



GONZALO CORTÉS-CAPANO | PRIVATE LAND CONSERVATION POLICIES: NAVIGATING FROM GLOBAL GAPS TO LOCAL PERCEPTIONS AND NEEDS

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ISBN 978-951-51-7117-7
UNIGRAFIA
HELSINKI 2021

Faculty of Sciences
University of Helsinki

PRIVATE LAND CONSERVATION POLICIES: NAVIGATING FROM GLOBAL GAPS TO LOCAL PERCEPTIONS AND NEEDS

Gonzalo Cortés-Capano

DOCTORAL DISSERTATION

To be presented for public discussion
with the permission of the Faculty of Science of the University of Helsinki,
in Athena Hall 107, Siltavuorenpenger 3 A, Helsinki, on the 24th of March, 2021 at 12 o'clock.

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ISSN-L 1798-7911
ISSN 1798-7911 (print)
ISBN 978-951-51-7117-7 (paperback)
ISBN 978-951-51-7118-4 (PDF)

Unigrafia
Helsinki 2021

*“Caminante, son tus huellas
el camino y nada más;
Caminante, no hay camino,
se hace camino al andar.
Al andar se hace el camino,
y al volver la vista atrás
se ve la senda que nunca
se ha de volver a pisar.
Caminante no hay camino
sino estelas en la mar”*

Antonio Machado

ABSTRACT

Despite efforts to reverse the current global environmental crisis that threatens biodiversity and human well-being, many indicators suggest we are still far from changing the main trajectory towards sustainability. With privately owned land covering large areas of the world, private land conservation (PLC) has been recognized as a promising strategy to complement protected area networks in meeting biodiversity conservation objectives. However, the overall success of PLC depends on designing and implementing a suite of policies according to geographical contexts and to the needs, values, and capabilities of different stakeholders. In my doctoral thesis, I aim to identify challenges and opportunities to foster PLC at different geographical scales by understanding the main trends and gaps in a global PLC literature review and by assessing landowners' preferences and needs at national and local levels. In order to do so I followed transdisciplinary approaches, combining theories and methods from the natural and social sciences in collaboration with stakeholders outside academia.

In the first chapter, I carried out an in-depth global literature review of PLC scientific articles. My results revealed that most studies have focused on limited geographical contexts and policies. This highlighted the need for i) assessing a more diverse set of policy instruments to increase participation; ii) increasing stakeholders' engagement in research to better inform PLC policy-making; iii) better understanding barriers and opportunities to foster PLC in underrepresented regions, such as South America.

Based on findings from my first chapter, I conducted two empirical studies at local and national levels in Uruguay, a country where most of the land is privately owned (~96%). While the importance of voluntary PLC has been recognized by law in 2017, in Uruguay PLC policy has not been developed or implemented yet. Hence, there is a need to understand context-specific landowners' preferences for voluntary PLC to inform policy-making at early stages.

In the second chapter, I applied qualitative methods to explore landowners' perceptions, motivations and needs for voluntary conservation in a cultural landscape in north-eastern Uruguay. I found that landowners considered themselves and their neighbours as local environmental stewards and their main needs to support biodiversity conservation were mostly related to enhance land management and social cohesion. My results revealed that strengthening existing links between people and nature and addressing local rural development needs could confer both social and conservation benefits in a just and sustainable way.

In the third chapter, I used stated preference methods to assess landowners' preferences for hypothetical voluntary PLC policies at the national level in Uruguay. My results revealed that landowners had high willingness to engage

in voluntary conservation initiatives if future policies would meet their heterogeneous preferences. Offering a diverse set of policy instruments, mainly non-monetary incentives, while fostering networks and collaboration with different stakeholders could help increase participation and long-term engagement in voluntary PLC.

To conclude, by following a transdisciplinary approach my thesis contributes to identifying and addressing research gaps in PLC at different scales with practical implications for biodiversity conservation, sustainability, and policy-making in Uruguay and elsewhere in the world in similar contexts. In addition, my thesis highlights the need for future research to disentangle the main context-dependent dimensions driving PLC effectiveness but also to identify general principles that could inform the design, governance and implementation of legitimate and equitable policies across contexts.

ACKNOWLEDGEMENTS

I would like to thank my supervisors Enrico Di Minin and Tuuli Toivonen for their advice, trust, support and for the many learning experiences and opportunities to grow as a researcher over these years. I also want to thank my co-supervisor Alvaro Soutullo for the interesting discussions and for the opportunity to work in different conservation projects in Uruguay.

I am very grateful for having Professor Joern Fischer as my Opponent in the public examination of my thesis and I am very excited about the opportunity to discuss about this work. I am very grateful to Professor Sarah Bekessy and Professor Tobias Plieninger for pre-examining the thesis and for their insightful comments. I would also like to thank my Professor Niina Käyhkö and Professor Janne Kotiaho for their support and feedback during the thesis committee meetings.

I would like to acknowledge the funding support by the National Research and Innovation Agency from Uruguay (grant # POS_EXT_2015_1_123575), which was crucial for me to carry out the PhD project. I would also like to acknowledge the Uruguayan Ministry of Housing, Land Planning and Environment project URU/13/G35 to Vida Silvestre Uruguay, which provided funding and support for the development and implementation of Chapter II of this thesis. In addition, I am grateful to the University of Helsinki and the Doctoral Programme in Interdisciplinary Environmental Sciences (DENVI) for the learning opportunities and for funding support, which allowed me to attend different international conferences and to finalise this thesis.

I would like to thank all co-authors for inspiring collaborations and for the opportunity to learn from each other. In this sense, I would especially like to thank Gustavo Garibotto-Carton for his trust, for all the insightful discussions over these years and for providing invaluable support to implement the studies on the ground. I am also very grateful to Nick Hanley and Oleg Sheremet for their trust and support during the development of Chapter III.

During this thesis, I had the opportunity to collaborate with, and learn from, different stakeholders in Uruguay. In this sense, I want to express my gratitude to all the people directly or indirectly engaged in the research processes. I would like to thank all the participants of the interviews and surveys for the generosity in sharing their time, perspectives and experiences. I would also like to thank all the people, institutions and media who helped me distributing the survey. I am grateful to the National System of Protected Areas (Uruguay), especially to Lucia Bartesaghi, Mariana Ríos and Alvaro Salazar for providing interesting insights to navigate the science-policy interface and for their trust and support along several stages of my research. I am also grateful to the Rural Development Board “Bañado de Cañas” for welcoming our team and for providing a unique opportunity to work collaboratively at the local level in Chapter II. I am also grateful to all the institutions at the national,

municipal and local level that collaborated in my research. I would also like to express my gratitude to Leticia D'Ambrosio for her support and insightful conversations regarding Chapter II.

I wish to thank all the colleagues from the “Helsinki Lab of Interdisciplinary Conservation Science” (HELICS), the “Digital Geography Lab” (DGL) and the Department of Geosciences and Geography (Faculty of Science), for the support and company along the way. I am especially grateful to Vuokko Heikinheimo, Christoph Fink and Joel Jalkanen for the peer support during the PhD. I would also like to thank my colleagues at Vida Silvestre Uruguay for the opportunity to work collaboratively and to learn about, and from, people and nature while trying to find solutions to different real-world problems during the PhD and over the last ten years. I would like to thank María Nube Szephegyi and Oscar Blumetto for many insightful discussions over these years. I wish to acknowledge Andrés Fernández, Caterina Dimitriadis, Verónica Etchebarne and Magdalena Carabio for their contribution in carrying out the project URU/13/G35. I am particularly grateful to all the landowners from the “Programa de Refugios de vida silvestre” for the opportunity to learn together. I am grateful to the Universidad de la República (Uruguay), particularly the Centro Universitario de la Región Este (CURE).

I am very grateful to my friends in Uruguay for their support, for being always with me, in spite of the transatlantic distance, in times of difficulty and in times of joy. I am especially grateful to Pablo, Seba, Nando and their families and to Ceci, Bochi and Adrian. Thank you very much Anna for your support, for believing in me and for caring. I am very grateful to Antonio, Pilar, Manolo, Maria and to all those whose memories are always with me. I am particularly grateful to Martín Ayala, my dear friend who unfortunately left us too soon but whose memory and wisdom will always be with me. I would like to thank my non-human friends with whom I have shared my life during the PhD journey. To the memory of Luna, Pelussa, Porá, Yagua and Panda, and to Pinqui, Pampa, Crash, Antonia, and Traru.

I am extremely grateful to my parents, Alicia and Miguel. Thanks for always believing in me and for inspiring me to do my best in order to be a better person every day. Thanks for fostering my curiosity and critical thinking and, my passion for learning about the world and about myself. Thanks for teaching me to appreciate beauty and meaning in simplicity. Thanks for always being with me beyond the physical distance, for understanding and for your wise advice to pursue a life worth living.

Finally, I would like to thank all the people who have supported me, in the broadest sense of the term, along the way. I really appreciate all the contributions, conscious or unconscious, to enhance my character and my understanding and appreciation of the world.

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LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following publications referred by the Roman numerals:

- I. **Cortés-Capano, G.**, Toivonen, T., Soutullo, A., & Di Minin, E. (2019). The emergence of private land conservation in scientific literature: a review. *Biological Conservation*, 237: 191- 199.
<https://www.sciencedirect.com/science/article/pii/S0006320718310723>
- II. **Cortés-Capano, G.**, Fernández, A., Dimitriadis, C., Garibotto, G., Soutullo, A., Toivonen, T. & Di Minin, E. (2020). Exploring landowners' perceptions, motivations and needs to inform voluntary conservation policy-making. *People and Nature*, 2(3): 840-855.
<https://doi.org/10.1002/pan3.10122>
- III. **Cortés-Capano, G.**, Hanley, N., Sheremet, O., Hausmann, A., Garibotto, G., Soutullo, A., Toivonen, T. & Di Minin, E. (2021). Assessing landowners' preferences to inform voluntary private land conservation: a case study from Uruguay. Manuscript under review (*Land Use Policy*).

Table of contributions

	I	II	III
Original idea	GCC, EDM, TT	GCC	GCC, EDM
Literature review	GCC	GCC	GCC
Study design	GCC, EDM, TT	GCC, GGC	GCC, AH, EDM, GGC, NH, OS, TT
Data collection	GCC	GCC, AF, CD, GGC	GCC, GGC
Analyses	GCC	GCC, AF, GGC	GCC, NH, OS
Writing - original draft	GCC	GCC	GCC
Writing - reviewing, editing and providing comments	GCC, AS, EDM, TT	GCC, AS, EDM, TT, GGC	GCC, AH, AS, EDM, GGC, NH, OS, TT

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 GCC: Gonzalo Cortés-Capano
 GGC: Gustavo Garibotto-Carton
 NH: Nick Hanley

OS: Oleg Sheremet
 TT: Tuuli Toivonen

1 INTRODUCTION

1.1 THE BIODIVERSITY CRISIS

Humanity depends on nature's contributions for life support and development in complex ways and at different scales, from local to global (Díaz et al., 2019; Fischer et al., 2015; McLaughlin, 2018; Rockström et al., 2009). However, we are currently facing an unprecedented global sustainability crisis that threatens biodiversity, food, water and health security, compromising human well-being (Cardinale et al., 2012; Ceballos et al., 2015; Díaz et al., 2019; Steffen et al., 2015). Most of the challenges are rooted in the current foundation of the global economy on consumption expansion and the structural imperative for unlimited growth in competitive market economies (Gómez-Baggethun, 2020; Otero et al., 2020; Vadén et al., 2020; Wiedmann et al., 2020). In addition, both the responsibilities and the impacts of the sustainability crisis are unequally shared between different regions and social groups (Agrawal et al., 2019; Díaz et al., 2019; Dorninger et al., 2021; Wiedmann et al., 2020). Despite global efforts to reverse this crisis, many indicators suggest we are still far from changing the main global trajectory towards biodiversity conservation and sustainability (Díaz et al., 2019; Naidoo and Fisher, 2020; Zeng et al., 2020).

Historically, protected areas have been one of the main strategies to address the biodiversity crisis and their importance has been widely recognized internationally (Butchart et al., 2012; Gray et al., 2016; Margules and Pressey, 2000; Watson et al., 2014; Aichi target 11 of the Convention of Biological Diversity, CBD 2010). In order to meet policy obligations at different scales (e.g. to cover at least 17% of all terrestrial land by 2020), protected areas have expanded rapidly over the last decades (Watson et al., 2016). However, conservation action has mainly focused on achieving quantitative targets, without simultaneously addressing the conditions needed to enable protected areas' success (Barnes, 2015; Barnes et al., 2018; Fukuda-Parr, 2014; Gill et al., 2017). Many protected areas have been established on locations that minimize conflict with agriculturally suitable lands (Venter et al., 2018) and some still remain 'paper' parks (Di Minin and Toivonen, 2015), not significantly reducing human pressures on biodiversity compared to unprotected landscapes (Eklund et al., 2019; Geldmann et al., 2019). In addition, many protected areas have been often imposed on local people, and many traditional practices have been limited therein, leading to an exclusionary process that separated people from nature (Agrawal and Gibson, 1999; Anaya and Espírito-Santo, 2018; Palomo et al., 2014; West et al., 2006). Overall, while protected areas have been crucial in tackling biodiversity loss (e.g. Bolam et al., 2020; Hannah et al., 2020; Pacifici et al., 2020), there is an urgent need to develop and implement complementary conservation policies that promote biodiversity beyond protected areas (CBD 2010).

Many strategies have been implemented worldwide to help tackle the biodiversity crisis beyond protected areas (e.g. Convention of Biological Diversity, Sustainable Development Goals). However, no single strategy can provide sufficient transformation towards sustainability and help achieve the full set of international goals of mutual benefits for both people and nature (Chan et al., 2020; Díaz et al., 2019). This is because many contemporary problems, such as biodiversity loss and climate change, can be characterized as “wicked problems” (Defries and Nagendra, 2017; Game et al., 2014; Levin et al., 2012; Sharman and Mlambo, 2012). These problems are typically complex, poorly understood, without readily available solutions, and attempts to resolve them by intervening in a system can lead to unintended consequences (Engler et al., 2020; Levin et al., 2012; Sharman and Mlambo, 2012; Toomey et al., 2017). In addition, challenges may also be related to the fact that they usually involve diverse stakeholders with different worldviews, values and perceptions, power legitimacy and interests (Defries and Nagendra, 2017; Rittel and Webber, 1973; Sharman and Mlambo, 2012). Addressing these complex issues requires transdisciplinary approaches (i.e. reflexive, integrative process between various scholars and non-scholars to address a specific real-world problem; Haider et al., 2018; Lang et al., 2012), in order to better assess the role of multi-scale direct and indirect drivers, while requiring actions and institutions to foster transformative changes in social-ecological systems (Chan et al., 2020; Engler et al., 2020; Fischer and Riechers, 2019; Freeth and Caniglia, 2020; Zafra-Calvo et al., 2020).

1.2 CONSERVATION IN CULTURAL LANDSCAPES

Traditional cultural landscapes integrate the natural and human domains of social-ecological systems as a result of their coupled evolution (Plieninger et al., 2015; Plieninger and Bieling, 2010). In these systems, people have interacted, perceived and shaped landscapes according to worldviews, values, and different cultural and institutional contexts (Chan et al., 2016; Díaz et al., 2018; Fagerholm et al., 2020; Jax et al., 2018; Pascual et al., 2017; Zafra-Calvo et al., 2020). Many cultural landscapes play an important role to conserve biodiversity, ecosystem services and cultural heritage, based on place-based traditional practices, knowledge and culture (Brockington et al., 2018; Fagerholm et al., 2020; Fischer et al., 2012; Plieninger et al., 2006; Strohbach et al., 2015). However, many of these cultural landscapes are threatened by pressures from local and global socio-economic drivers of change (Díaz et al., 2019; Fagerholm et al., 2020; Fischer et al., 2012). These threats at the local scale can have negative consequences on both people (e.g. negative impacts on social cohesion, local economies, access to education; Camarero and Oliva, 2019; McManus et al., 2012; Measham et al., 2012) and biodiversity (e.g. increasing risk of local extinction from habitat loss; Auffret et al., 2018; Cousins et al., 2015; Newbold et al., 2015; Staude et al., 2018). As these cultural landscapes

are dynamic, adaptive and continuously evolving social-ecological systems, there is a need to collaboratively design strategies that would facilitate the emergence of novel sustainable links between people and nature in a changing world (Fischer et al., 2012; Hanspach et al., 2020).

Rural communities can play a key role in contributing to biodiversity conservation and fostering sustainability through environmental stewardship, caring for, and responsibly managing the environment according to diverse motivations and capacities (Bennett et al., 2018; Fischer et al., 2012; Raymond et al., 2016). Therefore, understanding how people relate to places and nature in diverse cultural landscapes is key to identify transformative changes that could integrate sustainable production and biodiversity conservation (Chan et al., 2016; Gooden, 2019; MacGillivray and Franklin, 2015; Masterson et al., 2019; Pascual et al., 2017; West et al., 2018). As many cultural landscapes across the world occur on private land, private land conservation policies, if adequately designed, could help foster landowners' existing and novel links with nature and their environmental stewardship in a way that would benefit both people and nature (Bingham et al., 2017; Gooden, 2019; Kamal et al., 2015; Mitchell et al., 2018; WCPA, 2019).

1.3 PRIVATE LAND CONSERVATION

With privately owned land covering large areas of the world, private land conservation (PLC) is an increasingly recognized strategy to complement protected area networks (Bingham et al., 2017; Cortés-Capano et al., 2019; Kamal et al., 2015a; Mitchell et al., 2018; Stolton et al., 2014). PLC strategies include areas that have a primary conservation objective (i.e. privately protected areas), and areas that contribute to effective in-situ conservation of biodiversity, independently of their primary objectives (i.e. 'other effective area-based conservation measures' Casey et al., 2006; Disselhoff, 2015; Kamal et al., 2015a; Mitchell et al., 2018). If adequately designed, PLC policies have the potential to (i) increase total area managed to contribute to biodiversity conservation, (ii) increase the diversity of stakeholders engaged in conservation management and policy-making, (iii) enhance ecological and socio-economic connectivity and (iv) reduce social conflict (Doremus, 2003; Maciejewski et al., 2016; Paloniemi and Tikka, 2008; Stolton et al., 2014; Wallace et al., 2008). However, designing effective national and sub-national (e.g. municipal) PLC policies is challenging, as it requires interacting with complex, context dependent socio-ecological, institutional, legal and economic processes (Cocklin et al., 2007; Doremus, 2003; Kamal et al., 2015a; Selinske et al., 2017).

