WTP in the AC, we used the coefficient of price for the people with community land rights (CLR). All WTP are expressed in Mexican pesos (MXN) for a plot of 10 ha and with a confidence interval of 95%, or otherwise no WTP is presented. ASC = alternative specific constant, AIC = Akaike Information Criteria, PLR = Partial Land Rights.

For both communities, the most important attribute was surface water; the absence of permanent water on plots was considered a great disutility or had a negative valuation by farmers. Regarding the vegetation cover, completely deforested plots in the AC had contrasting valuations between people with common land rights (CLR) and both landless people and those with partial land rights (PLR). People with CLR had a positive and very significant valuation of fully deforested plots, while landless and PLR people gave them a negative valuation, although this was not statistically significant. In the *ejido*, the valuation of fully deforested plots had a negative value for all of the land rights. Regarding the valuation of half-deforested plots, the *ejido* showed significant differences between land rights; people with CLR and landless people had negative valuations for half-deforested plots, but this was only significant for CLR people, while people with PLR had a positive valuation, which was not significant either. In the AC, we did not find significant coefficients for half-deforested plots.

The attribute referring to the type of property (mixed inside the community versus the private property outside) showed a very significant negative valuation for private properties by residents of the AC with regard to properties inside the community. The respondents from the *ejido* also gave a negative valuation to private property plots, but this was not significant. For the attribute terrain slope in the AC, differences were found between land rights, where landless people had a negative valuation of plain plots, and no significant coefficients were found in the *ejido*. For the price in the AC, people with CLR had a more negative valuation than people with other land rights; this implies that these people cannot be included in the calculation of WTP, which was therefore based only on the coefficient of the CLR people.

Finally, the ASC had very significant and positive values, which did not vary between people with different land rights. The ASC was higher in the AC than in the *ejido*, which means that together, the reference levels of all of the attributes were viewed as a bigger utility in the AC than they were in the *ejido*. From the ranking, it is interesting to observe that priorities were not the same within each community (i.e., between different land rights), although the first and second ranks showed no differences between communities or within them. Finally, the fit measures from both communities improved from the models without interactions; yet, the *ejido* had better fit measures for the adjusted Rho-square.

4. Discussion

This research shows the associations between farmers' economic values to some of the social and ecological attributes of the landscape. We found that some of these values vary according to the land tenure status of the respondents as they represent differences in land rights, as we expected. Moreover, the results highlight the surface water availability as the most important landscape attribute for farmers considered on the CE, both across the two communities and across land rights. Interestingly, other attributes, such as vegetation cover and type of property, showed great heterogeneity between and/or within communities. Below, we examine these findings in more detail, and propose some explanations while suggesting some directions for future research. Finally, we discuss the methodology implications and limitations of this study.

4.1. Different Values Derived from Land Rights

Our study demonstrates that the land tenure status of a respondent and their associated land rights influences their values concerning the landscape. Some of the differences arise at the community level, i.e., between the AC and the *ejido* land tenure system; however, other differences can be found within the communities between those with full communal land rights and those who have partial land rights, or are landless. One of the most evident differences that was found in our valuation exercise was related to vegetation cover. In general terms, deforestation in the *ejido* is a disutility, while in the AC, it represents a utility and received a positive valuation. We suggest that these differences may be partially due to land rights restrictions (use and withdrawal) in the AC imposed by the biosphere reserve, which have led to a situation where already deforested plots become highly valuable and are intensely used by farmers [57]. In such cases, people within protected areas have less room to maneuver when deciding how to manage their natural resources, creating conflict around the use of natural resources [58]. This dilemma is also interpreted as being the result of conflicting values [2], i.e., those driving conservation versus those driving land management strategies.

In addition, differences in values observed for vegetation cover (all deforested for the AC and half-deforested for the *ejido*) become more acute when comparing within communities. In this case, people with full communal land rights (i.e., *ejidatarios* and *comuneros*) have different values from those with less rights. We relate this result to the privileges of authority that *ejidatarios* and *comuneros* can have, which includes information access and decision power, since they make important community decisions regarding land use [59,60]. Also, the direct benefits of governmental programs, such as payments for environmental services, are granted mostly to people with communal land rights. By not participating in the assembly, people that have another land tenure status (i.e., *posesionarios*, *avecindados*, non-*comuneros*) seem to hold different values concerning the landscape and its attributes. These intra-community differences are sometimes overlooked when, in fact, the internal social situation (land allocation, quality of the land) is far from egalitarian as a result of boundary rules [61]. The ability to make management decisions is restricted to a relatively small group, and this institutional mechanism can accentuate inequalities [29,62].

