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Contradictory distributive principles and land tenure govern benefit-sharing of Payments for Ecosystem Services (PES) in Chiapas, Mexico

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Abstract

Payments for Ecosystem Services (PES) are incentive-based instruments that provide conditional economic incentives for natural resources management. Research has shown that when economic incentives are parachuted into rural communities, participation and benefits are collectively negotiated and shared. However, we know little about how benefit-sharing evolves over time in community-based PES. To address this gap, we examine distributional justice in four communities of the state of Chiapas, Mexico, which participate in a PES programme, and we assess how local justice principles compare with the programme's goals. Our analysis reveals patterns of both continuity and change in how communities share PES benefits, which reflect a suite of contradictory justice principles, including entitlement, merit, need, and equality. The studied communities distribute PES benefits by providing differentiated compensation to diverse groups of landholders via private cash payments, whilst also attending non-landed community members through public infrastructure investments. We show that benefit-sharing is strongly influenced by pre-existing land tenure features and associated norms, which in the study area include three different types of individual and common-property. Yet, we also show that communities continuously adjust benefit-sharing arrangements to navigate distributional challenges emerging from programme engagement. Overall, we provide novel insights on the evolution, diversity, and complexity of distributive justice in community-based PES and we advocate for a context-sensitive, nuanced, and dynamic account of justice in incentive-based conservation.

Keywords: Payments for Environmental Services, distributive fairness, environmental justice, incentive-based conservation, Lacandon rainforest, distributive justice, social equity

1. Introduction

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3 Payments for Ecosystem Services (PES) have become a mainstream incentive-based
4 environmental policy over the last two decades (Salzman et al., 2018). PES provide
5 monetary or in-kind incentives to landowners and/or rural communities conditional on
6 the implementation of specific natural resources management activities, including forest
7 conservation, which should directly or indirectly result in the provision of ecosystem
8 services. In low and middle-income countries, and particularly Latin America, many PES
9 involve communities who collectively negotiate participation and benefit distribution
10 (Hayes et al., 2019; Kaczan et al., 2017; Kerr et al., 2014). In these contexts, collective
11 decision-making processes shape the access to and sharing of PES benefits, whilst also
12 influencing PES prospects for alleviating rural poverty (Bulte et al., 2008).

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21 Community-based PES implementation often involves different processes than individual
22 PES, for instance, by simplifying programme operation, reducing transaction costs, or
23 fostering community-wide benefit-sharing (Muñoz-Piña et al., 2008; Pagiola, 2008).
24 However, collective decision-making processes can create inequalities and social conflict
25 (Corbera et al., 2020). Understanding the contextual and policy-related factors that cause
26 negative distributive outcomes in community-based PES is thus crucial because unfair or
27 inequitable experiences can undermine programmes' social legitimacy, local viability,
28 and environmental effectiveness (Corbera and Pascual, 2012; Wells et al., 2020).

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Assessing whether PES are equitable requires an understanding of local equity
perceptions (Sikor et al., 2014). This is because perceptions over what constitutes an
'equitable' system to distribute PES benefits –in terms of a defined set of recipients (i.e.
who receives benefits), a benefit mode (i.e. how benefits are allocated, such as in cash or
in-kind), and an allocation principle (i.e. which equity principles determine distribution)–
differs across geographical and cultural contexts (McDermott et al., 2013). Local
institutions can also influence benefit-sharing practices (Haas et al., 2019; Hayes and
Murtinho, 2018; Loft et al., 2019; Martin et al., 2019, 2014), which may not necessarily
match programme goals (Loft et al., 2017).

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In this paper, we investigate the relationship between community-based distributive
justice principles, local benefit-sharing outcomes, and policy objectives in Mexico's PES
programmes. Distributive justice is broadly understood here as the allocation of benefits
and costs between individuals or social groups, and it is one of three other dimensions of
justice (e.g. *procedural*, *recognition* and *contextual*; see Friedman et al., 2018). Drawing
on extensive field research in Selva Lacandona (Chiapas), we ask how communities

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3 understand and perform benefit-sharing of PES revenues in terms of the distributive
4 principle, recipients of distribution, and benefit mode, and to what extent such sharing
5 practices align with or contradict programme goals. We consider distributive principles
6 as “decision-making guidelines that organise the relationship between subjects for
7 particular dimensions of justice” (Sikor et al., 2014: 526), which reflect what is
8 considered a fair distribution in a given setting.
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12 In a context of PES implementation, the following distributive principles are relevant:
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16 i) *entitlement*, where PES benefits are distributed according to a given entitlement, such
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21 ii) *merit*, where PES benefits are distributed based on some measure of merit, such as the
22 contribution in terms of invested time or land allocated to PES activities, or opportunity
23 costs, understood as income forgone as a result of entering land into the PES scheme;
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27 ii) *need*, where PES benefits are distributed considering those most in need, although
28 what are real or purported needs may be often controversial; and
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32 iii) *equality*, where PES benefits are distributed evenly across all recipient subjects.
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36 During fieldwork, however, we realised that PES participants sometimes understood
37 equality as needs-based distribution that promoted equality of capabilities, which
38 suggested that equality and need could be regarded as inseparable. Henceforth, those
39 cases where the distribution of PES benefits prioritised the most vulnerable at community
40 level were considered to be governed by a ‘need/equality’ principle.