Most existing policies to conserve biodiversity on private land are either involuntary, voluntary or a combination of both (Kamal et al., 2015a). In the case of involuntary policies, the decision to engage in PLC is not made by the landowner. As these policies typically involve mandatory land-use regulations or

total acquisition of land made by governments or central authorities in favor of biodiversity conservation, they can create social conflicts (e.g. discussions about property rights, social values and responsibilities; Moon et al., 2020; Rissman, 2016). On the other hand, voluntary approaches are based on landowners' willingness and motivations to engage in conservation initiatives (Kamal et al., 2015a). These policies usually involve diverse types of agreements between landowners and conservation organizations, such as government agencies or non-governmental organizations. The voluntary nature of these policies implies that their success mainly depends on adequately fostering landowners' willingness to engage, in terms of enrolment, permanence and security of conservation agreements. (Farmer et al., 2017; Hardy et al., 2017; Knight et al., 2010; Selinske et al., 2015). This requires conservation organizations to understand how to design policies that would help meet both landowners' preferences and needs, while fostering both biodiversity conservation and the broader society (Clement et al., 2015; Clements and Cumming, 2017a, 2017b; Epstein et al., 2015; Greiner, 2016; Hanley et al., 2012; Selinske et al., 2019, 2017).

Studies in PLC peer-reviewed literature usually focus on understanding factors driving landowners' decisions to participate in already existing PLC programs (e.g. Brenner et al., 2013; Drescher et al., 2017; Farmer et al., 2017; Farmer et al., 2015; Kabii & Horwitz, 2006; Ma et al., 2012; Moon et al., 2012; Selinske et al., 2015; Selinske et al., 2019). For example, these include understanding which policy instruments are preferred and how these preferences vary according to the socio-economic background of landowners (Drescher et al., 2017a; Januchowski-Hartley et al., 2012). Among different policy instruments (e.g. Casey et al., 2006; Disselhoff, 2015), buying property rights (e.g. conservation easements and covenants) or direct payments have been widely assessed as a way to provide monetary benefits in exchange of conservation actions on landowners properties (Casey et al., 2006; Cortés-Capano et al., 2019; Ma et al., 2012; Ruto and Garrod, 2009; Selinske et al., 2017; Sheremet et al., 2018; Villanueva et al., 2017). However, policies relying mainly on monetary benefits can marginalize other motivations for environmental stewardship ("crowding out") and generate financial dependency and expectations among landowners (Chapin and Knapp, 2015; Chapman et al., 2019; Cooke and Corbo-Perkins, 2018; Fischer et al., 2012; Gooden and 't Sas-Rolfes, 2020; Selinske et al., 2017; Yasué et al., 2019; Yasué and Kirkpatrick, 2018). In this sense, providing non-monetary incentives, such as access to trainings or strengthening landowners' social networks could foster their environmental stewardship and provide long term conservation outcomes (Cetas and Yasué, 2016; Cortés-Capano et al., 2020; Selinske et al., 2017). However, the importance of non-monetary incentives to meet landowners' preferences and needs in PLC is still poorly understood (Cortés-Capano et al., 2019). Addressing this gap is particularly important in the Global South, where resources for conservation are likely to be scarce, and where there is an urgent need to identify and implement a set of policy instruments that would help achieve more

equitable and sustainable outcomes (Cortés-Capano et al., 2019; Zafra-Calvo et al., 2020).

1.4 URUGUAY AS A CASE STUDY: CULTURAL LANDSCAPES IN PRIVATE LAND

Uruguay is located in south-eastern South America (Fig.1), within the “Río de la Plata Grasslands” ecoregion, one of the largest grasslands biomes in the continent (Paruelo et al., 2007; Soriano et al., 1992). This ecoregion is one of the most threatened (e.g. land-use change and intensification) and least protected in the world and is mainly found on private land (Bilenca and Miñarro, 2004; Henwood, 2010; Hoekstra et al., 2005; Jacobson et al., 2019; Overbeck et al., 2007). In Uruguay, diverse “old-growth” native grasslands (Behling et al., 2007; Veldman et al., 2015) have been used for traditional cattle ranching since European colonization, leading to the development of different cultural landscapes across the country. However, the area occupied by native grasslands in Uruguay has decreased at least 23% between 1961 and 2011 (OPP, 2015), and still continues to decrease due to the expansion of commercial forestry, crops and pastures (Altesor et al., 2019; Brazeiro et al., 2020; Cortés-Capano et al., 2020; Soutullo et al., 2020). Nevertheless, land-use change in Uruguay has been relatively moderate in the context of the Río de la Plata Ecoregion (Brazeiro et al., 2020) (i.e. ~60% of the country is still covered by native grasslands; Altesor et al., 2019). Since 96% of the land in the country is privately owned and the National System of Protected Areas (SNAP) covers only ~1% of the land (Ávila et al., 2018), this represents a unique opportunity to conduct empirical research in order to collaboratively inform effective and equitable voluntary PLC policies at the local and national scale in the ecoregion (Fig. 1). Beyond the context dependent nature of PLC policies (i.e. low transferability; Moon et al., 2016), lessons learned from the case of Uruguay might provide insights to inform actionable research (Beier et al., 2017) in other cultural landscapes globally.

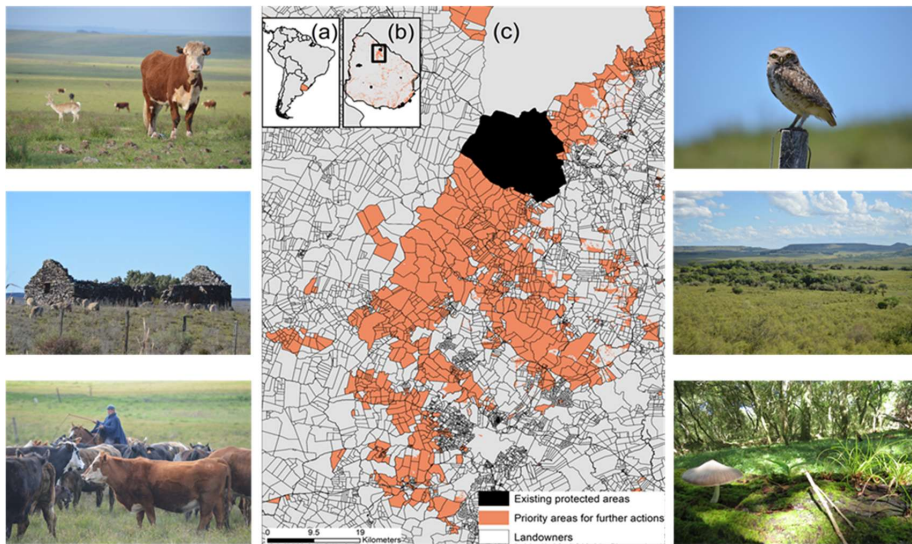


Figure 1. Map of the study areas where the empirical work of this thesis was conducted. (a) Location of Uruguay in South America; (b) map of Uruguay (Chapter III) and location of the cultural landscape addressed in Chapter II, within the country (Chapter III); (c) private landowners properties identified as priorities for the conservation of biodiversity and ecosystem services within the cultural landscape addressed in Chapter II. Our interviews were conducted in a sub-sample of those conservation priority properties (Figure modified from Di Minin et al., 2017). Pictures show examples of cultural landscapes, traditional cattle ranching on native grasslands and biodiversity in Uruguay (credit: Gonzalo Cortés Capano).

2 AIMS OF THE THESIS

As several governments are currently developing and implementing different PLC policies to help achieve global and national conservation targets (Disselhoff, 2015; Stolton et al., 2014; WCPA, 2019), there is a need to assess published scientific literature, identify research gaps, and direct future research. In my doctoral thesis, I aim to identify challenges and opportunities to foster PLC at different geographical scales. I did this by investigating the main trends and gaps in a global PLC literature review, and by assessing landowners' preferences and needs at the local and national levels in Uruguay, as a case study (Fig. 1).

The specific objectives of the thesis are:

- to identify and discuss the main research trends and gaps in PLC literature globally in order to inform future actionable research.
- to understand landowners' relationship with nature, their perceptions of the main problems affecting the area where they live, and their vision of a desired future in order to foster environmental stewardship in a cultural landscape in north-eastern Uruguay.
- to understand landowners' preferences for novel voluntary PLC policies, including both monetary and non-monetary incentives, in order to inform policy-making at the national scale in Uruguay.

The thesis is structured in three Chapters, one literature review at the global scale (Chapter I) and two empirical Chapters (Chapter II and III) at a local and national scale, aiming at addressing geographical and conceptual gaps identified in Chapter I (Fig. 2). Specifically, by using Uruguay as a case study, both empirical Chapters address the underrepresentation in peer-reviewed literature of South America, and particularly the Rio de la Plata grassland ecoregion, in PLC literature. In Chapter II, I addressed the conceptual gap of assessing the relationship between people and nature at the local level, in order to inform context specific voluntary PLC policies in a cultural landscape. In Chapter III, I addressed the conceptual gap of assessing the role of non-monetary incentives in fostering landowners' willingness to participate in voluntary PLC policy at the national level.

In order to address the aims of the thesis, I followed transdisciplinary approaches, combining theories and methods from the natural and social sciences and engaging diverse academic and non-academic stakeholders in the research process. The different approaches and findings of this thesis provide

practical insights to inform policy-making in Uruguay and to conduct actionable research to promote voluntary PLC in other underrepresented regions worldwide.

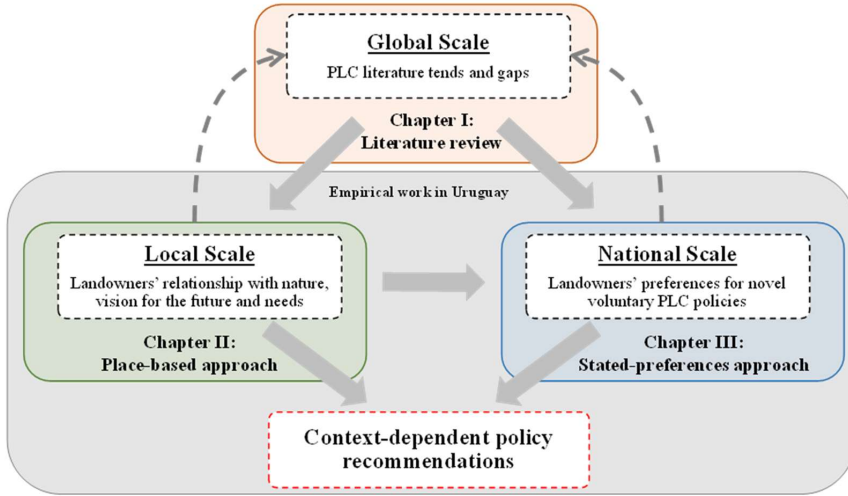


Figure 2. Logical framework of the thesis.

Related to the work conducted and described in this thesis, I have also worked on addressing and developing different PLC initiatives on the ground in Uruguay. By working at the Universidad de la República (Uruguay) and in Vida Silvestre Uruguay (national biodiversity conservation non-governmental organization), I had the opportunity to navigate diverse science-policy interfaces and develop skills that contributed importantly to frame the research questions of this thesis and develop the methodologies to address them. This experience also contributed to build trust with different stakeholders from the public, private and civil society sector, which was crucial to implement the collaborative approach.

3 RESEARCH METHODOLOGY AND METHODS

3.1 NAVIGATING THE “UNDISCIPLINARY” JOURNEY

In order to address the complexity of current environmental wicked problems it is increasingly necessary to actively transcend traditional academic disciplinary boundaries (Adler et al., 2018; Lang et al., 2012; Norström et al., 2020). Accordingly, transdisciplinary approaches to problem-driven actionable research have been increasingly conceptualised, advocated and applied to address conservation and sustainability problems (Beier et al., 2017; Fischer et al., 2015; Lang et al., 2012; Toomey et al., 2017). At different stages of this thesis, I aimed to apply transdisciplinary approaches engaging with, and learning from, academics from different disciplines (e.g. anthropology, agronomy, social psychology, geography, ecology) and non-academic stakeholders (e.g. rural landowners, municipal and national decision-makers, civil society) (Lam et al., 2020; Lang et al., 2012; Tengö et al., 2017). Overall, this collaborative approach provided opportunities to expand the space for the emergence of a wide range of socially acceptable research options. However, as an early career researcher, I encountered numerous theoretical (e.g. ontological, epistemological) and practical (e.g. learning diverse skills) challenges along the way. Navigating these challenges required continued systematic personal and collective reflexivity, which fostered diverse learning (and “unlearning”; Cumming et al., 2013; Nygren et al., 2017) processes along an “undisciplinary journey” (Haider et al., 2018). According to Haider et al., (2018), an undisciplinary journey could be characterised by research questions that require engaging in various research strategies, embracing complexity and uncertainty along the research process. Along this journey, I developed competencies on methodological groundedness (e.g. qualitative data gathering and analysis, quantitative econometric modelling) relevant to address my research questions. In addition, I exercised epistemological agility, continuously reflecting on different ontological and epistemological positions and assumptions, which facilitated the identification of conceptual opportunities and limitations as well as collaboration with diverse stakeholders.

3.2 PHILOSOPHICAL POSITION

By navigating the undisciplinary journey of my theses, I adopted a “critical realism” research position (Nastar et al., 2018). Critical realism accepts that there is a reality but, it also acknowledges the influence of human perception and cognition in shaping it (Bhaskar, 2008; Bhaskar et al., 2010; Collier, 1994; Danermark et al., 2002). Therefore, critical realism differentiates ontology

(i.e. the nature of reality) and epistemology (i.e. the knowledge of reality), recognising that knowledge of the reality is socially produced and therefore plural, fallible and incomplete (Bhaskar, 2008; Bhaskar et al., 2010).

This position proposes that reality is articulated by multiple nested layers with emergent properties (i.e. stratified ontology), including three domains (the empirical, the actual, and the real; Bhaskar, 2008) that the researcher critically investigates. For example, a researcher can observe landowners' land-use decisions on their properties (empirical domain). However, in order to obtain a more comprehensive understanding, the researcher should assess how diverse social-ecological contextual factors at the cultural landscape level might be influencing these decisions (actual domain). Finally, the researcher should always acknowledge that there are other broader factors (real domain) that, although might not be observable, are still influencing the context and the decisions, such as national land-use planning policies, and global market forces (Cockburn et al., 2020). Therefore, as noted by Cockburn et al. (2020), the critical realism position is consistent with social-ecological systems thinking, since it conceives reality as a complex system with non-reducible emergent properties. It encourages methodological pluralism (i.e. the use of qualitative, quantitative and mixed-methods) and transdisciplinary approaches to capture various dimensions of people and nature relationships at multiple scales, while acknowledging the influence of unobservable drivers (Cockburn et al., 2020; Mahmoud et al., 2018; Nastar et al., 2018; Olsson and Jerneck, 2018).

In this thesis, I adopted a critical realism position, and a mix-method approach, in order to account for a multiple set of socio-economic and cultural drivers (e.g. traditional practices, sense of place, formal education level, economic dependency on land, rural exodus) influencing landowners' perceptions and preferences for PLC at the local (Chapter II) and national (Chapter III) scales. However, I also acknowledge that several drivers, ranging from personal circumstances to the influence of global market drivers (e.g. Green et al., 2019; Moon et al., 2012) were not addressed by the research questions in this thesis, but are still important aspects influencing landowners' motivations and needs at different scales that should be addressed in future studies.

3.3 MIXED METHODS DESIGN

The term mixed-methods refers to research that combines quantitative and qualitative approaches, which provide different kinds of information with their own limitations and strengths (Creswell, 2014; Newing et al., 2011). Qualitative methods (e.g. interviews) are appropriate for exploring participant's perspectives on social-ecological phenomena, allowing to take into account different social and cultural aspects (Newing et al., 2011). They are

usually flexible methods and involve different levels of discussion between interviewer and interviewee, facilitating the emergence of unexpected insights. However, qualitative methods generate results which are usually context dependent and their generalization to a wider population should be cautious (i.e. low transferability; Moon et al., 2016). On the other hand, quantitative methods (e.g. questionnaires) provide data that can be analysed using different statistical and modelling techniques, potentially allowing for testing hypotheses and for generalising findings from a sample to a wider population (Newing et al., 2011). However, quantitative methods are less flexible (i.e. predefined set of standardised questions) and are less suitable for accounting for contextually relevant factors (Newing et al., 2011).

In the context of this thesis, I followed a mixed-method approach by combining both qualitative and quantitative methods at different stages of the research process (Brannen, 2005; Palinkas et al., 2019). This was in order to address research questions at different geographical scales, and to obtain a more comprehensive understanding of landowners' motivations, needs and preferences for voluntary PLC policies. The following paragraphs briefly summarise the main methodological approaches used in Chapter I (literature review), Chapter II (place-based approach) and Chapter III (stated preference methods) (Table 1). Across chapters, I followed an exploratory sequential mix methods approach (Creswell, 2014), in which findings from the qualitative interviews at the local level (Chapter II), were used to inform the design of a national level survey that would adequately integrate context dependent factors (Chapter III). Both Chapter II and III were informed by the literature review in Chapter I, by directing research towards addressing global gaps. More details about the methods used can be found in the chapters.

Table 1. *Mixed methods used for data collection and analysis in each of the chapters.*

	Qualitative methods	Quantitative methods
Chapter I	Critical reading of literature, topic identification and assessment	Content analysis, descriptive statistics
Chapter II	Critical reading of literature, stakeholder analysis, workshops with diverse stakeholders, informal discussions, qualitative interviews, community validation	
Chapter III	Critical reading of literature, focus groups, interviews	Choice experiment, mixed logit model

3.3.1 LITERATURE REVIEW

In Chapter I, I conducted a global scale review of peer-reviewed literature on PLC policies and strategies to identify research trends and gaps. The review

combined quantitative with qualitative approaches (Grant and Booth, 2009) (Table 1). First, in order to identify the relevant articles to be analysed I conducted a comprehensive keyword search including a broad set of synonyms for PLC in different countries and regions to account for the context-dependency in terminology. Then, I read all abstracts to ensure inclusion of articles addressing PLC policies, policy instruments, actions, and/or analysing their effectiveness and impacts on biodiversity conservation. Based on critical readings on the PLC literature and on the aims of the study, I qualitatively identified a set of topics of interest and classified each paper according to: (i) countries where the studies were conducted, (ii) conservation actions and policy instruments addressed, and (iii) stakeholder sectors reported to be engaged during the research process. In addition to this qualitative approach, I conducted quantitative analyses to describe the main trends and gaps in the literature. Finally, I performed a content analysis to identify most frequent topics present in the articles' abstracts. This complementary approach allowed me to obtain a comprehensive understanding of the literature, which was then used to inform both chapters II and III, together with extensive literature reviews on the addressed topics of each chapter.