The type of property to which the land is attached is also associated with different values between communities. For example, the AC showed negative values for plots with a private property regime outside the community. This could imply stronger traditional bonds and associated benefits within the AC, which is probably due to the historic basis and origins in which traditional management is based, meaning social land tenure. For example, it is notable that in the AC, there is common use of reciprocal labor and land sharing for those who are landless [63]. Some more recently created *ejidos* with a different organizational setup might not carry such a strong sense of community and may not reject private property so strongly [28]. Interestingly, we did not find any differences between the land tenure status of respondents regarding the property regime, which means that even when farmers have fewer rights over the land, there is a tendency to prefer the mixed regimes (i.e., a combination of collective and private rights). For most communities, the joint social capital is important, even though private properties could provide more freedom to farmers' management decisions and actions.

4.2. Value of Landscape Attributes and Management Implications

One more result to highlight from this CE is that water availability is the main priority among valued landscape attributes, which holds across the different communities and land tenure statuses of respondents. For the farmers in our study, most of the value of the landscape was based on this attribute, and lack of a permanent water source resulted in the greatest disutility for them. We believe that this result relates to the farmers' productive management strategies, which are strongly linked to agriculture and livestock production. These management strategies have high water demands, and large economic losses may occur when this attribute is scarce [64]. As shown in other studies [65,66], surface water is recognized as one of the most important assets in a community's valuation of the landscape. However, farmers do not perceive this attribute in isolation. To maintain water flows, many farmers leave riparian forest and forest patches in their plots, and even use operational rules to preserve them [67]. However, this may not be the case for all farmers, due to a lack of awareness on how their agricultural practices contribute to land and water degradation [68].

In the case of the vegetation cover, this attribute is perceived as a transformable characteristic of the plots depending on the needs of each farmer. This means that values could easily change depending on the circumstances, as we see in differences between communities and land tenure status. In the *ejido*, in terms of land rights, there is greater freedom to transform the land cover to the specific needs of the farmer, making it easier to deforest their plots. This is consistent with the idea that the institutional context has a great influence on values [2]. However, the results of the valuation of vegetation cover did not match what was observed in the field; that is to say, the *ejido* has less forest than the AC, but holds greater negative values for deforestation, while the opposite is true in the AC. Thus, we suggest that in order to improve integrated ecosystem management, it is important to reinforce the information and programs that bind the different landscape attributes and their functions, for example, the dependence of water quality and quantity on vegetation cover and the threshold of this resource at the watershed scale [26,68]. These results are important to lead efforts on conservation and integrate people from the communities with those efforts [69], which also becomes an opportunity for collective action between different actors [28].

In the case of terrain slope, we could not find very significant relationships with farmers' values. One hypothesis is that people are used to managing sloped terrains and developing their productive strategies in these landscapes, because it is a given attribute that cannot easily be changed, even though, in practice, plain terrains have larger opportunities and returns from agriculture [57], and the most sloping and distant terrains are the most preserved and have the least opportunity costs [67].

Finally, it is important to note that priorities are not always the same between communities and within them; other analyses concerning farmers' landscape decisions have shown them to be very heterogeneous, even within localized areas [13]. Our study also showed commonalities regarding to farmers' priorities, as it is the case with water availability. Thus, we believe that identifying farmers' and local people's priorities is essential in terms of good policy design and conservation, since these priorities and values have direct effects on natural resource management and biodiversity.

4.3. Methodological Implications and Limitations

Given that valuation processes are tools that make visible specific values, any valuation process should include a reflexive exercise [1]. This exercise can also allow the possibilities and limitations of the study to be understood.

In this case, the study covered only a fraction of the values that farmers can have in relation to the landscape and their practices. In addition, there can be social, expressive, and intrinsic values from farming [70]. In our case, the values that were mostly considered were economic or instrumental values; however, farmers usually recognize more than the profits they can get when choosing between the different alternatives, showing their fulfilling identities or 'sense of place' [63,69,71]. These 'deontological values' can hardly be captured by economic valuation exercises [72] although they constitute the basis of societal value systems. We recognize that our approximation to the landscape and its attributes was coarse. It is important that we do not forget that other attributes can play a role in decisions regarding resource management for farmers. However, our simplification of the landscape and its attributes included what we believe are the most fundamental issues for farmers and decision-making in the region. In addition, by dividing the landscape into its different attributes or pieces, the synergies from its elements were less evident. In this exercise, it is necessary to return to the unity of the social–ecological system. Values are constantly constructed and have feedback from our everyday experiences, defining relations between people and nature [71]. In this sense, understanding the process of value formation and not only the values itself is important.