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43 Who should be the set of recipients entitled to PES benefits in a given context (e.g.
44 participants only, or both participants and non-participants) can be influenced by PES
45 programme rules, local institutions, or PES participants. For example, a given PES
46 programme can consider households without property titles non-eligible for PES
47 participation, but these households may still receive benefits from fellow participants.
48 Recipients of distributive justice in a PES context may thus evolve over time and be
49 contextually contingent. Finally, PES literature has shown that the benefit mode ranges
50 from in-kind contributions to payments in cash or investment in public goods
51 (Izquierdo-Tort, 2020; Mahanty et al., 2013).
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55 This article diverges from research that has investigated justice issues in PES in at least
56 three ways. First, we focus on *intra-community sharing of PES benefits and the*
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3 *correspondent associated equity principles*. Studies have documented that communities
4 may develop multiple benefit allocation mechanisms, including different forms of
5 individual compensation to specific social groups (Alix-García et al. 2015; Haas et al.
6 2019; Yanez-Pagans 2013) and various types of public investments (Alix-García et al.
7 2018; Mahanty et al., 2013). Other studies have revealed a diversity of distribution
8 systems and underlying drivers of benefit-sharing across local contexts, including
9 different local norms and preferences (Martin et al., 2019). Focusing on local perceptions
10 of equity in a case study in Vietnam, Loft et al. (2017) show that an equality principle
11 was highly preferred by most households for PES benefit-sharing, whilst merit and needs
12 were much less popular. However, these studies do not reveal if and how communities
13 may employ distinct distributive justice principles to share PES benefits over time and
14 how the latter affects local outcomes.

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24 Second, we examine *the evolution of community-based benefit-sharing systems*. There is
25 growing recognition that PES programmes' goals and local notions of social justice may
26 diverge, and that interactions between policy and local principles can foster or hinder
27 programmes' performance (Hayes and Murtinho, 2018). However, what communities or
28 policymakers consider as fair may change over time. Community-based PES distributions
29 may change during enrolment years (Corbera et al., 2007a; García-Amado et al., 2011),
30 whilst PES scheme design and implementation may undergo significant changes in stated
31 objectives and informal practices (Izquierdo-Tort et al., 2021). A better understanding of
32 these changing processes should provide clues for what to expect with evolving PES
33 implementation regarding equity, including cases where communities participate in
34 several contracts simultaneously (Le Velly et al., 2017).

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44 Finally, we provide one of the few *analyses of distributive justice in PES in Mexico and*
45 *Latin America*. In a study among six communities participating in the PES programme
46 Socio Bosque in Ecuador, Hayes and Murtinho (2018) found that communities generally
47 distributed benefits based on egalitarian or equality principles and that such distribution
48 tended to be perceived as fair by participant households. In Mexico, nation-wide studies
49 of communities participating in PES have shown variations in how funds are allocated at
50 community level, with frequent uses of funds including: i) monetary allocation among
51 members; ii) investment in public goods; and iii) purchase of the material required and
52 payment of daily wages for forest management (Alix-Garcia et al. 2012; World Bank
53 Group et al. 2017). Further, case studies in Chiapas –where this study took place– have
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documented the collective benefit-sharing mechanisms adopted to participate in PES (Corbera et al., 2020, 2009, 2007a; García-Amado et al., 2011; Izquierdo-Tort, 2020) and suggested mixed distributional outcomes. We expand this work by examining the distributive justice principles which underlie benefit-sharing among participating communities. We focus on Mexico because the country's PES programmes are some of the longest-applied schemes worldwide (Shapiro-Garza, 2020); they have poverty alleviation as a key programmatic goal (Muñoz-Piña et al., 2008); and they represent a large incentive-based experiment in collective land tenure because over 60% of Mexico's forests are held in common-property (Madrid et al., 2009).

2. Materials and methods

2.1. Mexican PES programmes

Mexico is a pioneer in PES implementation in Latin America alongside Costa Rica (Muñoz-Piña et al., 2008). Mexico's National Forestry Commission (CONAFOR) implemented nation-wide schemes for hydrological services and biodiversity conservation since 2003 and 2004, respectively. Programmes provide annual payments over renewable five-year contracts, during which participants must conserve enrolled forests and develop forest management activities (e.g. firebreaks). CONAFOR monitors compliance through remote sensing and on-field visits. Payments are given per hectare (around Mxn\$1000 or USD\$48 in 2021) (Izquierdo-Tort et al., 2021).

When the applicant involves a community, or a group of landholders, CONAFOR disburses payments to community authorities through bank transfers after verifying compliance. Community authorities then distribute PES revenues among its members based on collective agreements made within the community assembly². Communities may choose to modify these agreements throughout the duration of the PES contract. Intermediary actors certified by CONAFOR, such as Non-Governmental Organisations (NGOs), forest engineers, and other technical service providers, help communities prepare applications and guide field-level implementation of programme activities.