3.3.2 PLACE-BASED APPROACH

Place-based research addresses the context-specific characteristics of different landscapes, explicitly taking into account the social–ecological dynamics of the system (Carpenter et al., 2012). Place-based empirical research can potentially facilitate active learning about the practice of stewardship in social–ecological systems that emerge from the interactions between people and nature (Cockburn et al., 2018). According to Balvanera et al. (2017), a successful place-based project can promote shared understanding of the social-ecological context between researchers and local communities while facilitating the identification of socially acceptable policy recommendations.

In Chapter II, I implemented a place-based collaborative approach to understand landowners' relationship with nature, their perceptions of the main problems affecting the area, and their vision of a desired future in a cultural landscape in Uruguay. In order to do so I applied the following methods: stakeholder analysis, workshops and qualitative interviews. Analyses followed constructivist analytic methods (Charmaz, 2006), iteratively integrating inductive (i.e. grounded in the views and experiences of the participants) and deductive (i.e. inquiring about topics related to existing theoretical frameworks, such as sense of place and stewardship) approaches (Gooden, 2019; Moon et al., 2016).

3.3.2.1 Stakeholder analysis

Stakeholders are the parties whose interests may be affected by an action or who can influence a process (e.g. policy-making or implementation), using means at their disposal, such as power, legitimacy, and existing ties of collaboration and conflict (Reed et al., 2009). In order to adequately engage stakeholders in the study area, in Chapter II I identified and characterized them according to their legitimacy, power, interests and relationships following Chevalier and Buckles (2008).

3.3.2.2 Workshops

In Chapter II, I conducted multiple workshops with diverse stakeholders (e.g. landowners, academics, managers, decision-makers). These workshops were conducted before, during and after the study in order to i) refine the overall scope of the study; ii) refine research questions and methods; iii) refine the geographical boundaries of the study area; iv) discuss the validity of our interpretations; and v) discuss the implications of the results for future policy-making. This method was key to implement the collaborative approach in practice, engaging stakeholders to adequately address complex science-implementation spaces (e.g. Reed et al. 2009; Sterling et al. 2017; Toomey et al. 2017).

3.3.2.3 Qualitative interviews

In Chapter II, I conducted qualitative interviews, in order to get in-depth understanding on landowners' perceptions and to facilitate the emergence of unexpected insights (Newing et al., 2011). While the interviews were flexible to follow landowners' interests, the main topics discussed covered their sense of place, their relationship with nature, the main problems perceived to be affecting the area and their vision for a desired future. As the approach was not based in any pre-conceived normative definition of nature conservation, I also inquired about their perception in order to inform future culturally appropriate actions and avoid social conflicts (Crow and Baysha, 2013; Peterson et al., 2010).

3.3.3 STATED-PREFERENCE APPROACH

Stated preference methods have been widely used to assess people's preferences for non-marketed goods, services and novel policies (Adamowicz et al., 1998; Hanley et al., 1998; Hanley and Czajkowski, 2019). One of the main approaches to stated-preference assessments are choice experiments, which allow to explore people's choices in experimentally controlled hypothetical settings (Hanley and Czajkowski, 2019). Respondents to a choice experiment are asked to indicate their preferred choice between alternative options showing a combination of attributes, defined by their levels (Hanley and

Czajkowski, 2019). People's choices allow the relative values placed on each attribute to be statistically estimated (Adamowicz et al., 1998; Hanley et al., 1998; Hensher et al., 2005). Compared to what is observable in real world situations, choice experiments allow for more variation in the attributes and levels defining novel policies (Adamowicz et al., 1998; Rabotyagov and Lin, 2013; Train, 2009). In addition, combined with surveys and qualitative methods, it is possible to further explore the influence of a range of respondents' socio-economic background, attitudes and values on their preferences, while accounting for non-observed sources of heterogeneity as random elements.

In chapter III, I designed and implemented a choice experiment to assess landowners' preferences for different novel voluntary PLC policies at the national level in Uruguay. Policies were designed based on findings from Chapters I and II, and by following a multi-stage collaborative process (i.e. literature review, focus groups and interviews; Greiner, 2015). Novel policies included both monetary and non-monetary incentives, and requirement or "costs" (conservation action and contract length). Preferences were assessed by using an online survey in Spanish language. Moreover, I assessed the influence of a range of landowners' socio-economic background and cultural aspects on their heterogeneity of preferences by using a mixed logit model (Broch et al., 2013; Greiner et al., 2014; Mariel et al., 2013).

3.3.3.1 Focus groups and interviews

Focus groups are a common approach when designing efficient and culturally appropriate choice experiments (Greiner et al., 2014; Hensher et al., 2005). In Chapter III, during the design of the survey I conducted multiple face-to-face focus groups discussions and interviews with a diverse group of stakeholders from the public, private and non-governmental sectors (e.g. practitioners, decision-makers, academics and landowners). Participants were recruited following a combined approach including purposive sampling informed by stakeholder analysis and snowball sampling, asking interviewees to recommend other participants (Newing et al., 2011). Participants were asked to provide feedback on the selection of relevant attributes and levels that were perceived to be understandable and important to landowners, while being feasible to implement by conservation organizations working in the country. In addition, respondents were asked to provide feedback related to the use of culturally appropriate content and clarity of the survey. The survey was adapted, piloted and finalised after feedback.

3.3.3.2 Online survey

In order to implement the choice experiment, I designed and distributed an online survey. The survey was structured in three parts: i) an introduction to

obtain informed consent; ii) the choice alternatives; and iii) the questions about socio-demographic background and other preferences and motivations (Chapter III). Compared to face-to-face interviews, an online survey allowed me to i) carry out a country-wide survey to reach out a larger proportion of the landowners' population; ii) ensure full anonymity of respondents (no personal identifiers were collected); and iii) avoid an intrusive approach which may motivate strategic responses (Lindhjem and Navrud, 2011; Menegaki et al., 2016). The link to the online survey was distributed within landowners' networks and organisations at a national level through pre-existing email lists and social media groups. It was also advertised via radio interviews.

4 MAIN RESULTS AND DISCUSSION

This thesis highlights that private land conservation research is a growing field in the global biodiversity conservation literature (Chapter I). However, the field has been mainly developed on a limited set of geographic locations, addressing a relatively narrow set of topics and policy instruments, while poorly reporting stakeholders' engagement in research. The growing PLC literature provides important contributions and insights to the understanding of the multiplicity of factors influencing PLC success and to inform further research. However, considering that most processes involved in PLC are typically context-dependent (Cooke et al., 2012), it is important to address the geographical and conceptual gaps identified in Chapter I in order to advance into a more comprehensive understanding of PLC that would help inform policy-making across regions. My in-depth results at the local scale in a cultural landscape in Uruguay (Chapter II) revealed opportunities to promote voluntary PLC by supporting landowners' current environmental stewardship. However, such policies would need to account for landowners' identity, values and needs, while aligning with broader social and rural development goals. Similarly, results at the national scale, in Chapter III, showed that landowners in Uruguay are willing to engage in voluntary PLC if policies would meet their preferences in terms incentives and conditions (e.g. allowing for traditional cattle ranching inside conservation areas). Designing a diverse set of policy instruments, including monetary and non-monetary incentives, would help foster participation in future PLC initiatives by addressing the diversity of participants' values, motivations, expectations, and experiences (Chapter III).

Overall, my thesis shows the importance of conducting research at different scales, following collaborative transdisciplinary approaches in order to get a more comprehensive understanding of social-ecological phenomena. This is also by taking into account different worldviews, perspectives, preferences, drivers and to expand the set of context specific options to foster voluntary conservation. At the same time, navigating some of the inherent multiscale complexities of PLC revealed different key issues that could not be addressed in this thesis, such as the influence of global market drivers, national and local institutions and governance schemes. Adequately addressing these issues in future actionable research could help inform the design of more effective legitimate and equitable policies within and across contexts.

4.1 GLOBAL SCALE: TRENDS AND GAPS IN PLC LITERATURE

The results from the global literature review revealed a strong geographical bias with most scientifically published research conducted in four countries only, the U.S.A., Australia, South Africa and Canada (Fig. 3) (Fitzsimons, 2015; Maciejewski et al., 2016; Merenlender et al., 2004; Schuster et al., 2017). In order to understand how variations in local contexts might influence policy outcomes, my findings show that there is need to conduct more research in different underrepresented geographical regions, where land is mostly privately owned (Cetas and Yasué, 2016; Cooke et al., 2012; Selinske et al., 2017; Sorice and Donlan, 2015). Beyond this geographical bias, literature content revealed some degree of heterogeneity in terms of the topics addressed in different continents, which might contribute to the understanding of regional needs and opportunities to increase PLC impact on the ground.

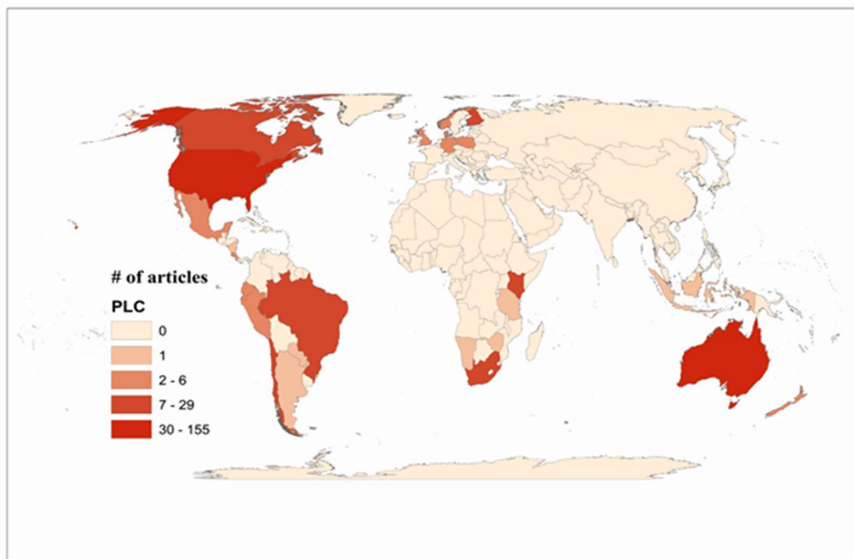


Figure 3. Global distribution of private land conservation peer-reviewed articles in English, classified according to the countries where the studies were conducted. Colour classification shows the number of articles per country and was prepared using the geometrical interval method in ArcMap™ (Esri- ArcGIS®).

I found that literature mostly focused on addressing property rights policy instruments (e.g. conservation easements and covenants) as a way to promote biodiversity conservation on private land (Fig. 4). Conservation easements generally focus on restricting development and preventing land use change, rather than on fostering stewardship and adaptive management (Rissman et

al., 2013; Rissman, 2016). However, I found that only few articles addressed their effectiveness and long-term conservation security (e.g. Braza, 2017; Byrd et al., 2009; Copeland et al., 2013; Farmer et al., 2017; Hardy et al., 2017; Pocewicz et al., 2011; Selinske et al., 2019). Since, investing in property rights acquisitions is becoming an increasing practice internationally, there is an urgent need to assess their implications in different socio-political contexts, particularly with regards to the effectiveness of public expenditure, transparency and equity (Cooke and Corbo-Perkins, 2018; Rissman et al., 2017).

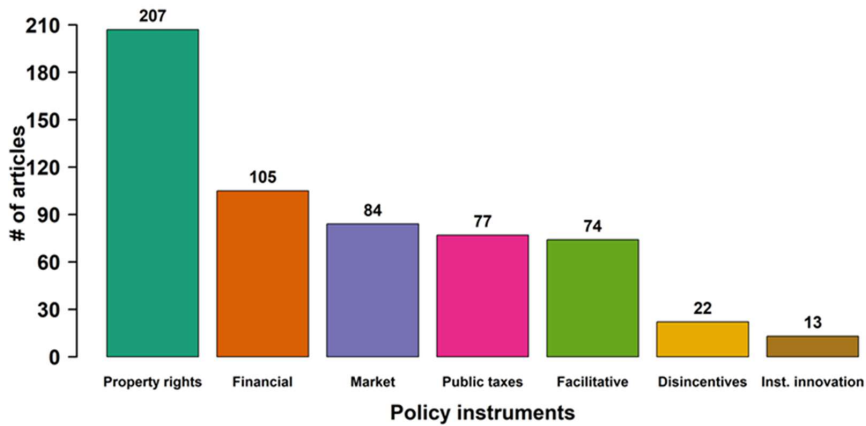


Figure 4. Barplot showing the number of scientific peer-reviewed articles in English addressing different private land conservation policy instruments. Note that a given article can address more than one policy instrument.

Finally, in spite of recent emphasis on stakeholders’ engagement in conservation research (Reed et al. 2009; Sterling et al. 2017; Toomey et al. 2017), almost half of the PLC studies did not report any stakeholder sector engagement in their research processes and cross-sector stakeholders’ engagement was often missing (Fig. 5). Integrating different stakeholders’ perspectives into research and decision-making is a crucial aspect that could potentially lead to the formulation of more legitimate and actionable policy proposals (Beier et al., 2017; de Vente et al., 2016; Jolibert and Wesselink, 2012). While stakeholders’ engagement in research might not always be fully documented in peer-reviewed articles (Jolibert and Wesselink, 2012), it would be important to improve its documentation to increase future learning opportunities.



Figure 5. Reported stakeholders' engagement in private land conservation scientific peer-reviewed articles in English, shown as the number of articles reporting the engagement of none, one, two and three stakeholder sectors (i.e. private, public and civil society) in the research process.

4.2 LOCAL SCALE: ENVIRONMENTAL STEWARDSHIP IN A CULTURAL LANDSCAPE

In Chapter II, by implementing a place-based approach (Balvanera et al., 2017) in a cultural landscape in Uruguay, I found that landowners considered themselves and their neighbours as stewards of local nature and culture. In line with the recent examinations of human nature relationships in social-ecological systems literature (Díaz et al., 2018; Enqvist et al., 2018; Jax et al., 2018; Pascual et al., 2017; West et al., 2018), I found that landowners' perceptions of local environmental stewardship were strongly mediated by their perceived benefits and conflicts with nature and their sense of place. Similar to the findings by Raymond et al. (2016), landowners showed an holistic understanding of stewardship, recognizing complex interdependencies between food production (cattle ranching) and ecological systems. Traditional cattle ranching on native grasslands was a core element of their stewardship, underlying self-identity, social cohesion and daily connections with nature (Díaz et al., 2018; Hall, 2019; IPBES, 2018; Modernel et al., 2016; Pascual et al., 2017). These results suggest that traditional conservation approaches failing to recognize existing links between people and nature (e.g. increasing regulations or buying property rights) are unlikely to foster environmental stewardship and provide long-term conservation outcomes in cultural landscapes (Bennett et al., 2019b; Bohnet and Konold, 2015; Chapman et al., 2019; Fischer et al., 2012; Moon et al., 2019). Instead, designing policies that would support existing local environmental stewardship, aligned with landowners' motivations and

needs, offer unique opportunities to meet socio-economic and ecological goals in the long term (Cetas and Yasué, 2016; Rueda et al., 2019).

Developing a shared understanding of the locally perceived problems and threats is key to support and further incentivize local stewardship in cultural landscapes (Bennett et al., 2018; Enqvist et al., 2018; Moon et al., 2019). In this sense, the in-depth approach used in Chapter II helped reveal that rural exodus and shrubland and forest encroachment were among the main pressures perceived to threaten the long-term economic, social and environmental sustainability in the area. In Chapter II, I discuss specific policy recommendations emerging from the study to help address some of the locally perceived problems (Fig. 6).

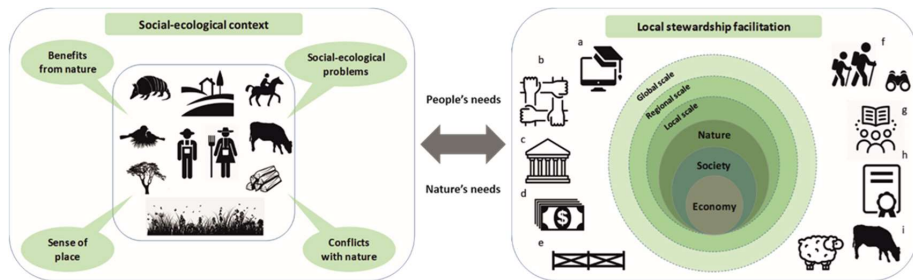


Figure 6. Conceptual model of our collaborative place-based approach. The approach is based on understanding landowners' perceptions on the main dimensions of the local social ecological context (sense of place, benefit and conflicts with nature and social-ecological problems) and their vision for the future to identify a set of policy instruments, based on people's and nature's needs, that would facilitate local stewardship and sustainable production in the long term. Some of the policy instruments that could potentially be implemented in our study area are: a) access to remote secondary education programs and capacity building; b) landowners networks; c) technical assistance from interdisciplinary teams; d-e) cost-share incentives to assist with the implementation of conservation actions; f) support to develop ecotourism initiatives; g) integration of different knowledge systems (e.g. local, academic) to find solutions to local problems; h-i) support to develop sustainable production and ecotourism certification schemes.

For example, landowners expressed the need for receiving support to enhance their autonomy, competence and relatedness, in line with insights from self-determination theory (Cetas and Yasué, 2016). In the context of future voluntary PLC policies, landowners suggested to include non-monetary incentives rather than only payments for conservation. Among the incentives, they mentioned the need for building local capacities (e.g. through trainings and workshops) and for accessing technical assistance from interdisciplinary teams (e.g. agronomists and conservationists working together). According to their views, these instruments might help mitigate rural exodus and address land management challenges respectively (Deotti and Estruch, 2016; Li et al., 2019). Overall, my results showed that biodiversity conservation goals in this

cultural landscape cannot be pursued in isolation from social and rural development goals (Hanks, 1984; Mikulcak et al., 2013) and need to consider already existing local environmental stewardship in order to succeed.