Contrary to many of the valuation inquiries with CEs or other valuation tools, this research did not set out a quantitative measure of WTP to be possibly applied to taxation or a contribution policy. Rather, it tried to show the importance of a landscape's attributes and the management implications of the presence or absence of these attributes. Although our CE method used monetary figures as a payment vehicle, other results can be highlighted, such as for example, the ranking of attributes and the differences between priorities and land tenure status. In many valuation exercises, values are reduced only to measures resulting in the monetization of nature [9,10,73,74] under the argument that monetary measures are what we need to inform decision-making [75,76]. This approach has been referred to as *value monism*, while the alternative is referred to as *value pluralism* [2]. Both the methods and the solutions need to incorporate different schemas beyond chrematistic approaches, yet value pluralism remains elusive in practice [8]. This task represents a challenge for developing new ways of thinking, reflecting, and communicating the value of nature using common and novel approaches to valuation.

5. Conclusions

This study provides a glimpse into some of the differences between farmers' valuations of landscape attributes as a result of differences in their land rights. In accordance with our expectations, differences in right bundles within and between communities that allow or restrict actions were shown to influence landscape values, although, it was possible to find some shared landscape values, such as water availability, for farmers across the two communities and across land rights. These differences and commonalities are critical to understanding value dynamism and its possible implications for natural resource management. They also allow the integration of land rights and land tenure, which is a key element of the Mexican governance system, and the rural context through an institutional setting.

Furthermore, differences within communities require a deeper understanding of their causes and consequences in order to build strong links between sustainable livelihoods and natural resource management. In this regard, it is important for top–down approaches and policies to recognize the existence of different social groups within the rural context. In addition to the acknowledgement of the resources or attributes of the landscape that are evidently critical to farmers and shared among social groups, such as surface water, it is important to also recognize the particularities associated with other attributes of the landscape, such as vegetation cover. Our results could have substantial implications for the design of local or regional conservation policies and represent a first step toward eliciting plural and shared values from farmers in a highly biodiverse region.

Supplementary Materials: The following are available online at http://www.mdpi.com/2071-1050/10/11/4321/s1, Survey format S1: Choice experiment questionnaire.

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Appendix A

Table A1. Interaction models with Delta values <2 from both communities.

Attribute Levels	AC				*Ejido*
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 1**
ASC	2.81 (0.24) ***	2.82 (0.24) ***	2.85 (0.24) ***	2.83 (0.24) ***	3.17 (0.28) ***
Half-forested	0.18 (0.15)	0.17 (0.26)	0.16 (0.15)	0.17 (0.15)	
Half-forested: CLR					−1.07 (0.38) ***
Half-forested: PLR					0.36 (0.29)
Half-forested: Landless					−0.08 (0.36)
All deforested					−0.44 (0.19) *
All deforested: CLR	1.02 (0.31) ***	1.04 (0.31) ***	1.04 (0.31) ***	0.99 (0.31) **	
All deforested: PLR	−0.37 (0.23)	−0.37 (0.23)	−0.37 (0.23)	−0.36 (0.23)	
All deforested: Landless	−0.32 (0.36)	−0.55 (0.34)	−0.55 (0.34)	−0.35 (0.36)	
Sloped	−0.28 (0.16)	−0.29 (0.16)			−0.03 (0.19)
Sloped: CLR			0.40 (0.29)	0.49 (0.31)	
Sloped: PLR			−0.60 (0.23) *	−0.58 (0.24) *	
Sloped: Landless			0.60 (0.34) +	0.43 (0.37)	
Plain		0.08 (0.16)	0.07 (0.16)		0.03 (0.18)
Plain: CLR	0.07 (0.31)			0.27 (0.33)	
Plain: PLR	0.21 (0.23)			0.09 (0.24)	
Plain: Landless	−0.63 (0.35) +			−0.46 (0.38)	
Seasonal water	−1.04 (0.14) ***	−1.01 (0.14) ***	−1.02 (0.14) ***	−1.03 (0.14) ***	−1.29 (0.15) ***
No water	−2.66 (0.20) ***	−2.64 (0.19) ***	−2.69 (0.20) ***	−2.69 (0.20) ***	−3.76 (0.27) ***
Private property	−0.52 (0.12) ***	−0.51 (0.11) ***	−0.52 (0.12) ***	−0.52 (0.12) ***	−0.23 (0.13)
Price					−0.001 (0.0002) ***
Price: CLR	−0.0007 (0.0003) *	−0.0007 (0.0003) **	−0.0008 (0.0003) **	−0.0008 (0.0003) **	
Price: PLR	−0.0004 (0.0002)	−0.0004 (0.0002)	−0.0004 (0.0002) +	−0.0004 (0.0002) +	
Price: Landless	−0.0004 (0.0003)	−0.0002 (0.0003)	−0.0001 (0.0003)	0.0003 (0.0003)	
Model information					
logLik	−435.37	−437.57	−435.77	−434	−377.2
AICc	901.01	901.34	901.82	902.34	778.6
ΔAIC	0	0.32	0.8	1.32	0

The results of each level and attribute in the form of estimated coefficients with their standard errors. +, *, **, *** = significance levels at 90%, 95%, 99%, and 99.9% respectively.

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