2.2. Four ejidos in Selva Lacandona

² *Ejido* communities are governed by an assembly of all the household heads who hold formal land entitlements, known as *ejidatarios*. Communities elect three members (i.e. president, secretary, treasurer) as formal authorities in front of the State's administration during three year appointments. The assembly formulates collective decision-making procedures and rules within the community, including those related to resource management and access to and distribution of government subsidies.

We analysed benefit-sharing by four neighbouring *ejidos*³ of Marqués de Comillas (MdC) in Selva Lacandona (Figure 1) participating in the national biodiversity PES scheme. By 2020, MdC had 12,892 inhabitants⁴ across 22 *ejidos*. MdC's population suffers from economic poverty and lacks basic educational, health, and sanitary services. Most households rely on crop agriculture and livestock for subsistence and income, and many receive cash transfers, agricultural subsidies, and PES (Izquierdo-Tort, 2020).

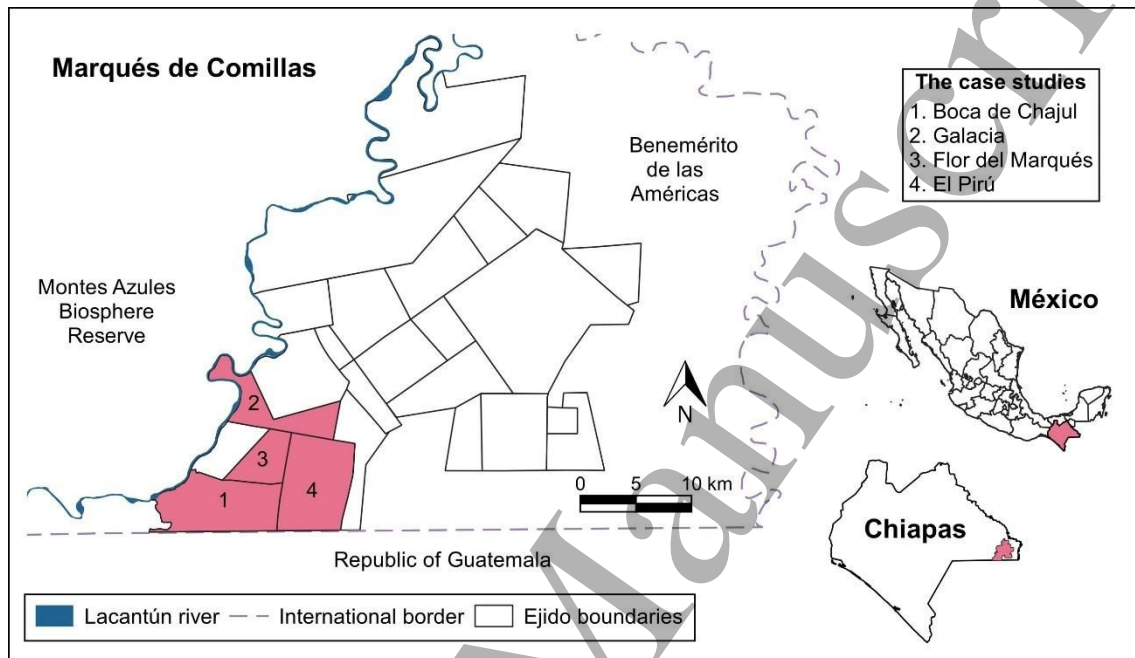


Figure 1. Map of the study area.

The four selected *ejidos* were established between 1970s-1980s by peasants from across Mexico (Table 1). MdC settlement and associated productive activities triggered extensive deforestation (Fernández-Montes de Oca et al., 2015; Jong et al., 2000)⁵. Previous PES studies in MdC show that programmes have been highly effective in securing compliance and reducing deforestation (Costedoat et al., 2015; Izquierdo-Tort et al., 2019).

In the study site, lands tenure includes three property types: i) ‘*ejidal* parcels’, small communal land plots assigned for basic services or for use by specific social groups (e.g. school or women); ii) ‘communal lands’, collectively managed forests; iii) ‘individual

³ *Ejid*os are a type of collective tenure recognized after the Mexican revolution in the early 20th Century which are composed of individually held land plots and common resource management areas under a communal governance system (Barnes, 2009).

⁴ According to 2020 census data from Instituto Nacional de Estadística y Geografía (INEGI): <https://www.inegi.org.mx/programas/ccpv/2020/default.html>

⁵ Between 2001-2018, 37% of the municipality's forests (24,253 hectares) were lost, at an average annual forest cover loss rate of 2.06% (Izquierdo-Tort et al., Forthcoming).

parcels', household-managed individual plots encompassing farming, pasture, and forestry areas. Household heads entitled to land rights are known as *ejidatarios*⁶.

Although Mexican law stipulates that tenure in *ejido* forested lands must be communal and cannot be individually parcelled, the studied *ejidos* developed internal parceling processes. Consequently, some lands *de jure* classified as communal are *de facto* held individually based on internal *ejido* agreements. From here on, land property refers to *de facto* property except when distinctions are required.