4.3 NATIONAL SCALE: LANDOWNERS' PREFERENCES FOR NOVEL PLC POLICIES

While there is a global growing tendency to foster landowners' engagement in conservation by providing financial incentives (Chapter I), in-depth findings at the local scale in Uruguay (Chapter II) revealed that policies relying mainly on these instruments might marginalize other motivations for environmental stewardship. In order to bridge these global trends and local findings, in Chapter III I conducted a national scale assessment of landowners' preferences for novel voluntary policies, including both monetary and non-monetary incentives. Overall, I found that landowners in Uruguay showed positive interest in joining voluntary PLC programs with heterogeneous preferences for policies according to their socio-economic background. In line with local scale findings in Chapter II, monetary incentives were also not the main attractor for landowners to participate in future PLC policies at the national scale. Instead, non-monetary incentives were mostly preferred, given that cattle ranching would be allowed inside those conservation areas. As found in Chapter II, cattle ranching on native grasslands is a core element of landowners' environmental stewardship and livelihoods. In Uruguay, traditional cattle ranching on native grasslands is also a key aspect supporting land management inside and outside protected areas (Cortés-Capano et al., 2020; de Freitas et al., 2019; Lapetina, 2012; Modernel et al., 2019). Recent findings at the global level showed that Sustainable Development Goals and Nature's Contribution to People can benefit, with no significant adverse trade-offs, from improving land grazing and livestock management (Hall, 2019; McElwee et al., 2020; Proença and Teixeira, 2019). Overall, my findings showed that integrating context-specific social-ecological characteristics is a crucial aspect to maximize landowners' participation and design effective, legitimate and equitable PLC policies (Cooke et al., 2012; Moon et al., 2014; Raymond and Brown, 2011).

While policies centred around monetary incentives may create financial dependency among landowners (Clements and Cumming, 2018; Gooden and t Sas-Rolfes, 2020; Selinske et al., 2017; Yasué and Kirkpatrick, 2018), policies designed to build landowners' capacity might foster their intrinsic motivations and stewardship in the long-term (Cetas and Yasué, 2016; Gooden and Grenyer, 2019). In Chapter III, I found that non-monetary incentives were particularly important for landowners with lower formal education levels and owning smaller properties. Integrating this result into future PLC policies design at the national level might help achieve biodiversity conservation, while fostering broader social and rural development aims (Cortés-Capano et al.,

2020; Hanks, 1984; Mikulcak et al., 2013). In addition, similar to other contexts, landowners in Uruguay preferred policies with shorter contract length agreements (e.g. Espinosa-Goded et al., 2010; Hanley et al., 2012; Horne, 2006; Layton and Siikamäki, 2009; Sheremet et al., 2018; Sorice et al., 2013). However, I found that landowners already participating in either production or conservation groups preferred to engage in longer-term agreements and were more interested in allocating larger proportions of their properties to biodiversity conservation. Therefore, fostering existing landowners' networks (e.g. exchange of diverse knowledge, skills and resources) may increase engagement in the long term while facilitating the coordination of conservation actions across property boundaries and social learning (Banerjee et al., 2017; Cortés-Capano et al., 2020; Duff et al., 2017; Hoffman, 2017; Kuhfuss et al., 2016; Maciejewski et al., 2016). Overall, my results suggest that designing a diverse set of policy instruments, including monetary and non-monetary incentives and flexible options regarding contract length, would help foster participation and long-term engagement based on addressing the diversity of participants' values, motivations, expectations and experiences.

4.4 REFLECTIONS ABOUT SCALE IN PRIVATE LAND CONSERVATION

Understanding multiple and complex problems related to scale, and particularly how institutions and policies might fit social-ecological systems structure and dynamics, is central for research and decision-making in biodiversity conservation and sustainability (Cumming et al., 2013; Epstein et al., 2015; Fischer et al., 2015; Folke et al., 2011; Häyhä et al., 2016; Liu et al., 2018; Ostrom, 2009; Sterling et al., 2017; Wu, 2019). Although comprehensively addressing these issues is beyond the scope of this thesis, I discuss here some reflections related to PLC.

Following up from a critical realism position, understanding wicked problems, such as biodiversity loss and the efficacy of PLC policies, requires assessing multiple levels of reality at different spatial and temporal scales (Bhaskar et al., 2010; Cockburn et al., 2020). This is because, the world is stratified and different scales will exhibit emergent and unique mechanisms and properties, which are often non-reducible to other scales. For example, while global studies are important to get broad understanding of trends and gaps in research (Chapter I), the information produced at such a broad scale might fail to capture context-specific values, perspectives and needs at policy-relevant scales (e.g. local and national, Chapter II and Chapter III respectively) (Brockington et al., 2018; E.J. Sterling et al., 2017). In the context of exploring opportunities to develop PLC policies at national scales (Chapters III), first assessing landowners' motivations and needs at the local scale (Chapter II), is important to understand the conditions that would facilitate the implementation of socially and culturally appropriate policies, that would benefit both

people and nature. However, challenges may also emerge when generalising information from local to a broader scale, as it might not reflect the specific place-based characteristics across social-ecological contexts. For example, while the findings on preferences for PLC policies in Uruguay filled important information gaps in the global literature (e.g. role of non-monetary incentives to increase policy participation, Chapter II and Chapter III), their transferability to broader scales and other contexts would require applying critical comparative case-study approaches (Cockburn et al., 2020). More studies aiming to increase understanding of diverse systems are, therefore, needed and could be integrated in comparative case studies in order to identify cross-context general principles (e.g. Balvanera et al., 2017; de Vente et al., 2016; Fagerholm et al., 2020; García-Martín et al., 2018).

Contextualising the role of PLC within broader social, economic and political drivers operating at different scales is also crucial in order to adequately identify potential opportunities and constraints. This means that it is important to assess how different “external” conditions, operating at various scales, might facilitate or limit the efficacy of PLC policies (e.g. funding, telecoupling, policy regimes, market drivers) (Clements et al., 2020; Díaz et al., 2019; Green et al., 2019; Leverkus et al., 2020; Martín-López et al., 2019; Paavola et al., 2009; Rocha et al., 2019; Waldron et al., 2013; Zimmerer et al., 2018). In Chapter II, rural exodus was perceived at the local scale to be one of the main pressures that threaten the long-term economic, social and environmental sustainability of the cultural landscape. Far from being a local problem, rural exodus is a complex global issue, causing the shrinkage of rural communities’ economies and autonomy (Li et al., 2019). While my thesis shows that culturally appropriate PLC policies might help foster local environmental stewardship, it would be important to understand how other global drivers, which are beyond the scope of locally crafted policies, might hinder their long-term success. Moreover, in a recent study conducted in South Africa, landowners identified threats to PLC interacting across scales, namely direct threats to biodiversity within properties (e.g. poaching, alien invasive species) and socio-economic threats at broader scales (e.g. national policies, global economic fluctuations) (Clements et al., 2020). While such an in-depth analysis extends beyond the scope of this thesis, my results revealed the need for further studies assessing potential opportunities and constraints arising from multiple-scale drivers in PLC. Analysing different scales and following transdisciplinary approaches would provide a more comprehensive understanding of complex social-ecological phenomena, facilitating the co-production of actionable knowledge (Bhaskar et al., 2010).

4.5 INSIGHTS TO INFORM VOLUNTARY PLC POLICY-MAKING IN URUGUAY

Since most of the land in Uruguay is privately owned, voluntary PLC can play a key role in promoting biodiversity conservation and sustainable development at the local and national scales. As a signatory to the CBD and with limited resources for implementing conservation actions, voluntary PLC is also important to help meet national and international biodiversity conservation targets. While the voluntary PLC has been officially recognized (Law N° 19.535, Article 163, October 2017, <https://www.impo.com.uy/bases/leyes-originales/19535-2017/163>), the policy still lacks instruments and has not been developed or implemented yet. Di Minin et al. (2017) identified priority areas for the conservation of biodiversity and ecosystem services at the cadastral level in Uruguay. In order to enhance implementation and identify the most appropriate PLC policies, there was a need to understand landowners' perspectives and preferences. In this context, both the collaborative processes implemented in this thesis and the results aimed at providing actionable information to assist policy-making at the local and national scales. In Chapters II and III, I provided specific policy recommendations for doing so, based on empirical observations emerging from the studies (for more details see respective chapters). These results can also be channeled back into a national spatial conservation prioritization that considers opportunities for implementation based on the preferences and socio-economic information of the respondents. In Box 1, I briefly suggest a non-exhaustive series of aspects that, based on my results and on a critical reading of the PLC literature, should be considered in the policy-making processes and further addressed in future studies in order to foster PLC in Uruguay.

BOX 1. INSIGHTS FOR VOLUNTARY PLC POLICY-MAKING IN URUGUAY

Stakeholders' engagement and participation: considering that a wide range of stakeholders might be interested or affected by the implementation of PLC policies, these policies should be developed collaboratively, engaging a diverse set of stakeholders from the public, private and civil society sectors, at different stages of the policy-process (e.g. Reed et al. 2009; Sterling et al. 2017; Toomey et al. 2017). The participation processes should be carefully designed addressing among other factors, power relations, legitimacy and conflicts of interest, aiming to build trust and collaboration between stakeholders (de Vente et al., 2016; Hurlbert and Gupta, 2015; Reed et al., 2018). In addition, a fair and transparent flow of information could foster social learning (e.g. from communication to co-production) (Clements et al., 2018; Reed et al., 2018).

Plural policies: as a result of the collaborative processes, future policies should have broad goals explicitly acknowledging the plurality of values, knowledge systems (e.g. academic, local) preferences, motivations and needs of different stakeholders.

Recognition and governance: Promoting voluntary conservation in a way that would contribute to broader transformative changes towards sustainability in Uruguay (Abson et al., 2017; Fischer and Riechers, 2019) would require addressing different complex issues at different scales (e.g. rural exodus, Chapter II). Future policies in Uruguay should recognize and support already existing conservation and sustainable development initiatives (e.g. on the ground conservation programs) at different scale, from the public, private and civil society sectors. Existing and future initiatives should be integrated within adequate governance schemes that would foster a better fit of institutional and social-ecological systems dynamics (e.g. polycentric governance) (Epstein et al., 2020; Oberlack et al., 2018; Ostrom, 2010).

Policy instruments and resilience: future policies should implement a diverse set of policy instruments and flexible agreements to account for landowners' heterogeneous needs and to help address some of the locally perceived problems. Since there are numerous drives of uncertainty influencing the success of PLC, these instruments should aim at fostering resilience at different scales, from the individual property level to the landscape and national scale. For example, policy instruments to foster resilience at the property level might include providing support to: i) diversify current business models (e.g. integrating ecotourism and cattle ranching); ii) improve land management, increasing native grasslands resilience to extreme climatic events such as severe droughts; Modernel et al., 2019) and; iii) build capacity for long-term conservation and sustainable production fostering landowner' autonomy and self-efficacy (Cetas and Yasué, 2016; Selinske et al., 2019). In addition, fostering multi-stakeholders networks could help enhance resilience at the landscape and national scale by facilitating the coordination of conservation actions across property boundaries and the exchange of diverse knowledge, skills and resources (Banerjee et al., 2017; Cortés-Capano et al., 2020; Duff et al., 2017; Hoffman, 2017; Kuhfuss et al., 2016; Maciejewski et al., 2016).

Monitoring: in order to evaluate PLC policies effectiveness it would be necessary to design and implement monitoring systems that would: i) capture diverse ecological, social and psychological dimensions contributing to biodiversity conservation and sustainable production (Selinske et al., 2015, 2019); ii) enable adaptive management and governance of complex social-ecological systems (Folke et al., 2005; Schultz et al., 2015; Waylen et al., 2019) and; iii) be based on culturally grounded indicators (Eleanor Sterling et al., 2017).

Part of the work I conducted in this thesis was performed under a project supported by the Uruguayan Ministry of Housing, Land Planning and Environment (project URU/13/G35) In this context, I prepared different reports in Spanish language in order to inform on the ground policy-making (e.g. (Cortés-Capano et al., 2018, 2017; Fernández et al., 2017). In order to build institutional capacities, reports also included methodological protocols on how to inquire about landowners' motivations and needs at the local level (e.g. stockholder analysis, interview design). Moreover, as part of the collaborative approach, I presented the main results of this thesis in different national and regional venues (e.g. meetings, conferences and seminars), and in different radio interviews, in order to reach a diverse stakeholders audience in Uruguay.

5 CONCLUDING REMARKS

There is no single strategy that would provide a comprehensive solution to our current global crisis of biodiversity, there is no panacea (Chan et al., 2020; Ostrom et al., 2007). Although PLC policies can potentially contribute to the necessary wider societal transformation towards sustainability, their contribution is limited as they are only a piece of a bigger puzzle. Hence, we need to understand how to better fit these policies into broader societal goals towards sustainability and how they may contribute to human well-being and biodiversity conservation (Gooden, 2019; Horton et al., 2017; G. N. Wallace et al., 2008; Yasué et al., 2020). If PLC policies are not contributing to foster environmental and social justice, they may create unexpected negative impact on people (Bennett et al., 2019a). For example, researchers have warned that the emergence of PLC in some contexts has led to negative impacts such as cultural conflicts, exclusion of people to resources and decision-making, and green grabbing (Benjamin Cooke and Corbo-Perkins, 2018; Gooden and 't Sas-Rolfes, 2020; Holmes, 2015, 2014, Serenari et al., 2017, 2015). Reversing unwanted outcomes (e.g. negative attitudes towards conservation, further disconnection between people and nature) may require much higher efforts from stakeholders and become more challenging (Bennett et al., 2019b; Bennett and Dearden, 2014; Chapman et al., 2019). However, these challenges should not prevent us from action. Instead, it urges us to increase our efforts to understand the complexity behind socio-ecological systems and to navigate science-policy interfaces. There are promising platforms contributing to these efforts, such as the Intergovernmental Platform for Biodiversity and Ecosystem Services (IPBES), which is promoting the integrations of scales and different knowledge types, engaging diverse stockholders in the processes. In addition, other examples may include the Programs on Ecosystems Change and Society (PECS) (Balvanera et al., 2017; Carpenter et al., 2012), Future Earth (van der Hel 2016), and ENVISION project (<https://inclusive-conservation.org/the-project/>). In addition, recognizing already existing successful initiatives, such as the “Seeds for a good Anthropocene” initiative (<https://goodanthropocenes.net/>), may help learning best practices from a diverse set of examples at the global level. Adequately integrating PLC into these broader initiatives may help to add another piece in the sustainability solutions puzzle.

In order to better understand and steer the contribution of PLC policies in the broader context of transformative change towards sustainable pathways, it might be insightful to observe these policies through the lens of leverage points for sustainability. Leverage points are places in a system where a small change could lead to a proportionally large shift in systems' behaviour and outcomes (Abson et al., 2017; Chan et al., 2020; Fischer and Riechers, 2019; Meadows, 2009). According to this approach, there are different points to intervene in a

system, with an increasing level of transformative potential. PLC conservation policies, if adequately implemented (e.g. integrating stakeholders motivations and needs), can potentially be used to intervene in the “design” of a systems by introducing new rules, such as incentives and regulations to environmental governance (Fischer and Riechers, 2019). In addition, as suggested in Chapter II, by fostering landowners’ social-cohesion and collaboration grounded in rurality (e.g. exchange of diverse knowledge, skills and resources), PLC policies may help promote self-organization and facilitate resilience to emerging socio-ecological disruptions (Leap and Thompson, 2018). These are considered relatively deep leverage points, where interventions are difficult and require deeper understanding and engagement at societal level but have great potential to foster transformative changes towards sustainability (Abson et al., 2017; Fischer and Riechers, 2019).

To conclude, at the time when this thesis synopsis is being written, the global COVID-19 pandemic is causing unprecedented worldwide health, economic, social and environmental impacts, with uncertain consequences for global and regional sustainability (e.g. Corlett et al., 2020; Guerriero et al., 2020; Johns Hopkins Coronavirus Resource Center, 2020; Marco et al., 2020). Diverse stakeholders (e.g. decision-makers, civil society, academics) are increasingly discussing about the urgency of shifting current development paradigms. These include, for example, to reduce pressures on biodiversity, promote resilient and fair food production systems, developing coordinated and preventive health systems and overall, to integrate local, national and global scale solutions (e.g. Béné, 2020; Fatiou and de Paula, 2020; Naidoo and Fisher, 2020; Oldekop et al., 2020; Paul et al., 2020). The magnitude of such complex global issues might generate the impression that local actions may be unable to address these challenges (Bennett et al., 2018). However, engaging into local environmental actions may provide ways for people to develop meaningful experiences (Ives et al., 2019), to imagine alternative futures (Wyborn et al., 2020) and to promote transformative changes towards sustainability (Bennett et al., 2018; Chan et al., 2020). Reflecting on this, I hope this thesis makes a contribution both to the scientific literature and to expand the space for the emergence of a wide range of policy options to foster environmental stewardship on the ground.

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6 ORIGINAL PUBLICATIONS

CHAPTER I

Cortés-Capano, G., Toivonen, T., Soutullo, A., & Di Minin, E. (2019).
The emergence of private land conservation in scientific literature: A review.
Biological Conservation, 237: 191-199.
doi.org/10.1016/j.biocon.2019.07.010



Contents lists available at ScienceDirect

Biological Conservation

journal homepage: www.elsevier.com/locate/biocon

Review

The emergence of private land conservation in scientific literature: A review

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ARTICLE INFO

Keywords:

Biodiversity
 Conservation easements
 Conservation actions
 Policy instruments
 Private land conservation
 Stakeholders

ABSTRACT

Private land conservation (PLC) is an important means for achieving global conservation targets. We reviewed peer-reviewed literature focussing on PLC to summarize past scientific evidence and to identify research trends and gaps to direct future research. We carried out an in-depth review of 284 scientific articles and analysed where, when and in what context PLC has been studied. Specifically, we (i) assessed where and when PLC studies took place and which topics they covered; (ii) identified the most addressed conservation actions and policy instruments, and (iii) investigated whether stakeholders' engagement during research processes was reported or not. We found that (i) there has been an increase in the number of scientific PLC publications over time; (ii) 78% of the articles in scientific journals focussed on four countries only (United States of America, Australia, South Africa and Canada); (iii) literature content focussed mostly on easements, programs and landowners and showed both geographical and temporal differences; (iv) land/water protection, law and policy and livelihood, economic and other incentives were the most addressed conservation actions; (v) property rights, particularly conservation easements, were the most addressed policy instrument; and (vi) half of the articles did not report the engagement of any stakeholder sector and cross-sector stakeholders' engagement was often missing. Overall, our results highlight the need for future studies on PLC to cover currently underrepresented regions; to assess the effectiveness of more conservation actions and policy instruments; and to test how engaging different stakeholders can potentially promote legitimate and equitable PLC policies across contexts.