Table 1. Key characteristics of the studied *ejidos*

Feature	<i>Ejido</i>				
	Boca de Chajul	Galacia	Flor de Marqués	El Pirú	
Place of origin of the early settlers (and approx. date)	States of Chiapas, Guerrero, State of Mexico, Tabasco and Michoacán (1970s)	State of Chiapas (early 1970s)	States of Chiapas, Oaxaca, Veracruz (early 1980s)	States of Mexico City, Chiapas, Guerrero, Oaxaca and Michoacán (1980s)	
Population (2020)	385	232	201	207	
Year founded (# of <i>ejidatarios</i> on that date)	1976 (118)	1975 (50)	1984 (27)	1980 (51)	
Total # of hectares in year of founding	3810	2664	1779	4984	
Total # of hectares after PROCEDE during the late 1990s or early 2000s (# of <i>ejidatarios</i> on that date)	4408 (156)	2664 (53)	1779 (25)	4984 (54)	
Individual property as % of <i>ejido</i> (collective property ¹ as % of <i>ejido</i>) at time of PES enrolment	De jure	94.4% (5.6%)	45.8% (54.2%)	0% (100%)	65.4% (34.6%)
	De facto	94.4% (5.6%)	99% (1%)	77.5% (22.5%)	65.4% (34.6%)

⁶ Before 1992, *ejidatarios* were not legally allowed to rent or sell lands, but henceforth *ejidos* could obtain individual titles and potentially privatise family-run and communal lands through a voluntary land certification programme called *Programa de Certificación de Derechos Ejidales y Titulación de Solares Urbanos* (PROCEDE) (Haenn, 2006). The three PROCEDE steps are as follows. Firstly, *ejidos* can have lands measured and delineated. Secondly, *ejidatarios* can receive land titles to house plots, individual parcels and communal lands. In a final step, *ejidos* can privatise lands and dismantle the *ejido*. The last step concludes by legally changing the land regime to 'private property'. No *ejido* in MdC has completed this last step.

Note: 1) Includes communal lands and *ejidal* parcels. Source: own elaboration with fieldwork data and information from Registro Agrario Nacional (RAN) and Instituto Nacional de Estadística y Geografía (INEGI).

The studied *ejidos* participated in multiple national (biodiversity, hydrological) and subnational (Selva Lacandona) PES since 2008 (Izquierdo-Tort et al., 2021). However, we focus on each *ejidos*' first PES contract (Table 2). We selected these cases for three reasons. Firstly, these *ejidos* participated in PES simultaneously and therefore faced the same programme rules. Secondly, they had the same PES intermediary, Natura y Ecosistemas Mexicanos (henceforth Natura Mexicana), a conservation NGO whose staff had regional experience since the 1970s (Carabias et al., 2015). Finally, a focus on each community's first PES contract allowed us to examine how pre-existing institutions shape benefit distribution systems without influence from prior programme involvement.

Table 2: Studied PES contracts in the *ejidos*. All *ejidos* participated in the national biodiversity PES scheme

<i>Ejido</i>	Contract period	Lands enrolled by tenure type
Flor del Marqués	2009-2013	672 ha: 284 ha from individual parcels belonging to 21 <i>ejidatarios</i> ; 19 ha from <i>ejidal</i> parcels (10 ha 'Women' and 9 ha 'School' parcels); 369 ha from communal lands.
El Pirú	2009-2013	1231 ha: 750.6 ha from individual parcels belonging to 18 <i>ejidatarios</i> ; 68.9 ha from <i>ejidal</i> parcels (28.8 ha 'School' and 40.1 ha 'Women' parcels); 411.5 ha from communal lands.
Boca de Chajul	2008-2012	1071 ha: 819 ha from individual parcels belonging to 45 <i>ejidatarios</i> ; 250 ha from <i>ejidal</i> parcels (27.6 ha 'School', 60.6 ha 'La Presa', 126 ha 'Mariposario' parcels); 37.7 ha from communal lands.
Galacia	2008-2012	1058 ha: 1039.2 ha from individual parcels belonging to 38 <i>ejidatarios</i> ; 18.8 ha from <i>ejidal</i> parcel ('Ejidal').

Source: own elaboration with data collected from Natura Mexicana and fieldwork.

2.3. Data collection and analysis

Sixty-two interviews were conducted by the first author with PES participants, non-participants, and community authorities during two fieldwork rounds (2015-2016, 2020) (Appendix A). First round interviews focused on the mechanisms and perceptions regarding PES benefit-sharing during the *ejidos*' first PES contract. Interviews in 2020 focused on current PES distributive practices and changes over time. All interviews were

developed with prior verbal consent and were recorded and transcribed for manual coding.

Considering that first round interviews asked retrospective questions beginning as early as 2008, which could potentially create bias, we made the following efforts to ensure the reliability of recall data: i) we asked multiple informants in each community about distributive outcomes and decisions in their community, and we compared and contrasted their responses; ii) we asked community authorities to show payment receipts or other forms of community documentation of how payments were distributed and/or spent. Overall, we found that interviewees' responses were consistent in each community and that these matched with community documentation. We are therefore confident that the data we gathered is accurate.