1. Introduction

Aichi target 11 of the Convention of Biological Diversity promotes the expansion of the global protected area network to cover at least 17% of all terrestrial land by 2020, while enhancing ecological representativeness and connectivity (Convention on Biological Diversity [CBD], 2010). With limited resources available for protected area expansion and effective management, meeting Aichi target 11 requires countries to design and implement complementary area-based conservation policies (CBD 2010).

With privately owned land covering large areas of the world, private land conservation (PLC) is an increasingly recognized strategy to complement protected area networks, either as privately protected areas (PPAs, i.e. areas that have a primary conservation objective) or as 'other effective area-based conservation measures' (i.e. areas that deliver the effective in-situ conservation of biodiversity, regardless of its primary objectives) (Bingham et al., 2017; Kamal et al., 2015b; Mitchell

et al., 2018; Stolton et al., 2014; WCPA, 2019). As the field is complex and continuously growing, the semantics and governance systems of PLC include multiple definitions (e.g. Stolton et al., 2014; Kamal et al., 2015b). In this article, we broadly refer to PLC as land under private ownership (e.g. individuals, families or other non-public institutions) managed to help achieve biodiversity conservation objectives. PLC policies have the potential to (i) increase total area under protection, (ii) increase the diversity of stakeholders engaged in conservation policy-making, (iii) enhance ecological and socio-economic connectivity and (iv) reduce social conflict (Doremus, 2003; Maciejewski et al., 2016; Paloniemi and Tikka, 2008; Stolton et al., 2014; Wallace et al., 2008). However, designing effective national and sub-national (e.g. municipal) PLC policies is challenging, as it requires interacting with complex, context dependent socio-ecological, institutional, legal and economic processes (Cocklin et al., 2007; Doremus, 2003; Kamal et al., 2015a; Selinske et al., 2017).

Implementing on the ground conservation actions on private land

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mostly depends on landowners' willingness to collaborate with conservation organizations (e.g. in terms of enrolment, permanence and security of conservation agreements) and their management capabilities (e.g. in terms of resources and knowledge) (Farmer et al., 2017; Hardy et al., 2017; Knight et al., 2010; Selinske et al., 2015). In addition, the success of PLC depends on conservation organizations capacities to adequately plan, implement and monitor the effectiveness of conservation actions (Clement et al., 2015; Drescher and Brenner, 2018; Epstein et al., 2015; Rissman et al., 2017). In this context, many policies involving a wide range of instruments have been developed worldwide to increase landowners' engagement in PLC, to support them with implementing conservation actions, and to ensure their long-term commitment (Casey et al., 2006; Selinske et al., 2015). These range from involuntary policies, which might include imposed land use regulations, to voluntary policies, which can include financial and capacity building instruments (Casey et al., 2006; Disselhoff, 2015; Kamal et al., 2015b). Overall, the success of PLC policies depends on designing and implementing a suite of different policy instruments according to geographical contexts and to the needs, values, and capabilities of different stakeholders (Cocklin et al., 2007; Doremus, 2003; Selinske et al., 2017).

Engaging stakeholders in conservation research and policy-making processes has been considered critical to adequately address complex science-implementation spaces (e.g. Reed et al., 2009; Sterling et al., 2017; Toomey et al., 2017). As a result, a growing number of international conventions and science-policy platforms call for stakeholders' engagement as a way of facilitating the co-production of relevant and usable knowledge (e.g. CBD, Intergovernmental Platform for Biodiversity and Ecosystem Services [IPBES], Future Earth; van der Hel, 2016; Tengö et al., 2017). Engaging stakeholders in a comprehensive way (e.g. by conducting stakeholder analyses, Reed et al., 2009) is seen particularly important in the context of PLC research that aims to inform policy-making because a wide range of community, business and government stakeholders might be interested or affected by the implementation of PLC policies (Cocklin et al., 2007; Cooke et al., 2012; Kamal and Grodzinska-jurczak, 2014; Paloniemi et al., 2018).

As several governments are currently developing and implementing different PLC policies to achieve national and global conservation targets (Disselhoff, 2015; Stolton et al., 2014; WCPA, 2019), there is a clear need to assess the published scientific literature, identify research gaps, and direct future research. To our knowledge, no previous literature review has studied research trends and gaps in PLC peer-reviewed literature at the global level (but see for example Casey et al., 2006; Stolton et al., 2014; Disselhoff, 2015; Kamal et al., 2015b, for PLC policy instruments descriptions and classifications). Here, we filled this gap and (i) assessed when and where the identified studies took place and which topics they covered; (ii) identified the most addressed conservation actions and policy instruments, and (iii) investigated whether stakeholders' engagement during research processes was reported or not. For the purpose of this review, we focused on the broader PLC literature, including literature on PPAs as well as other PLC policies. Finally, we discuss possible ways for future PLC research to fill the gaps in order to better inform PLC policy-making and to increase on the ground outcomes.

2. Methods

We conducted a comprehensive keyword search in SCOPUS database, capturing articles published between 1988 to February 2018. We used the following keyword search: (TITLE-ABS-KEY ("Private land Conservation" OR "Private Reserves" OR "Private* Protected Areas" OR "Private conservation areas" OR "Private Game Reserves" OR "Private Wildlife Reserves" OR "Private Wildlife Refuges" OR "Private Nature Reserves" OR "voluntary conservation" OR "conservation easements" OR "conservation covenants")). As PLC terminology can be context-dependent, we included other widely used broad synonyms for PLC in

different countries and regions (e.g. private game reserve, conservation easements). While we are aware that there are many PLC policies and topics addressed in the "grey literature" (e.g. local and national reports) and that scientific documents on biodiversity conservation are also published in other languages than English (Amano et al., 2016), in this study we only focussed on peer-reviewed articles in English. This choice was due to the global nature of this study and the potential geographical and language bias in accessing and interpreting national and local reports.

Our initial search resulted in 858 articles. We read all abstracts to ensure inclusion of relevant articles only. We considered an article relevant for our review if it described PLC policies, policy instruments, actions, and/or analysed their effectiveness and impacts on biodiversity conservation. We discarded articles focussing on reporting ecological surveys inside PLC areas without relating the results to PLC policies or those articles focussing on agriculture policies without addressing their potential impact on biodiversity conservation.

After manual sorting, our final database resulted in 284 articles (264 research articles, 16 reviews, two letters and two notes, according to Scopus document type classification) (see Appendix A for a full list). After reading the whole text, for each study we recorded (i) year of publication, (ii) countries where the studies were conducted, (iii) conservation actions and policy instruments addressed, and (iv) stakeholder sectors reported to be engaged during the research process. Some studies were from several countries and/or addressed more than one policy instrument and were classified accordingly.

We then carried out a content analysis to identify most frequent words (hereafter topics, according to our content interpretation) present only in articles' abstracts, using the tm package (Feinerer and Hornik, 2017) in R version 3.4.4 (R Core, 2018). We also counted the number of abstracts that use these most frequent topics. In order to concentrate on the relevant policy related content, we removed frequent English "stop words" (e.g. the, is, what, we) from the analysis. We removed the term "private land conservation" because it was already the focus of our review and might have obscured the relationship between other words. We then classified the articles according to the date when they were published. We used year 2010, when the Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets were approved (CBD 2010), as a policy landmark that could have affected the temporal trends in PLC research content. In addition, we classified the abstracts' content per continent where the studies were conducted to detect geographical content patterns. We also searched for unique topics within the most frequently addressed topics (i.e. ten most frequent topics) to detect other patterns at geographical and temporal levels. While it is important to note that we have only analysed text from articles' abstracts, abstracts should nonetheless report the most relevant concepts from the entire articles. Therefore, we argue that analysing the whole text would not greatly affect our main results (Nunez-mir et al., 2015).

In order to assess which conservation actions were addressed or recommended in the articles to increase the effectiveness of PLC policies, we followed the classification by Salafsky et al. (2008). Conservation actions can be defined as interventions undertaken by different stakeholders, designed to reach conservation goals (Salafsky et al., 2008). We then classified conservation actions as: (i) land/water protection, i.e. those actions that identify, establish or expand legally protected areas, and those that protect resource rights; (ii) land/water management, i.e. those actions that aim to conserve or restore habitats and the environment in general; (iii) species management, i.e. those actions focussed on managing or restoring species; (iv) education and awareness, i.e. those actions directed at improving people's understanding and skills; (v) law and policy, i.e. those actions that help develop and implement legislation, regulations, and voluntary standards; (vi) livelihood, economic and other incentives, i.e. those actions developed and implemented to influence behaviour; and (vii) external capacity building, i.e. those actions aiming to facilitate the conditions

to increase conservation impact.

In the context of this review, we followed Game et al. (2015) definition of conservation policies, to be any set of institutionalized behaviours or practices that influence conservation activities. PLC policies typically consist of a set of different policy instruments, which can be defined as any type of instrument designed to support or promote a change in behaviour (induced or voluntary), associated with biodiversity conservation on private land (Casey et al., 2006; Disselhoff, 2015; Doremus, 2003; Selinske et al., 2017). We classified the policy instruments addressed in the articles following the classification by Casey et al. (2006). We used this taxonomy because it is comprehensive and broad enough to include a wide variety of policy instruments developed to promote PLC (Casey et al., 2006). We classified policy instruments as: (i) *regulatory & economic disincentives*: policies that discourage practices that might have negative impacts on biodiversity, by defining management standards and penalties for non-compliance; (ii) *legal/statutory innovations*: new rules that provide some permits for ecosystem transformations or regulatory relief for those landowners who voluntarily commit to implement conservation actions on their properties; (iii) *property rights instruments*: involve landowners voluntarily transferring total or partial property rights to a conservation organization (e.g. land trust, government agency) in order to restrict land use intensity; (iv) *market based instruments*: developed to create markets that value biodiversity conservation, increasing economic opportunities for landowners through the design of certification schemes or ecotourism; (v) *financial instruments*: involve payments to compensate landowners for the opportunity and/or management costs associated with implementing conservation actions on their land; (vi) *public tax instruments*: provide tax reductions (e.g. income, property) to those landowners who maintain or restore land for biodiversity; (vii) *facilitative instruments*: institutional strategies designed to build landowners' capacity to implement conservation actions, by providing training, technical assistance and recognition of conservation efforts among other benefits.

In order to assess which stakeholder sectors were reported to be engaged in PLC research we followed the classification suggested by the United Nations Development Programme (UNDP, 2012). The classification recognizes the following types of stakeholder sectors: *private* (e.g. individuals, families, businesses), *public* (e.g. national and local governments, international bodies) and *civil society* (e.g. media, universities, NGOs). Then, to determine whether a given stakeholder sector was reported to be engaged, we used Rowe and Frewer (2000) stakeholders' engagement classification, which is based on the direction of communication between parties. It recognizes three broad categories: (i) communication (i.e. dissemination to passive recipients), (ii) consultation (i.e. collecting information from participants) and (iii) participation (i.e. two-way communication and learning process between participants and researchers) (Rowe and Frewer, 2000). Within the scope of this review, we broadly considered that a stakeholder sector was engaged in the research process if the paper documented (i) consultation or (ii) participation engagement (e.g. interviews, surveys, workshops).

3. Results

Our results showed an increasing temporal trend in the number of published peer-reviewed articles in English focussing on PLC (see Appendix B, Fig. B1). The number has, in fact, doubled after 2010 when the Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets were approved (CBD 2010). However, the number of articles appears to have stabilized in the last years (Fig. B1). Furthermore, we found a strong geographic bias in the English peer-reviewed literature (Fig. 1). Research in the analysed 284 articles was conducted in 26 countries (15 studies were either theoretical or analysed different aspects of PLC policies without focussing on any particular region). Most studies (78%) were conducted only in four

countries, namely United States of America (U.S.A) (56%, $N = 155$); Australia (12%, $N = 33$); South Africa (6%, $N = 16$); and Canada (4%, $N = 12$). Asia was the least represented continent with only one study conducted in Indonesia. In Europe, the most represented country was Finland (3%, $N = 7$). In Latin America & the Caribbean the most represented country was Brazil (3%, $N = 7$). In Africa, the second most represented country after South Africa was Kenya (2%, $N = 6$).

The most frequent topics covered in the abstracts were “easement(s)”, which was mentioned 508 times in 125 abstracts, “landowner(s)” which got 329 mentions in 138 abstracts, and “program(s)” that was mentioned 326 times in 125 abstracts (see Appendix C, Table C1). Other important topics were “management” ($f = 202$, 91 abstracts) and “protect” ($f = 175$, 47 abstracts). Other topics such as “institution(s), or (institutional)” ($f = 41$), “sustainability (or sustainable)” ($f = 34$), “governance” ($f = 15$) and “well-being” ($f = 3$), were less present in the abstracts.

Regarding temporal patterns in abstracts content, the three most frequent topics in PLC literature (easement, program and landowner, Fig. 2, see Table C1 for full details) were present both before and after CBD Aichi targets. However, we also found differences in research focus before and after CBD Aichi targets. Before CBD, topics such as “reserve” ($f = 75$), “incentive” ($f = 68$), “public” ($f = 55$) and “use (e.g. use of biodiversity)” ($f = 52$) received more attention, whereas after CBD Aichi targets literature mostly focussed on issues regarding “property” ($f = 115$), “forest” ($f = 106$), “policy” ($f = 102$) and “participation” ($f = 101$) (Table C1).

We also found geographical differences in PLC abstracts content (Fig. 3, see Table C2 for full details). In North America, the most common topics were “easement” ($f = 493$), “landowner” ($f = 246$) and “program” ($f = 193$). Latin America and the Caribbean literature mostly focussed on topics such as “reserve” ($f = 87$), “protect” ($f = 36$) and “incentive” ($f = 22$), whereas in Africa the most frequent topics were “management” ($f = 41$), “protect” ($f = 34$) and “species” ($f = 26$). The most prominent topics in the abstracts from Europe were “landowner” ($f = 53$), “program” ($f = 36$) and “voluntary” ($f = 34$). In the case of Oceania, the most frequent topics were “program” ($f = 77$), “landholder” ($f = 63$) and “management” ($f = 45$). We did not include the results from Asia because only one article was found. In addition, we found unique topics within the most frequently addressed topics per continent (i.e. ten most frequent topics), for example “public” in North America, “ecotourism” in Latin America and the Caribbean, “species” in Africa, “voluntary” in Europe, and “benefit” in Oceania.

Regarding conservation actions, all articles in our database addressed or discussed land/water protection actions (100%, $N = 284$), followed by law and policy conservation actions (88%, $N = 251$), conservation actions related to livelihood, economic and other incentives (75%, $N = 213$), land/water management (45%, $N = 128$), external capacity building (32%, $N = 91$), species management (15%, $N = 43$), and education and awareness (14%, $N = 41$). We also found that English peer-reviewed literature in different continents generally reflected these global patterns, with the exception of Africa, where incentives and land/water management were the most addressed actions, following land conservation actions (see Fig. D1). Education and awareness conservation actions were the least addressed actions across all continents (see Fig. D1).

Regarding the policy instruments addressed in the articles, property rights, particularly conservation easements, were the most covered policy instrument accounting for 73% of the studies ($N = 207$), followed by financial instruments (e.g. cost-share incentives; 37%, $N = 105$), and market-based instruments (e.g. ecotourism and certification schemes; 30%, $N = 84$) (Fig. 4). The least addressed policy instruments were regulatory and economic disincentives (8%, $N = 22$) and legal/statutory innovations (5%, $N = 13$). We found geographical differences in the number of English peer-reviewed articles addressing different policy instruments in different continents (Fig. D2). In North America and Oceania, property rights were the most addressed policy

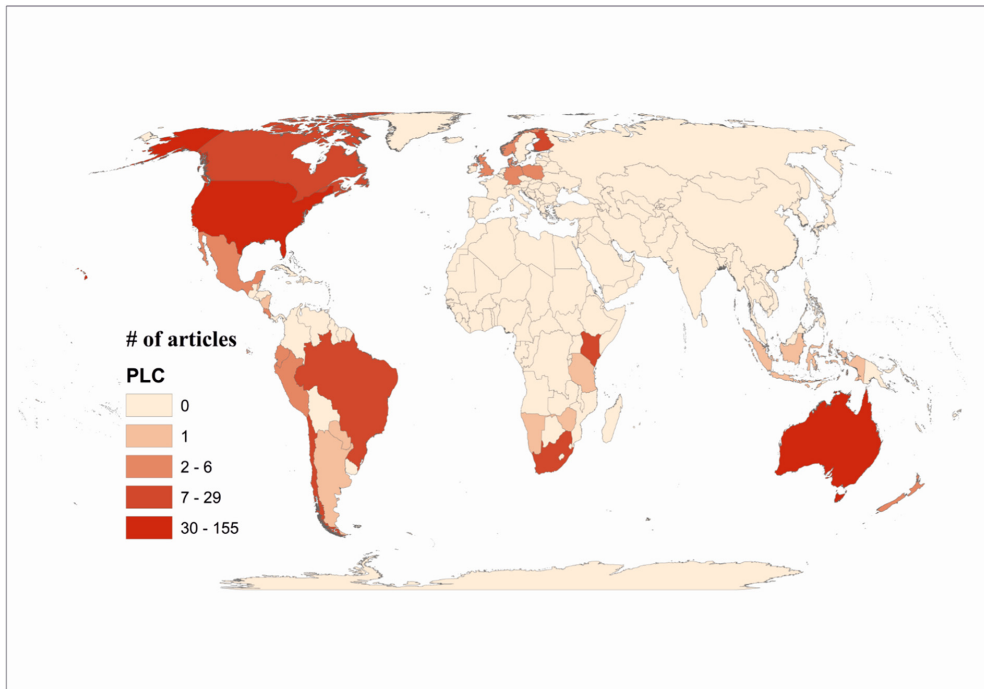


Fig. 1. Global distribution of private land conservation peer-reviewed articles in English, classified according to the countries where the studies were conducted. Colour classification shows the number of articles per country and was prepared using the geometrical interval method in ArcMap. The geometrical intervals classification is an appropriate method to classify heavily skewed, not normally distributed, data and was used only for visualization purposes.

instruments. In Latin America and the Caribbean and in Africa, market-based instruments received more attention, whereas in Europe financial instruments were the most addressed instruments.