We extracted from interview transcriptions the following information related to distribution systems: allocation principle, defined set of recipients, benefit mode. 'Land tenure type' emerged as a further theme during coding and we compared responses between informants over time to explore temporal, intra-, and inter-community variations. To understand how local distributive principles aligned with PES objectives, we reviewed the national biodiversity PES 'rules of operation' (reglas de operacion⁷) for 2008 and 2009, which specify PES objectives, methodology, and design features. We also conducted two interviews with regional CONAFOR staff in Tuxtla Gutierrez (in 2013 and 2016).

3. Community-based distribution systems

The studied communities devised diverse, complex, and evolving systems to share PES benefits (Table 3). Whilst benefit-sharing varied across communities and over time, we identified land tenure type as a common factor shaping distributive outcomes. Overall, communities tended to ' earmark' or keep separate accounts for PES benefit-sharing based on whether money came from enrolled individual parcels, *ejidal* parcels, or communal lands. We have thus structured this section in three parts, which correspond to the distribution systems we found for each land tenure type.

Table 3. PES benefit distribution in the studied <i>ejidos</i>		
Land	Distribution system	Applicable

⁷ Available at CONAFOR's website: <https://www.gob.mx/conafor>.

tenure type	Allocation principle	Defined set of recipients	Benefit mode	ejidos
Individual parcels	Entitlement and merit	Individual parcel holders who enrolled lands	Private cash payment	All <i>ejidos</i>
Communal lands	Need/equality	Users of community infrastructure	Public goods investment	Boca de Chajul
	Entitlement	Communal land right holders	Private cash payment	El Pirú, Flor del Marques
<i>Ejidal</i> parcels	Need/equality	<i>Ejidal</i> parcel beneficiaries (i.e. women, youth, school)	Private cash payment	All <i>ejidos</i> except Galacia
	Need/equality		Public goods investment	
	Need/equality	Users of community infrastructure	Public goods investment	Galacia
	Entitlement and merit	Individual parcel holders who enrolled lands	Private cash payment	All <i>ejidos</i>
	Entitlement	Communal land right holders	Private cash payment	Flor del Marqués

Source: own elaboration with fieldwork data.

The programme's 2008-2009 rules did not explicitly specify how communities should internally distribute payments nor under which justice principles. Interviewed staff from CONAFOR's office in Chiapas confirmed a lack of involvement on distributional affairs, noting an institutional preference to avoid involvement in community politics. Similarly, interviewed *ejidatarios* from MdC confirmed their ability to freely decide regarding benefit-sharing without CONAFOR's influence. However, the rules of the national biodiversity PES scheme in 2008-2009 prioritised the participation of communities located in municipalities classified as 'marginalised', and it did so by awarding extra points in the application system to communities located in such municipalities. This 'pro-poor' emphasis—a persistent pattern in the targeting and selection of participants in national PES schemes in Mexico (see Izquierdo-Tort et al., 2021; Muñoz et al., 2008; Sims et al., 2014)—reflects a needs-based equity principle within CONAFOR.

3.1. Individual parcels: private cash payments and entitlement and merit

In the four studied *ejidos*, revenues from individual parcels were allocated in private cash amounts proportional to the number of hectares enrolled by each landholder. For instance, an *ejidatario* who enrolled ten hectares of individual lands received an annual cash

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3 payment equivalent to ten hectares at the contract's payment rate. All *ejidos* used the
4 same distribution system throughout the PES contract's timeline.
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7 Entitlement and merit governed private cash disbursements that accounted for both land rights
8 and opportunity cost considerations. Firstly, private cash payments recognised individual
9 parcel holders' rights to receive benefits associated with their property, as happens with
10 other governmental agricultural subsidies which directly accrue to landowners. At the
11 same time, cash disbursements compensated landholders for potential opportunity costs of
12 participating in PES. This is because programme rules explicitly forbid crop and livestock
13 agriculture on enrolled lands, and they also restrict the extraction of timber and other non-
14 timber forest products. The rationale behind this individual distribution of PES benefits
15 based on both entitlement and merit is explained by an individual parcel holder from El
16 Pirú,
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25 The land is theirs. Their parcel is theirs. No way can we take what is theirs, their
26 heritage and give it to the *ejido*. That is for them and their family. Otherwise, that
27 person must use the land, they must harvest. The person is not working their land
28 so that is their money.
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30 However, cash allocations were not perfectly aligned with opportunity cost calculations.
31 Each individual parcel holder received the full payment proposed by CONAFOR in
32 exchange for forest conservation despite potential variations in opportunity costs based
33 on economic activities and land suitability for alternative uses for each landholder. In fact,
34 opportunity costs may be lower than the PES payment per hectare for many participants.
35 After all, previous PES studies in MdC show that enrolled forest parcels are remote and
36 of low soil quality, whilst participants face capital and labour constraints for agricultural
37 expansion (Izquierdo-Tort et al., 2019).
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44 **3.2. Communal lands: entitlement and merit versus need/equality**

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46 In the study area, three of the four *ejidos* still held communal lands, and each devised a
47 different system to allocate PES revenues (Table 4). In Boca de Chajul, payment
48 distribution was based on need/equality since distribution targeted the needs of specific
49 vulnerable groups. In this case, a share of PES revenues each year was invested in funding
50 a school bus that picked children from neighbouring *ejidos* to attend the local school.
51 Towards the contract's end (2010-2012), some revenues were invested in the health clinic
52 and street lighting. These allocations were promoted by the *ejido*'s president who saw
53 PES funds as an opportunity to improve deficient public services. Several interviews in
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Boca de Chajul confirmed that the president⁸ persuaded the *ejido* assembly to invest PES money on certain collective needs as a ‘better’ use of the money despite some initial interest among communal right-holders for individual distributions. The following interview with the *ejido* president highlights his views about the use of PES funds,

To me there are three basic things that we need in this *ejido*. Education so that this town improves. Health because I have seen people die of nothing. Social development to help people so that their income can be enough. Therefore, when I saw the possibility of making improvements (with PES money), I wanted to do it.

Table 4: Distribution systems related to communal lands

<i>Ejido</i>	Land rights: access and distribution	Distribution system		
		Defined set of recipients	Mode	Allocation principle
Boca de Chajul (2008-2012)	All 169 <i>ejidatarios</i> equally	Users of <i>ejido</i> infrastructure	2008-2012: investment in school bus; 2010-2012: investment in health clinic and public lighting	Need/equality: public investments focused on infrastructure needs
El Pirú (2009-2013)	Group of communal land right holders proportional to share ownership	Communal land right holders	2009-2013: proportional individual/private cash payments	Entitlement: private cash payments according to tenure rights
Flor del Marqués (2009-2013)	2009-2010: all 25 <i>ejidatarios</i> equally	2009-2010: all 25 <i>ejidatarios</i>	2009-2013: equal individual/private cash payments	Equality: payments accrue equally
	2011-2013: all 17 <i>ejidatarios básicos</i> equally	2011-2013: all 17 <i>ejidatarios básicos</i>		Merit: payments awarded according to previous and current conservation efforts

Source: own elaboration with fieldwork data.

In El Pirú, PES revenues from communal lands were distributed based on entitlement: monies were disbursed in proportional cash payments among the cohort of 22 people who held the set of 54 rights to communal lands⁹. For example, each of the six *ejidatarios* who

⁸ The *ejido* president was a proactive individual who was born in the *ejido* but had migrated temporarily in 2003 with his family. He returned in 2007, was subsequently appointed as president, and took other leadership positions in the *ejido* the following years.

⁹ Before PES participation, a group of 22 *ejidatarios* had informally purchased all the rights to communal lands from the other 32 *ejidatarios* involved in the PROCEDE process (originally there were 54 rights to communal lands). By 2009, 14 *ejidatarios* held one share each or 1.9% of all communal lands; six

held two rights received 3.8% (2/54) of the payment. Whilst the distribution system in El Pirú (and in Flor del Marqués as detailed below) resembles that of individual parcels (Section 3.1), it was not based on opportunity cost considerations because these lands were not individually parcelled and therefore no *ejidatario* is entitled to engage in income earning activities on PES lands, including agriculture or cattle grazing.

In Flor del Marqués, payment distribution changed from equality to merit-based. In the first two contract years (2009-2010), all 25 *ejidatarios* of the *ejido* received equal cash payments. In the last three years (2011-2013), however, only the 17 *ejidatarios básicos*¹⁰ received payments. Interviews suggest that this change in the distribution principle reflected longstanding internal conflicts related to forest conservation between *ejidatarios básicos* and more recent settlers. The *básicos* asserted a merit-based system based on previous and current conservation efforts within the community. The *básicos* we interviewed argued that some *ejidatarios* did not follow PES rules, mainly by not participating in conservation activities and engaging in hunting, which risked PES participation. *Básicos* also claimed that they had conserved the communal forests and invested in *ejido* infrastructure since they settled long ago, which now entitled them to participate and benefit from PES. Ultimately, being unable to control activities by ‘non-compliant’ *ejidatarios*, the *básicos* opted for excluding the former from payments.

3.3. *Ejidal* parcels: evolving benefit-sharing

The four studied *ejidos* enrolled different types of *ejidal* parcels to PES and devised diverse distribution systems to share benefits (Table 5). In each *ejido*, revenue distribution generally targeted the needs of the *ejidal* parcel user’s group (i.e. women or the school). However, the set of recipients and benefit mode varied between different kinds of *ejidal* parcels. PES money from the school parcel was invested in school infrastructure and managed by the school parent board, whilst PES money from the women’s parcel was evenly allocated among female *ejidatarias* or wives of *ejidatarios*, thus excluding other women. Money from other *ejidal* parcels, such as conservation parcels, was also invested

ejidatarios each held two shares or 3.8%; two *ejidatarios* held three shares each or 5.7%; and one *ejidatario* held 22 shares or 40.7%.