In relation to stakeholder sectors engagement, no stakeholders were reported to be engaged in 48% of the PLC studies ($N = 138$; Fig. 5a). Furthermore, we found that only one sector was reported to be engaged in 38% of the studies ($N = 107$). Within those articles that reported to engage only one stakeholder sector, the private sector was the most engaged 80% ($N = 86$), followed by the civil society sector 17% ($n = 18$) and the public sector with only 3% ($N = 3$). Similarly, within those articles that reported to engage at least one stakeholder sector (52%, $N = 149$), we found that private sector (e.g. landowners) was involved in 79% of the studies ($N = 118$), followed by the civil society sector (e.g. NGOs; 36%, $N = 54$) and the public sector (e.g. governments; 26%, $N = 39$) (Fig. 5b). Overall, cross-sector engagement was unusual in our database, with only few articles reporting the engagement of two (8%, $N = 22$) or three (7%, $N = 20$) stakeholder sectors (Fig. 5a). The number of English peer-reviewed articles reporting stakeholders' engagement in each continent broadly reflected these global patterns, except for studies conducted in Europe where private and the public sectors were the most reported stakeholders (Fig. D3).

4. Discussion

In this paper, we reviewed the PLC literature to identify important research trends and gaps. Our results showed (i) an increase in the number of PLC publications over time, followed by a period of stagnation after 2010; (ii) a strong geographical bias with most scientifically published research conducted in four countries only, particularly the U.S.A.; (iii) that the literature content broadly focussed on

easelements, programs, landowners and management, and that there were both geographical and temporal content patterns; (iv) that literature mostly focussed on addressing conservation actions related to land/water protection, to law and policy and to livelihood, economic and other incentives; (v) that property rights were the most addressed PLC policy instruments; and (vi) that almost half of the studies did not report any stakeholder sector engagement in research and that engaging more than one stakeholder sector was infrequent. While we are aware that there is an important amount of information about PLC policies and implementation in grey literature, our results nonetheless reflect important PLC trends and gaps and the way key issues are currently covered in peer-reviewed literature.

Although PLC has a long history in some countries, formal international recognition came only recently and only for some PLC policies (e.g. PPAs, other effective area-based conservation measures; Bingham et al., 2017; Mitchell et al., 2018; Stolton et al., 2014; WCPA, 2019). In this sense, the increasing scientific publication trend is in accordance with the growing recognition of the importance of PLC policies to achieve biodiversity and ecosystem services conservation targets (Bingham et al., 2017; Stolton et al., 2014).

Regarding the geographical distribution of research, it is not surprising that the U.S.A., Australia, South Africa and Canada were the most represented countries in the literature given that they have long PLC tradition (Fitzsimons, 2015; Maciejewski et al., 2016; Merenlender et al., 2004; Schuster et al., 2017). We acknowledge that, in spite of our efforts, our results might be biased to a certain level because we only considered peer-reviewed articles written in English, while the topic might well be covered in other languages (Amano et al., 2016) and PLC be an important topic of discussion also in other countries. Nonetheless, the fact that only ~20% of the reviewed studies were conducted in

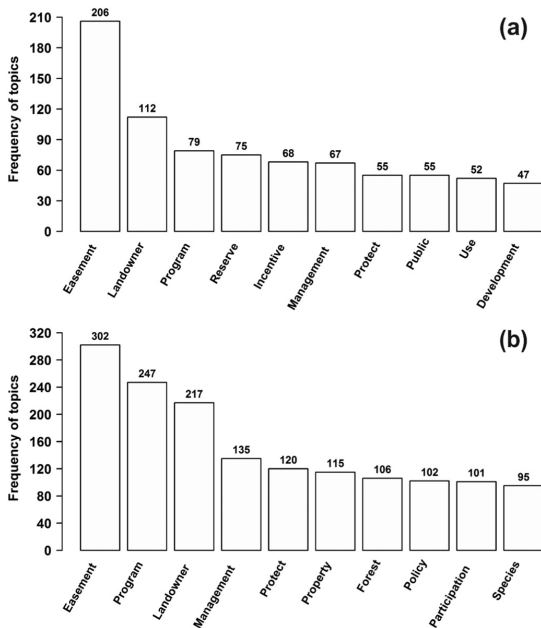


Fig. 2. Barplots showing the ten most frequent topics (i.e. words) occurring in abstracts of peer-reviewed articles about private land conservation. Abstracts were divided by the time when the studies were published: (a) before the approval of the Convention on Biological Diversity (CBD) Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets in 2010; (b) after the approval of the CBD Strategic Plan for Biodiversity. Note the differences in the y-axes.

other countries around the world reveals the existence of an important geographical bias in English peer-reviewed studies related to PLC. Therefore, considering that most processes involved in PLC are typically context dependent, it is important to be cautious when transferring evidence and recommendations from current English peer-reviewed literature to policy-making in other countries (Cooke et al., 2012). In order to fill this gap and to understand how variations in local contexts might influence policy outcomes, there is need to conduct more internationally recognized scientific research in different underrepresented geographical regions where land is mostly privately owned (Cetas and Yasué, 2016; Cooke et al., 2012; Selinske et al., 2017; Sorice and Donlan, 2015).

In terms of research focus at the global level, there was a clear emphasis in literature content on conservation easements as instruments to promote the conservation of both land and threatened species. Understanding landowners' motivations and preferences to place an easement or to join other PLC programs was another major research focus. Although these topics are relevant, it would be important to conduct more research assessing the contribution of PLC to socio-ecological systems sustainability and human well-being (e.g. Wallace et al., 2008; Villamagna et al., 2015; Clements and Cumming, 2017; Horton et al., 2017; Serenari et al., 2017).

Regarding temporal trends in content, even though the most frequent topics present in the abstracts were similar before and after CBD Aichi targets (easements, programs and landowners), a closer look into high frequency unique topics showed different emphasis in content. For example, while before Aichi targets reserves and incentives were frequently mentioned in abstracts, after Aichi targets topics such as property, policy and participation became more prevalent. In the context of having to meet national and international targets for biodiversity

conservation with limited resources, literature focus has shifted from a focus on general biodiversity conservation programs (e.g. species conservation, land use restrictions, Langholz, 1996; Merenlender et al., 2004; Swift et al., 2004; Wright, 1994) to studying national and international policies, and the broad set of instruments and requirements to comply with them (e.g. Adams and Moon, 2013; Barton et al., 2013; Cooke and Moon, 2015; Drescher et al., 2017; Owley and Rissman, 2016).

Research from different continents focussed on different topics. This geographical heterogeneity in PLC literature topics and focus might be influenced to a certain extent by researchers' interests, but might well also reflect research adaptation to regional contexts (i.e. related to the types of existing policies in each region). In Latin America & the Caribbean, PLC literature mostly focussed on addressing issues related to nature reserves, different incentives to increase landowners' enrolment and ecotourism. Focus on these topics was mainly driven by literature from Brazil, where private reserves in perpetuity are legally recognized and can only be used for research, education and ecotourism (Pegas and Castley, 2016, 2014). In the case of PLC literature from Africa, the content was largely driven by studies conducted in South Africa, addressing issues related to endangered and charismatic species management and protection (e.g. Maciejewski and Kerley, 2014). Social aspects of PLC planning were also addressed in literature from Africa (e.g. Knight et al., 2010; Pasquini et al., 2010). Literature from Europe mostly focussed on issues related to landowners' attitudes and preferences and on voluntary programs (e.g. Kamal et al., 2015c; Mönkkönen et al., 2009; Nielsen et al., 2018). Finally, literature from Oceania was mostly driven by Australia and broadly focussed on addressing landowners' motivations, programs design and land management (e.g. Adams et al., 2014; Greiner, 2015; Moon and Cocklin, 2011). This literature content heterogeneity contributes to the identification of regional needs and opportunities to increase PLC impact on the ground.

Regarding conservation actions, our results showed that the most addressed actions in PLC peer-reviewed literature were land conservation, law and policy and actions related to livelihood, economic and other incentives. These findings were to a certain extent expected, given the importance of these actions in the context of PLC. Although these results were largely influenced by research conducted in North America, it is interesting to note that English peer-reviewed literature in different continents generally reflected these patterns, except in Africa, where incentives and land management actions received comparatively more attention. Overall, most of the literature focussed on landowners' motivations and barriers to participation while less than half of the peer-reviewed articles addressed or discussed about management actions implementation and effectiveness after enrolment (Farmer et al., 2017). This gap might be partially caused by conservation easements generally focussing on restricting development and preventing land use change rather than on fostering stewardship and adaptive management (Rissman et al., 2013; Rissman, 2013). Although attention towards addressing management actions has increased recently (e.g. Adams et al., 2012; Farmer et al., 2017; Hardy et al., 2017; Rissman, 2010; Stroman and Kreuter, 2015), there is still need to conduct more studies in different geographical contexts. Research on other key conservation actions such as external capacity building (e.g. Clement et al., 2015), species management (e.g. Maciejewski and Kerley, 2014), and education and awareness (e.g. Van Fleet et al., 2012) was consistently underrepresented both at the global and continental levels. Efforts should be made to fill these gaps, both in order to build a more comprehensive PLC science framework, and to understand how to better combine different conservation actions to increase PLC effectiveness on the ground.

Regarding policy instruments, we found that property rights, particularly conservation easements and covenants, were the most addressed instruments at the global level (e.g. Merenlender et al., 2004; Rissman et al., 2007; Fitzsimons and Carr, 2014; see Nolte, 2018 for a recent in-depth review on acquisition of private forest property rights

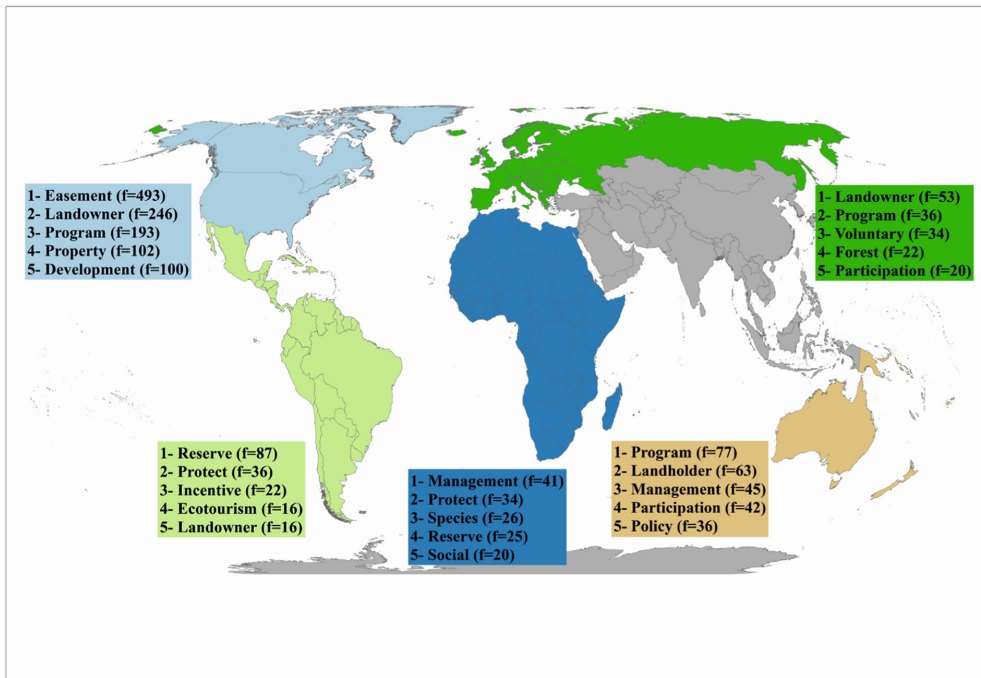


Fig. 3. Five most frequent topics (i.e. words) occurring in abstracts of English peer-reviewed articles about private land conservation, classified according to the continents where the studies were conducted. Continents classification followed the United Nations “Standard Country or Area Codes for Statistical Use” (<https://unstats.un.org/unsd/methodology/m49/>). Note that data from Asia was not displayed due to the small sample size (only one article).

for conservation). While the proportion of investments on property rights acquisitions has grown exponentially in the last decades (Fishburn et al., 2009), comprehensive evidence on their long-term effectiveness is still relatively limited (Braza, 2017; Byrd et al., 2009; Copeland et al., 2013; Hardy et al., 2017; Merenlender et al., 2004; Pocewicz et al., 2011; Rissman et al., 2007). In addition, as easements are becoming increasingly international, there is need to assess their implementation feasibility in different countries where resources for conservation are limited, either to buy property rights or to bear the loss of revenue from taxes (Kamal et al., 2015b). Furthermore, there is an urgent need to assess their implications for different socio-political contexts, particularly regarding effectiveness of public expenditure,

transparency and equity (Cooke and Corbo-perkins, 2018; Rissman et al., 2017). Future research should aim at addressing a broader set of policy instruments, which might be relevant in geographical areas not yet covered in English peer-reviewed literature and at identifying general aspects of PLC policy design that could enhance effectiveness across contexts (Cocklin et al., 2007; de Vente et al., 2016; Moon and Cocklin, 2011).

Despite the recent emphasis on stakeholders' engagement in conservation research (Reed et al., 2009; Sterling et al., 2017; Toomey et al., 2017), almost half of the PLC studies did not report any stakeholder sector engagement in their research processes. The private sector was the most engaged stakeholder group (mostly through consultation,

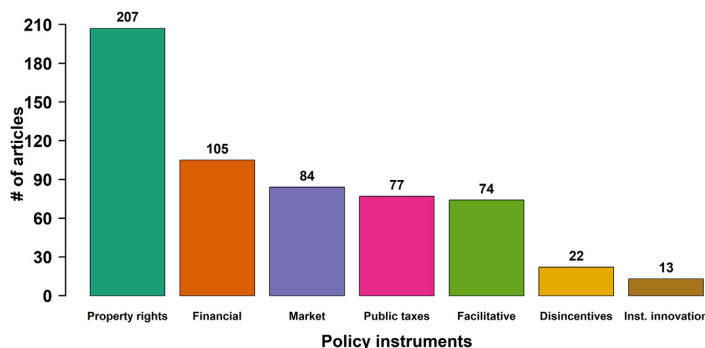


Fig. 4. Barplot showing the number of scientific peer-reviewed articles in English addressing different private land conservation policy instruments. Note that a given article can address more than one policy instrument.

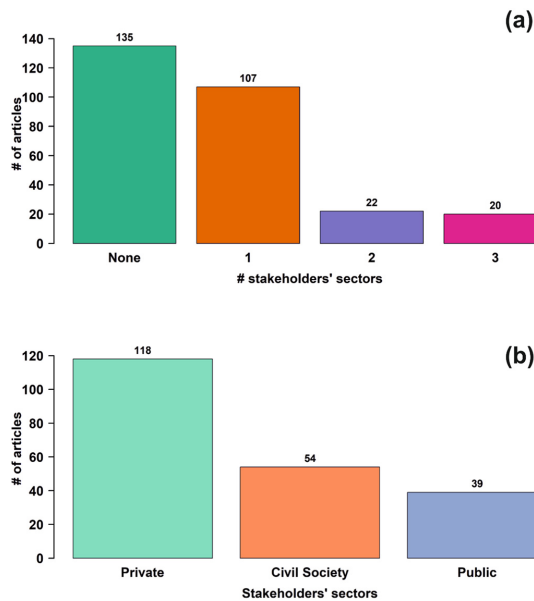


Fig. 5. Reported stakeholders' engagement in private land conservation scientific peer-reviewed articles in English, shown as two barplots: (a) the number of articles reporting the engagement of none, one, two and three stakeholder sectors (i.e. private, public and civil society) in the research process; (b) the number of articles reporting the engagement of different stakeholders sectors in the research process. Note that a given article can report the engagement of more than one stakeholder sector.

e.g. surveys, interviews), not only at the global level but also at the continental level. This finding was expected according to the key role private sector plays in PLC policies implementation (Farmer et al., 2017; Knight et al., 2010; Moon and Cocklin, 2011). However, research would also benefit from increasingly engaging other stakeholders, such as the public sector, who might be key for supporting, recognizing and reporting private initiatives to comply with international conventions such as the CBD (Bingham et al., 2017). We also found that reporting cross-sector stakeholders' engagement was infrequent. Integrating different stakeholders' perspectives into research and decision-making depends on the research question and can be challenging due to issues such as legitimacy, power relations and conflicting interests (Reed et al., 2009). However, actively and comprehensively engaging different stakeholders following co-production approaches could potentially lead to (i) more innovative research, (ii) increasingly shared understanding of complex socio-ecological systems, and (iii) the formulation of more legitimate and actionable policy proposals (Beier et al., 2017; Bracken et al., 2015; de Vente et al., 2016; Jolibert and Wesselink, 2012; Paloniemi et al., 2018; Salomaa et al., 2016). While we acknowledge that stakeholders' engagement in research might not always be fully documented in peer-reviewed articles (Jolibert and Wesselink, 2012), we called for better documentation to increase future learning opportunities.

To conclude, our results highlight the need for future studies on PLC to aim at (i) improving our understanding of diverse socio-ecological contexts and how they influence PLC policy outcomes, (ii) assessing the implementation feasibility and effectiveness of different conservation actions, particularly land management, (iii) covering a broader set of policy instruments, (iv) engaging different stakeholders in research to co-produce actionable knowledge, and (v) identifying general principles that might inform the design, governance and implementation of

effective, legitimate and equitable PLC policies across contexts.

Acknowledgements

We are very grateful to Vida Silvestre Uruguay and the Uruguayan Ministry of Housing, Land Planning and Environment project URU/13/G35. This work was supported by the National Research and Innovation Agency, Uruguay (grant number POS_EXT_2015_1_123575); and the Academy of Finland (grant number 296524). E.D.M thanks the European Research Council (ERC) for funding under the European Union's Horizon 2020 research and innovation program (grant agreement #802933).

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The emergence of private land conservation in scientific literature: a review

Appendix A

Private land conservation database consisting of 284 peer reviewed articles selected manually sorted from a list of 858 articles obtained by using the following keyword search: (TITLE-ABS-KEY ("Private land Conservation" OR "Private Reserves" OR "Private* Protected Areas" OR "Private conservation areas" OR "Private Game Reserves" OR "Private Wildlife Reserves" OR "Private Wildlife Refuges" OR "Private Nature Reserves" OR "voluntary conservation" OR "conservation easements" OR "conservation covenants")). Full list of analyzed articles is found below.