¹⁰ This group of *ejidatarios básicos* are the founding *ejidatarios* of Flor de Marqués, or their families, who are called as such because their names are listed in the ‘basic folder’ (carpeta básica), which is the official land documentation granted during PROCEDE. From interviews we gathered that PROCEDE officials did not grant individual parcel rights in Flor del Marqués in the late 1990s because the *ejido* was mostly forest-covered at the time, and thus the entire *ejido* surface remained as communal then.

Ejidatarios básicos have since then sold land informally to more recently community-acknowledged *ejidatarios*.

in public goods, either to support the community's administrative needs (Galacia) or for local infrastructure (Boca de Chajul)¹¹. In the words of an *ejidatario* from El Pirú,

The 'School' parcel is for the school. Whatever the school needs. We have like 25 hectares in the kinder and primary school. There is no high school, children go to Chajul or Orizaba. They used the money for doors, construction, furniture... The school parents decide. When the money gets here, it is given to the committee. The *ejido* decided to give it to the school. The school has always been in bad conditions, there is no more support than that.

Table 5: Distribution of PES revenues from *ejidal* plots in the study area

<i>Ejido</i>	Local name (ha)	Parcel purpose	Defined set of recipients and distribution mode		Allocation principle
Boca de Chajul	Escolar (27.6)	School	2008: 1) private cash payments to individual landholders who were rejected; 2) investment in school bus	2008-2012: public investment in school bus, health clinic, and public lighting	2008: 1) entitlement and merit; 2) need/equality 2009-2012: need/equality
	La Presa (60.6)	Conservation			
	Astillero (37.7)	Timber extraction			
	Mariposario (126)	Conservation			
Galacia	Ejidal (18.8)	Conservation	2008-2012: investment in ejido administrative needs		2008-2012: need/equality
Flor del Marqués	Escolar (9)	School	2009-10: investment in primary school	2011-2013: private cash payments to group of 17 <i>ejidatarios básicos</i>	2009-2010: need/equality 2011-2013: merit
	Mujeres (10)	Women	2009-2010: individual/private cash payments to female <i>ejidatarias</i> or wives of <i>ejidatarios</i>	2011-2013: individual cash payments to female <i>ejidatarias básicas</i> or wives of <i>ejidatarios básicos</i>	
El Pirú	Escolar (28.8)	School	2009: 1) private cash payments to individual landholders; 2) private cash payments to communal right holders	2010-2013: investment in school	2009: entitlement and merit 2010-2013: need/equality
	Mujeres (40.1)	Women		2010-2013: private cash payments female <i>ejidatarias</i> or wives of male <i>ejidatarios</i>	
Source: own elaboration with fieldwork data.					

However, equity principles associated with *ejidal* parcels evolved over time in all *ejidos* except for Galacia. In Flor del Marqués, the distribution changed from needs/equality in the first two contract years to a merit-based approach. In the first two years, the school's and women's parcel money was, respectively, invested in the schools and distributed

¹¹ In this *ejido*, money from the Astillero parcel, which was designated for timber extraction, was also invested in public infrastructure.

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3 among female *ejidatarias* or wives of *ejidatarios*. In the final three years, the school
4 parcel money was distributed in equal cash payments among the group of 17 *básicos*,
5 whilst money from the women's parcel was allocated equally to the wives of male *básicos*
6 or female *básicas*. This distribution change resulted, as noted previously, from internal
7 *ejido* conflicts regarding current and past conservation efforts.
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12 The allocation principle in Boca de Chajul and El Pirú changed from an entitlement and
13 merit-based approach in the first year of the contract, to a need/equality approach
14 subsequently. In both communities, the beneficiaries used a share of *ejidal* parcel money
15 from the first year to pay a group of people whose individual or communal lands had been
16 rejected by CONAFOR in the *ejido*'s application. In doing so, they compensated fellow
17 community members who had tried to enrol lands to PES but did not meet eligibility
18 criteria. Rejected individual parcel holders in Boca de Chajul and El Pirú received private
19 and proportional cash payments, whilst rejected communal right holders from El Pirú
20 received private cash amounts corresponding to their ownership share (see Sections 3.1-
21 3.2). In the last four years of each *ejido*'s contract, *ejidal* parcel money was invested in
22 public infrastructure (e.g. schools) or given in cash payments to women. This change
23 occurred because PES applicants who were rejected in the first contract were able to enrol
24 successfully through a new contract.
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35 **4. Discussion**