- Adams, V.M., Moon, K., 2013. Security and equity of conservation covenants: Contradictions of private protected area policies in Australia. *Land use policy* 30, 114–119. <https://doi.org/10.1016/j.landusepol.2012.03.009>
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The emergence of private land conservation in scientific literature: a review

Appendix B

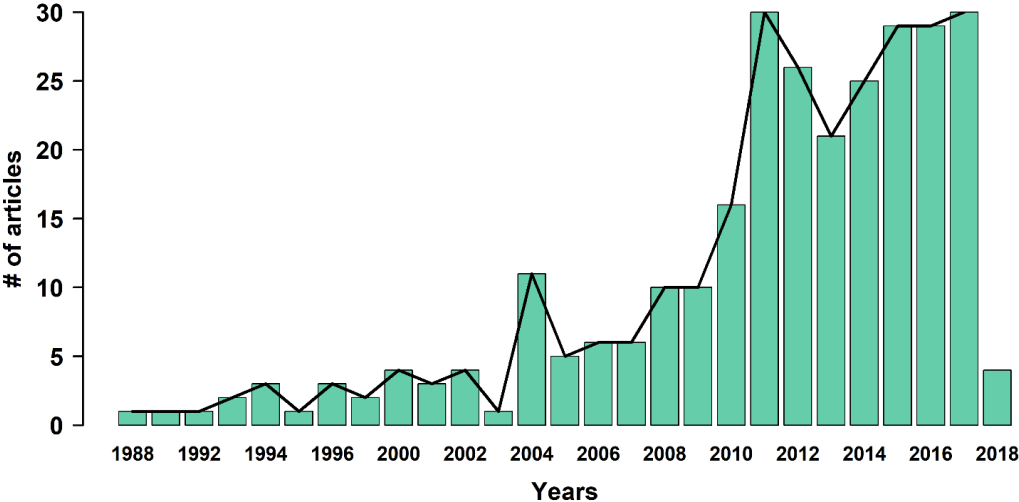


Figure B1: Temporal trend in the number of private land conservation peer-reviewed articles in English (N=284). Note that the last bar only accounts for those articles published before February 2018.

The emergence of private land conservation in scientific literature: a review

Appendix C

Table C1: Ten most frequent topics (i.e. words) occurring in abstracts of peer-reviewed articles about private land conservation, divided by (i) the content of the entire database, (ii) the time when the studies were published, in respect of the approval of the Convention on Biological Diversity (CBD) Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets in 2010. “N” reports the number of abstracts for the full database and for the temporal analysis. Each topic reports in parenthesis: “f” the number of times it was mentioned within the respective group, and “n” the number of abstracts where it was used.

All abstracts (N = 284)	Time	
	Before CBD (N = 90)	After CBD (N = 194)
Easement (f=508; n=125)	Easement (f=206; n=47)	Easement (f=302; n=78)
Landowner (f=329; n=138)	Landowner (f=112; n=51)	Program (f=247; n=82)
Program (f=326; n=115)	Program (f=79; n=33)	Landowner (f=217; n=87)
Management (f=202; n=91)	Reserve (f=75; n=40)	Management (f=135; n=60)
Protect (f=175; n=47)	Incentive (f=68; n=32)	Protect (f=120; n=34)
Property (f=158; n=79)	Management (f=67; n=31)	Property (f=115; n=56)
Reserve (f=150; n=60)	Public (f=55; n=27)	Forest (f=106; n=48)
Policy (f=134; n=78)	Protect (f=55; n=13)	Policy (f=102; n=55)
Use (f=134; n=75)	Use (f=52; n=30)	Participation (f=101; n=40)
Incentive (f=131; n=70)	Development (f=47; n=22)	Species (f=95; n=38)

Table C2: Ten most frequent topics (i.e. words) occurring in abstracts of peer-reviewed articles about private land conservation, divided by the continents where the studies were conducted. “N” reports the number of abstracts corresponding to each geographical region. Each topic reports in parenthesis: “f” the number of times it was mentioned within the respective group, and “n” the number of abstracts where it was used. Unique topics within the most frequently addressed topics per continent are also highlighted (*). Also note that data from Asia was not displayed due to the small sample size (only one article).

Continents				
North America (N = 168)	Latin America & the Caribbean (N = 26)	Africa (N = 25)	Europe (N = 22)	Oceania (N = 36)
Easement (f=493; n=112)	Reserve (f=87; n=17)	Management (f=41; n=17)	Landowner (f=53; n=16)	Program (f=77; n=23)
Landowner (f=246; n=91)	Protect (f=36; n=18)	Protect (f=34; n=17)	Program (f=36; n=13)	Landholder* (f=63; n=21)
Program (f=193; n=68)	Incentive (f=22; n=7)	Species* (f=26; n=9)	Voluntary* (f=34; n=18)	Management (f=45; n=19)
Property (f=102; n=50)	Ecotourism* (f=16; n=5)	Reserve (f=25; n=10)	Forest (f=22; n=12)	Participation (f=42; n=13)
Development (f=100; n=53)	Landowner (f=16; n=14)	Social* (f=20; n=20)	Participation (f=20; n=7)	Policy (f=36; n=14)
Management (f=99; n=46)	Local* (f=16; n=6)	Manager* (f=18; n=6)	Protect (f=19; n=13)	Property (f=36; n=15)
Public* (f=97; n=57)	National* (f=16; n=11)	Landowner (f=17; n=9)	Costs* (f=18; n=11)	Covenant* (f=33; n=18)
Use (f=90; n=40)	Communities* (f=15; n=11)	Program (f=14; n=6)	Policy (f=15; n=9)	Ecological (f=25; n=11)
Habitat* (f=89; n=41)	Use (f=14; n=8)	Ecological (f=14; n=10)	Sites* (f=15; n=9)	Incentive (f=24; n=11)
Trusts* (f=81; n=47)	Forest (f=14; n=12)	Implementation (f=13; n=5)	Information* (f=13; n=5)	Benefit* (f=23; n=10)

The emergence of private land conservation in scientific literature: a review

Appendix D

These supplementary figures show the geographical differences in English peer-reviewed literature focussing on private land conservation, here divided by conservation actions (Fig. A1), policy instruments (Fig. A2) and stakeholder engagement in research processes (Fig. A3). We classified the information according to the continents where the studies were conducted.

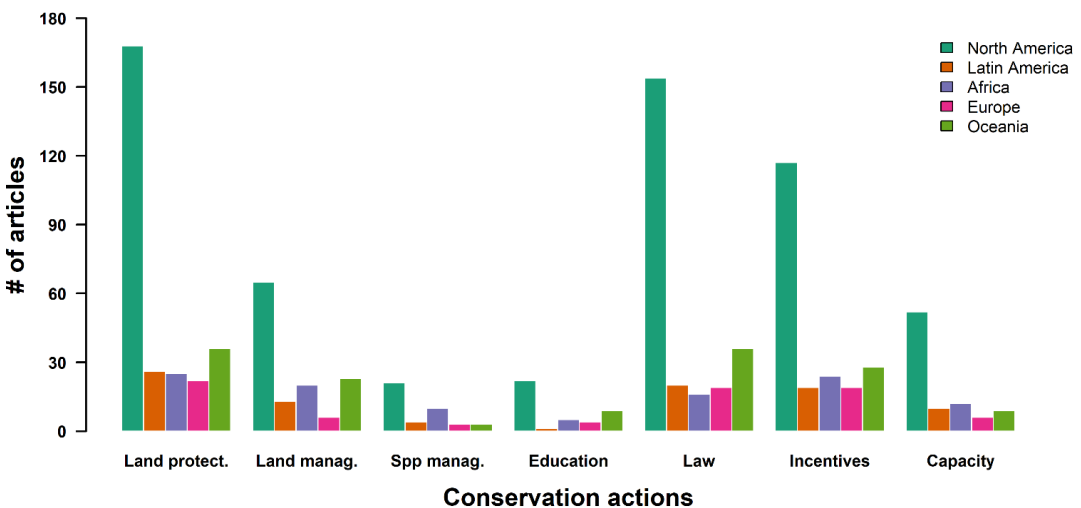


Figure D1: Barplot showing the number of peer-reviewed articles in English addressing different conservation actions, according to the continents where the studies were conducted. Note that a given article can report the engagement of more than one stakeholder sector. Also note that data from Asia was not displayed due to the small sample size (only one article).

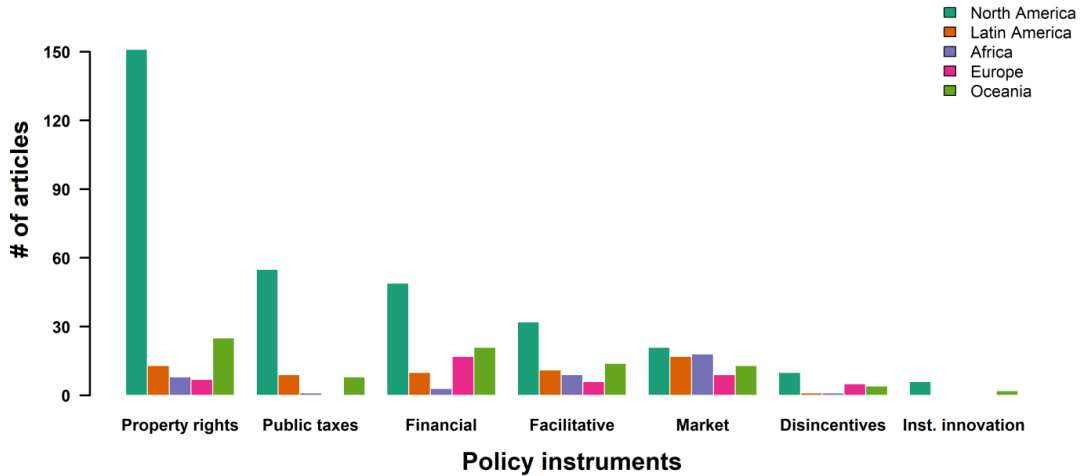


Figure D2: Barplot showing the number of peer-reviewed articles in English addressing different policy instruments, according to the continents where the studies were conducted. Note that a given article can report the engagement of more than one stakeholder sector. Also note that data from Asia was not displayed due to the small sample size (only one article).

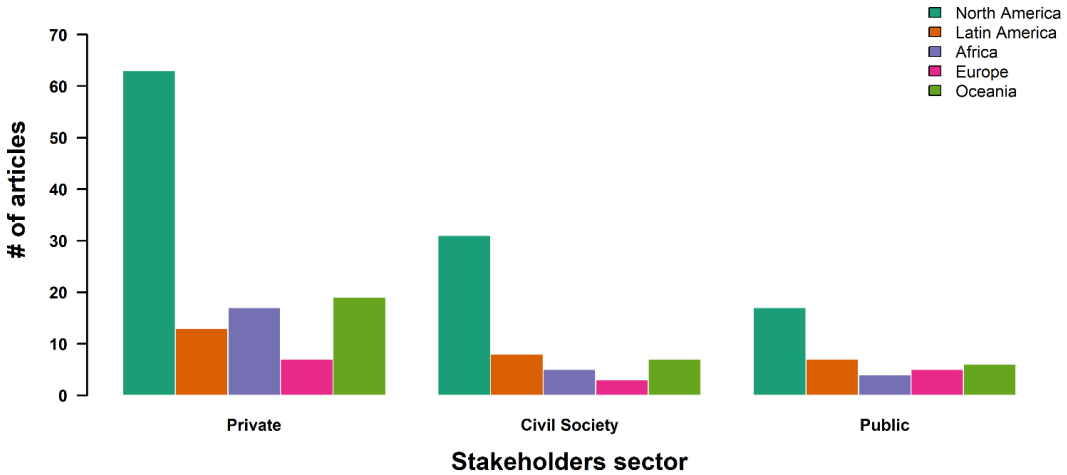


Figure D3: Barplot showing the number of peer-reviewed articles in English reporting the engagement of different stakeholders (private, civil society and public) sectors in the research process, according to the continents where the studies were conducted. Note that a given article can report the engagement of more than one stakeholder sector. Also note that data from Asia was not displayed due to the small sample size (only one article).

CHAPTER II

Cortés-Capano, G., Fernández, A., Dimitriadis, C., Garibotto, G., Soutullo, A., Toivonen, T. & Di Minin, E. (2020). Exploring landowners' perceptions, motivations and needs to inform voluntary conservation policy-making. *People and Nature*, 2(3): 840-855. doi.org/10.1002/pan3.10122



RESEARCH ARTICLE



Exploring landowners' perceptions, motivations and needs for voluntary conservation in a cultural landscape

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Funding information

National Research and Innovation Agency, Uruguay, Grant/Award Number: POS_EXT_2015_1_123575; Ministry of Housing, Land Planning and Environment, Uruguay, Grant/Award Number: URU/13/G35

Handling Editor: Ambika Aiyadurai**Abstract**

1. While efforts to reverse the current global environmental crisis increase, we are still experiencing unprecedented rates of species' extinctions. Traditional cultural landscapes can potentially play an important role for biodiversity conservation globally. However, these landscapes are threatened by pressures from global to local socio-economic drivers of change. Many cultural landscapes across the world occur on private land where landowners' environmental stewardship can help support nature conservation.
2. In this study, we applied a place-based collaborative approach to understand the main aspects underlying landowners' relationship with nature, their perceptions of the local social-ecological context and their vision of a desired future to identify the constraints and opportunities to support voluntary private land conservation. The study was conducted in Uruguay, in a traditional cattle ranching cultural landscape, which is a national priority area for the conservation of biodiversity. In Uruguay, approximately 96% of the land is privately owned, while the National System of Protected Areas covers only ~1% of the land.
3. Our results revealed that landowners had a close relationship with nature and considered themselves and their neighbours as local environmental stewards. Landowners were well aware of the importance of nature contributions to their livelihood and lifestyle and were concerned that rural exodus to urban areas and shrubland encroachment would negatively impact the social-ecological context they value and depend upon. Main needs of landowners to support biodiversity conservation were not primarily motivated by economic interests, but more related to the need for support that could enhance land management and social cohesion.

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4. Biodiversity conservation goals in this cultural landscape cannot be pursued in isolation from social and rural development goals. Addressing local needs based on already existing links between nature's contributions and people might help support biodiversity conservation in the area. Failing to understand the context and to recognize locally perceived problems could increase the risk of voluntary conservation failure. Our approach and lessons learned can provide insights to actionable research in other cultural landscapes globally.

KEYWORDS

collaborative approach, conservation actions, cultural landscapes, environmental stewardship, nature contributions, rural development, social-ecological system, voluntary private land conservation

1 | INTRODUCTION

Humanity depends on nature's contributions for life support and development in complex ways and at different scales, from local to global (Díaz et al., 2019; Fischer et al., 2015; McLaughlin, 2018; Rockström et al., 2009). However, we are currently facing an unprecedented global environmental crisis that threatens biodiversity and, consequently, human well-being (Cardinale et al., 2012; Ceballos et al., 2015; Díaz et al., 2019). Despite global efforts to reverse this crisis, many indicators suggest we are still far from changing the main global trajectory towards sustainability (Díaz et al., 2019). Even though protected areas have expanded rapidly over the last decades to meet international and national policy obligations (e.g. to cover 17% of land globally by 2020; Watson et al., 2016), their locations have not always been optimal for protecting biodiversity and many still remain 'paper' parks (Di Minin & Toivonen, 2015). Importantly, from the perspective of this study, their establishment has often focussed on locations that minimize conflict with agriculturally suitable lands (Venter et al., 2018).

Traditional cultural landscapes were found to be important for both people and nature (Fagerholm et al., 2020; Fischer, Hartel, & Kuemmerle, 2012; Plieninger, Höchtl, & Spek, 2006; Strohbach, Kohler, Dauber, & Klimek, 2015). In these landscapes, people relate to nature and perceive its contributions (i.e. positive and negative) in different ways according to worldviews, values, and different cultural and institutional contexts (Díaz et al., 2018; Pascual et al., 2017). These relationships are usually complex and extend beyond intrinsic values (i.e. the value of nature itself, independent of people) and instrumental values (i.e. what nature provides for us), to include relational values (preferences, principles and virtues about human–nature relationships; Chan et al., 2016; Jax et al., 2018; Muradian & Pascual, 2018).

In cultural landscapes, rural communities and biodiversity have evolved as tightly coupled social–ecological systems where local people play a key role in biodiversity conservation through environmental stewardship, caring for and responsibly managing the environment according to diverse motivations and capacities (Bennett et al., 2018; Raymond et al., 2016). In this context, sense of place, defined as the meanings and attachment to a setting

held by an individual or group (Tuan, 1977), has been increasingly shown to play an important role in people's motivations for environmental stewardship and adaptation to environmental changes (Chapin & Knapp, 2015; Masterson, Enqvist, Stedman, & Tengö, 2019; Masterson et al., 2017; Raymond, Brown, & Robinson, 2011; Raymond et al., 2016).

However, these cultural landscapes are threatened by pressures from local and global socio-economic drivers of change, which might result in the abandonment of traditional farming practices and the establishment of intensive monocultures (Díaz et al., 2019; Fagerholm et al., 2020; Fischer et al., 2012). These, in turn, might trigger land-use change and rural exodus, which can have negative consequences on both humans (e.g. negative impacts on social cohesion, local economies, access to education; Camarero & Oliva, 2019; McManus et al., 2012; Measham, Darbas, Williams, & Taylor, 2012) and biodiversity (e.g. increasing risk of local extinction from habitat loss; Auffret, Kimberley, Plue, & Waldén, 2018; Cousins, Auffret, Lindgren, & Tränk, 2015; Newbold et al., 2015; Staude et al., 2018). These challenges and the ways they might affect and threaten environmental stewardships at the local level are also manifested, perceived and addressed differently according to ecological, cultural and economic context (Masterson et al., 2019; West et al., 2018; Wilbanks, 2015). Therefore, understanding how people relate to places and nature in diverse cultural landscapes is key to identify sustainable development pathways that could integrate sustainable agriculture and biodiversity conservation (Chan et al., 2016; Gooden, 2019; MacGillivray & Franklin, 2015; Masterson et al., 2019; Pascual et al., 2017; West et al., 2018).