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37 The findings above demonstrate that communities involved in PES can develop complex,
38 diverse, and evolving benefit-sharing arrangements reflecting a suite of contradictory
39 distributive justice principles. As shown in previous studies in Mexico (Alix-Garcia et
40 al., 2012, 2015; García-Amado et al., 2011; World Bank Group et al., 2017; Yanez-
41 Pagans, 2013) and elsewhere (Mahanty et al., 2013), communities can allocate PES
42 payments to specific individuals, split such monies collectively, or invest in local public
43 goods. They can ' earmark ' community-based PES funds for certain purposes whilst
44 maintaining flexibility to adapt benefit-sharing to changing contextual conditions.
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51 The principles governing the distribution of PES benefits, such as entitlement, merit,
52 need, and equality, do not always fall in their neat and separately theorised categories.
53 Instead, we have shown that their expression on the ground is messy and intertwined.
54 Previous studies in Mexico (Corbera et al., 2007a, 2007b; García-Amado et al., 2011) and
55 elsewhere (Haas et al. 2019) suggest that pre-existing land institutions influence how
56 communities share PES revenues. We have advanced this evidence further by
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3 systematically linking benefit-sharing to land property ‘types’. Specifically, we have
4 revealed strong links between ‘individualised’ land tenure and cash payments following
5 entitlement and merit considerations. This echoes the distribution of other types of land-
6 use subsidies in Mexico (Izquierdo-Tort 2020), as well as the sharing of PES benefits in
7 agricultural frontier regions where common-property regimes have increasingly become
8 individualised (Corbera et al., 2020; Garcia-Amado et al. 2011), but instead contrasts with
9 other studies that have shown a strong preference for equality in the distribution of PES
10 benefits (Hayes and Mourtinho, 2018; Loft et al. 2017).

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17 In the studied communities, equality in distribution has only been a relevant concern when
18 a share of PES enrolled lands affected common-property forests owned by a social group
19 (e.g. the school forest plot) or by a group of individuals (e.g. the ejidatarios’ common
20 forest). The distribution or investment of the correspondent share of payments reflected
21 then wider collective considerations, such as solidarity and conflict avoidance, and
22 considered both need and equality simultaneously.

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28 These insights suggest that distributive justice principles and practices can change at
29 local-level under specific circumstances. Internal conflicts, as exemplified by Flor del
30 Marqués where conflicts between landholders related to perceived non-compliance with
31 PES norms, triggered changes in who was considered worthy of receiving payment.
32 Further, enrolment in multiple PES schemes, as shown in Boca de Chajul and El Pirú
33 where enrolment in a subsequent PES contract soon after the first contract had started,
34 allowed the community to release resources for investments in public infrastructure that
35 had previously been committed for compensating rejected landholders. The coexistence
36 of, and dynamic interactions between, multiple PES participants and contracts can
37 influence how programme incentives are distributed over time, which can have positive
38 or negative distributive implications.

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48 In this regard, it should be emphasised that PES programme’s rules did not explicitly
49 specify how communities should share benefits during the study period, which allowed
50 communities to freely decide which distributive norms to apply and why. The participants
51 we interviewed valued the autonomy offered by PES in terms of distributive decisions,
52 which arguably improved the programme’s local legitimacy and allowed communities to
53 use their situated agency to craft appropriate benefit-sharing arrangements
54 (Shapiro-Garza et al., 2020). Such decision-making autonomy in programme
55 implementation has been associated with high participation rates (Izquierdo-Tort et al.,
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2021), high compliance with environmental protection conditions (Izquierdo-Tort et al., 2019), and high effectiveness in reducing deforestation (Costedoat et al., 2015). This evidence, notwithstanding, should not let one conclude that distributional practices in community-based PES will always translate into inclusive, or pro-poor distribution systems where the most disenfranchised households of a given community profit from PES directly.

Finally, we acknowledge that the studied communities contain a series of specific features –high deforestation rates, presence of biodiversity conservation policies, small populations, and large proportions of parcelled lands– that strongly influence benefit-sharing practices. Therefore, the studied communities may not necessarily be representative of other *ejido* communities in Mexico or elsewhere. However, we believe that the theoretical and methodological approach developed here, as well as the findings, could well inform other analytical contexts where land-use change is proceeding apace amidst the implementation of PES programmes or other forms of incentive-based conservation policy.

5. Conclusion

This article has analysed how communities involved in PES distribute benefits, which distributive principles come into play, and how such principles are shaped by PES programme's rules and changing institutions and social dynamics at local level. We have shed new light on the diverse local mechanisms through which communities engaged in incentive-based policies, share benefits, and navigate emerging justice challenges. Specifically, we have shown that who is entitled to PES benefits within the community and the norms governing benefit-sharing can differ and evolve over time. Communities make distinctions between subjects of justice, which include individual or collective contributors to forest conservation based on property rights entitlements, and other marginalised or socially relevant groups based on gender or education considerations. Communities also distinguish between benefit types (e.g. cash payments versus collective investments) and between distributive norms, including entitlement, merit, need, and equality.

To conclude, we believe that before making grand claims about the relative fairness of incentive-based conservation policy one needs to understand local manifestations of justice (Corbera, 2015). Mexican communities have, in principle, the agency to maximise local fairness in PES, but this hardly guarantees such a goal will be pursued or achieved.

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3 For example, none of the studied communities distributed all PES income to people in
4 most financial need, nor did any community target benefits only to households who
5 enrolled lands. Instead, the communities identified multiple beneficiary groups, and
6 established diverse and mutable benefit-sharing systems with distinct distributive norms.
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8 There is therefore a research need for explicitly adopting a context-sensitive, nuanced,
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10 and dynamic account of justice in incentive-based conservation to capture the evolution,
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12 diversity, and complexity of benefit-sharing in local settings.
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30 **Ethics declaration**

31 The interviews conducted between 2015-2016 abode to the ethical guidelines of the
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