As many cultural landscapes across the world occur on private land, private land conservation policies are increasingly being developed and implemented from national to local levels to foster landowners' environmental stewardship and increase the impact of conservation (Bingham et al., 2017; Gooden, 2019; IUCN-World Commission on Protected Areas Task Force, 2019; Kamal, Grodzińska-Jurczak, & Brown, 2015; Mitchell, Fitzsimons, Stevens, & Wright, 2018). These policies range from involuntary policies, which might include imposed land-use regulations, to voluntary policies, which can include financial and capacity building instruments

(Casey, Vickerman, Hummon, & Bruce, 2006; Disselhoff, 2015; Kamal et al., 2015). Overall, the success of these policies depends on designing and implementing a suite of different policy instruments according to geographical contexts and to the needs, values and capabilities of different stakeholders (Cooke, Langford, Gordon, & Bekesy, 2012; Cortés-Capano, Toivonen, Soutullo, & Di Minin, 2019; Selinske et al., 2017). While researchers and policy-makers are becoming increasingly aware of the importance of getting in-depth understanding of landowners' perceptions, relational values, motivations and needs (Bennett, 2016; Cetas & Yasué, 2016; Chan et al., 2016; Selinske, Coetzee, Purnell, Knight, & Lombard, 2015), these approaches are still not commonly used to inform policy-making at the early design stage.

In spite of important recent theoretical and conceptual advances in stewardship literature (e.g. Bennett et al., 2018; Cockburn, Cundill, Shackleton, & Rouget, 2018; Enqvist et al., 2018; Masterson et al., 2019), there is a clear need to further develop the links between theory and practice (Cockburn et al., 2018). In this study, we contribute to filling this gap with empirical data from one of the most impacted and least protected biomes in the world, the 'Río de la Plata' temperate grasslands ecoregion (Bilenca & Miñarro, 2004; Henwood, 2010; Hoekstra, Boucher, Ricketts, & Roberts, 2005; Jacobson, Riggio, Tait, & Baillie, 2019; Overbeck et al., 2007). In addition, we contribute to filling a geographical gap in private land conservation literature as South America is currently underrepresented in published studies (Cortés-Capano et al., 2019). Specifically, our goal is to understand landowners' relationship with nature, their perceptions of the main problems affecting the area and their vision of a desired future to identify the constraints and opportunities to support voluntary private land conservation and foster environmental stewardship in a traditional cattle ranching area. This cultural landscape was identified as a priority area for the conservation of biodiversity in Uruguay (Di Minin et al., 2017). In Uruguay, 96% of the land is privately owned and the National System of Protected Areas (SNAP) covers only ~1% of the land (Di Minin et al., 2017). As a signatory to the CBD and with no resources for acquiring land for conservation, Uruguay recognizes the importance of voluntary private land conservation to help meet national and international biodiversity conservation targets (Law No. 19.535, Article 163, October 2017, <https://www.impo.com.uy/bases/leyes-originales/19535-2017/163>).

2 | METHODS

2.1 | Study area

At the national level, Uruguay is still predominantly covered by native grasslands (~60% of the country; Altesor, López-Mársico, & Paruelo, 2019). These biodiversity-rich 'old-growth' grasslands have evolved as cultural landscapes, shaped by human activities, such as fire management, since the Holocene (Behling, Pillar, Müller, & Overbeck, 2007; Kaal, Gianotti, del Puerto, Criado-Boado, & Rivas, 2019; Veldman et al., 2015) and have been allocated to

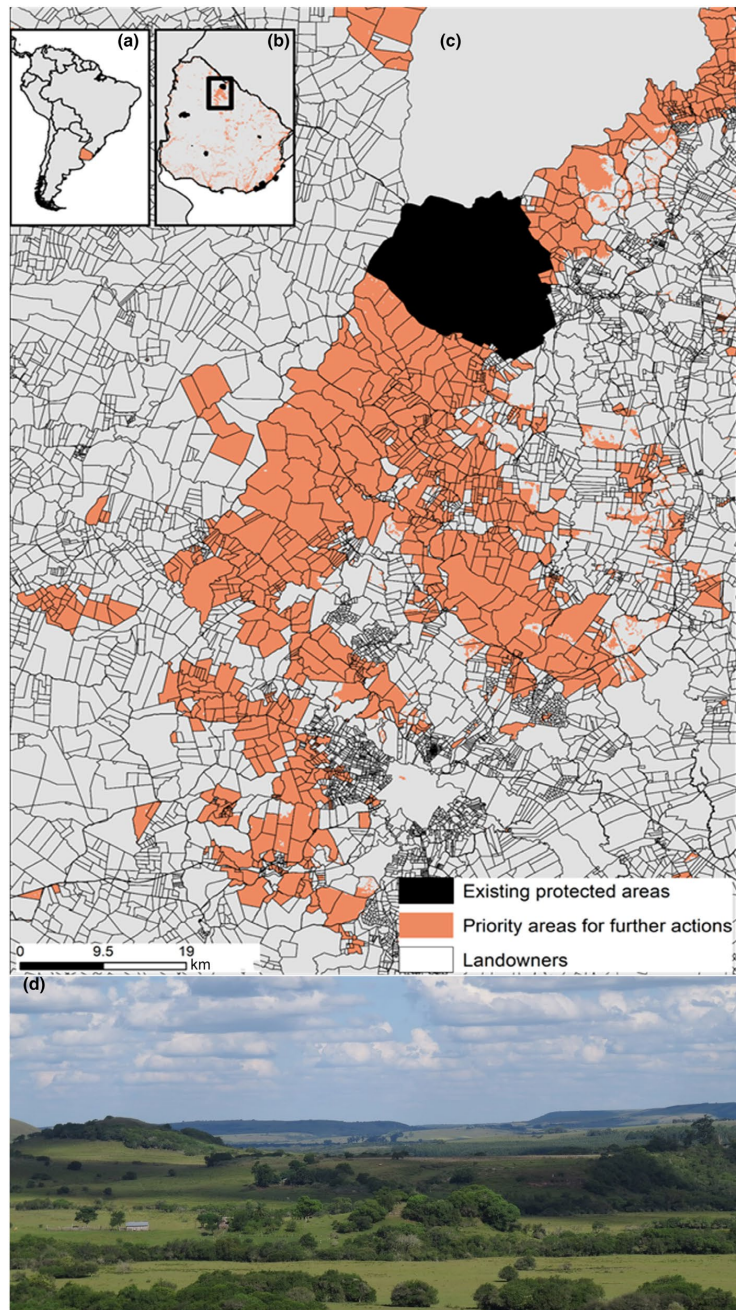
traditional extensive cattle ranching production since European colonization. Cattle ranching, predominantly on native grasslands, is one of the main economic activities in Uruguay (MGAP-DIEA, 2019). However, the area occupied by native grasslands has decreased at least 23% between 1961 and 2011 (OPP, 2015) and still continues to decrease (Altesor et al., 2019). The main causes of this decline are the expansion of commercial forestry, crops and pastures (Altesor et al., 2019; Modernel et al., 2016).

The study was conducted in the 'Quebradas del Norte' region, located in North Eastern Uruguay (Figure 1). The area of study has been identified at the national (Di Minin et al., 2017) and international (e.g. part of the 'Biomá Pampa-Quebradas del Norte' Biosphere Reserve, UNESCO, 2015, and part of the Important Bird Area 'North Quebradas and grasslands', BirdLife International, 2019) level as a priority area for biodiversity, ecosystem services and cultural heritage conservation. Specifically, we focused on an area called 'Cuchilla de Laureles y Cañas', which covers approximately 62,500 ha in the Departments of Tacuarembó and Rivera. The area includes diverse ecosystems, predominantly native grasslands (~60%), but also sub-tropical forests and shrublands immersed in a rolling topography characterized by hills, valleys, rivers and waterfalls (Figure 1d; DINAMA, 2009). In terms of species richness, the area hosts >600 plant species and >200 bird species. The area has also developed a unique culture over centuries, including a distinctive dialect related to the Uruguayan-Brazilian border territories ('Uruguayan Fronterizo'; Lipski, 2009), folk music and gaucho traditions and celebrations (e.g. Fiesta de la Patria Gaucha). While no official statistics exist for the study area, local stakeholders have consistently mentioned that approximately 70 families currently live in this rural area. Approximately 80% of the properties are smaller than 500 ha and >70% of the landowners permanently live there (Santos, 2008). The main land-use in the area is traditional cattle and sheep ranching on native grasslands. Recently, some ecotourism initiatives were also started to complement cattle ranching with other sources of income. These initiatives provide tourists with opportunities to experience local rural culture (e.g. traditional food and music and horse riding) and nature (especially native forests). However, commercial forestry has increased in the last decades and is expected to continue increasing in the future, representing one of the main threats to biodiversity conservation in the area (DINAMA, 2009).

2.2 | Methodological approach

To address local social-ecological complexity, we engaged diverse stakeholders in the research process (e.g. decision-makers, managers, landowners, Beier, Hansen, Helbrecht, & Behar, 2017; Cortés-Capano et al., 2019; Reed et al., 2009; see stakeholder analysis section for more details). Specifically, through formal and informal interviews, meetings and project presentations, we collaboratively (a) refined the overall scope of the study; (b) refined research questions and methods; (c) refined the geographical boundaries of the

FIGURE 1 Map of the study area. (a) Location of Uruguay in South America; (b) location of the study area in Uruguay; (c) private landowners properties identified as priorities for the conservation of biodiversity and ecosystem services in Uruguay (figure modified from Di Minin et al., 2017); (d) picture of the study area cultural landscape (credit: Gonzalo Cortés Capano). Our interviews were conducted in a sub-sample of those conservation priority properties



study area; (d) discussed the validity of our interpretations and (e) discussed the implications of the results for future policy-making.

Our research followed a constructionist epistemological position (Creswell, 2014; Moon & Blackman, 2014). This position assumes that meaning is created as people engage with and interpret the

world. Therefore, different individuals construct meaning in different ways according to their cultural, historical and personal perspectives and experiences (Creswell, 2014). This approach aims to be inclusive of individuals or groups' values, in relation to specific qualities or features in the environment, including place-specific ones

(Chan et al., 2016; Masterson et al., 2019). As we were interested in understanding local perceptions, we followed the definition of perceptions by Bennett (2016) to be 'the way an individual observes, understands, interprets, and evaluates a referent object, action, experience, individual, policy, or outcome'.

Our design followed continuous critical evaluations to respect the well-being and safeguard the dignity and autonomy of all participants. We followed recommendations from the voluntary ethics code developed by the Uruguayan Association of Social and Cultural Anthropology (Asociación Uruguaya de Antropología Social y Cultural, 2013) to ensure that the design would be culturally appropriate and would meet ethical requirements. Participation in all the instances of this study was voluntary. Informed consent was granted by all participants after adequately understanding the research aims, the institutions promoting and funding the research, how their data would be used and their rights as participants. It was possible for participants to withdraw from the study at any time and that it would not affect them in any way. A letter signed by the researchers conducting the interviews was provided to all participants including a summary of the research and the researchers' contact details in case the participants would like to express concerns or to withdraw from the study. The anonymity and confidentiality of all participants were strictly preserved by not revealing their names, identity and location of their properties at any stage of the research process (i.e. data collection, analysis and reporting of the main findings). Discussions were audio-recorded only after asking for expressed permission by the interviewee. It was stated that every opinion was valid (i.e. there are no good or bad answers) as the aim of the study was to understand participants' perceptions, experiences and reflexions. Data were anonymized and safely stored in a password protected environment under the control of the leading researcher. Raw data will be destroyed after publication. All analyses were conducted by the lead researcher in accordance with the other researchers. Finally, findings were summarized and presented during workshops at the local and national levels to divulgate the results and to receive feedback. Overall, by following these ethical criteria, our approach complied with the ethical principles of research in the human sciences both in Finland (Finnish National Board on Research Integrity, 2019) and Uruguay (Asociación Uruguaya de Antropología Social y Cultural, 2013).

2.3 | Stakeholder analysis

Stakeholders are the parties whose interests may be affected by an action or who can influence a process (e.g. policy-making or implementation), using means at their disposal, such as power, legitimacy, and existing ties of collaboration and conflict (Reed et al., 2009). To adequately engage stakeholders in the study area, we identified and characterized them according to their legitimacy, power, interests and relationships following Chevalier and Buckles (2008). To do this, we first identified a diverse group of key informants from the government, local community and non-governmental organizations working in the area. We then followed an iterative process

comprising scoping interviews, focus groups and follow-up interviews with these key informants to identify and characterize other local stakeholders (e.g. landowners, municipal authorities, private companies and businesses) in the area (Reed et al., 2009). The results of this process were then used to understand the local context and to inform sampling design (i.e. aiming to represent a diverse set of contexts and perspectives).

2.4 | Interviews

To get in-depth understanding on landowners' perceptions and to facilitate the emergence of unexpected insights, we conducted in-depth qualitative interviews (Newing, Eagle, Puri, & Watson, 2011). Topics discussed in the interviews were identified following a literature review and consultation with different stakeholders (e.g. decision-makers, landowners) to cover important aspects enabling landowners' environmental stewardship and to facilitate the identification of appropriate policy instruments aligned with their motivations and needs (Table 1; e.g. Chan et al., 2016; Enqvist et al., 2018; Hausmann, Slotow, Burns, & Di Minin, 2016; Masterson et al., 2019; Pascual et al., 2017; West et al., 2018). While the interviews were flexible to follow landowners' interests, the main topics discussed covered their sense of place, their relationship with nature, the main problems perceived to be affecting the area and their vision for a desired future. As our approach was not based in any pre-conceived normative definition of nature conservation, we inquired about their perception to inform future culturally appropriate actions and avoid social conflicts (Crow & Baysha, 2013; Peterson, Russell, West, & Brosius, 2010).

The interviews were always conducted by the same team composed of three people. Before starting the interviews, we explained the aim and the scope of the study. We also explained that the results would be anonymous and confidential and that they would be used for research purposes and to potentially inform the development of future policies for the area. In addition, we stated our position as researchers collaborating with the government and other institutions for this purpose (Singh et al., 2019). We expressed that every opinion was valid (i.e. there are no good or bad answers) since we were genuinely interested in understanding their perceptions, experiences and reflexions. Discussions were recorded only after asking for expressed permission by the interviewee. Interviews followed a flexible conversational approach (Moon, Adams, & Cooke, 2019) and lasted between 90 and 180 min. All interviews were conducted face-to-face in Spanish.

2.5 | Sampling design

Our design combined non-probabilistic purposive sampling informed by stakeholders analysis (Newing et al., 2011; Palinkas et al., 2015) and snowball sampling informed by asking interviewees to recommend participants who would have different views to them (Moon, Brewer, Januchowski-hartley, Adams, & Blackman, 2016; Newing et al., 2011). This overall strategy enabled us to interview

TABLE 1 Main topics discussed in the in-depth interviews with landowners in the cultural landscape of 'Cuchilla de Laureles y Cañas', Uruguay

Topic	Example questions	Supporting references
Demographic information	<i>Household composition, main source of income, property size</i>	Newing et al. (2011)
Sense of place	<i>What does it mean for you to live in the area? What would you miss the most if you had to leave the area?</i>	Gooden (2019), Hausmann et al. (2016), MacGillivray and Franklin (2015) and Masterson et al. (2019)
Relationship with nature	<i>How do you feel when you are in nature? What are the main benefits and conflicts with nature?</i>	Chan et al. (2016), Chapman et al. (2019), Díaz et al. (2015), Jax et al. (2018) and West et al. (2018)
Problems perceived to be affecting the area	<i>What do you think are the main problems in the area?</i>	Balvanera et al. (2017), Cockburn et al. (2018), Cooke et al. (2012) and Knight et al. (2019)
Vision for a desired future	<i>How would you like this place to be in the future?</i>	Matschoss, Repo, and Timonen (2019), Palomo, Martín-López, López-Santiago, and Montes (2011) and Sandström et al. (2016)
Main needs	<i>What would be needed for the area to move in the desired direction?</i>	Cetas and Yasué (2016), Moon et al. (2019) and Moon and Cocklin (2011)
Nature conservation definition	<i>Have you ever heard about nature conservation? What does it mean for you?</i>	Crow and Baysha (2013) and Peterson et al. (2010)

landowners covering a broad spectrum of contexts (e.g. property size, power, interests), to get a comprehensive understanding of how eventual policies could have a positive or negative impact in the area.

Since we aimed at getting in-depth understanding rather than representing a broader landowners population, our sampling size was estimated following the qualitative saturation principle (Newing et al., 2011). In practice, interviewee recruitment concluded when collecting more data revealed no further insights or understanding on the topics of interest (Creswell, 2014; Moon et al., 2016).

2.6 | Data analysis and validation

The interviews were analysed following constructivist analytic methods (Charmaz, 2006), iteratively integrating both inductive (i.e. grounded in the views and experiences of the participants) and deductive (i.e. inquiring about topics related to existing theoretical frameworks, such as sense of place and stewardship) approaches (Gooden, 2019; Moon et al., 2016). This approach was agreed as suitable with different stakeholders since there were no pre-existing theories regarding people's perceptions on the research topics for this area. Our analysis and coding mainly relied on audio transcriptions, and on field notes, memos and informal conversation when interviewees did not give permission to record audio.

Finally, we conducted two workshop validation exercises to discuss our main findings with different stakeholders at the local and national levels. First, to engage the local landowners' community we presented and discussed our interpretation of the results and suggested policy instruments in a locally relevant participatory platform

(Rural Development Board, Ministry of Livestock, Agriculture and Fisheries; MGAP). After adjusting and improving the results with their feedback, we presented and discussed them with different stakeholders from the public, private and civil society sectors at the national level (National Advisory Commission for the National System of Protected Areas, Ministry of Housing, Land-use planning and Environment; MOVTMA). This process helped us increase our results' validity (i.e. appropriateness of the interpretation of the results based on the evidence, research design and social context) and credibility (i.e. the degree to which the research represents the actual meanings of the research participants), which are key aspects of quality in qualitative research (Moon et al., 2016).

3 | RESULTS

3.1 | General descriptive information

We conducted 11 households' interviews, directly involving 16 people (eight women and eight men). In four interviews, two or three members of the family engaged in the conversations. Households were composed of between two and five family members. Ages of interviewees ranged between 20 and 70 years of age, the 40–50 range being the most frequent age class. All interviewees except one lived permanently in the area. Most of the interviewees (7 out of 11 families) mentioned that their family had been living and producing in the area for at least four generations, while two families were first generation in the area.

Property size ranged from 24 to 2,200 ha, covering a total area of approximately 5,500 ha. More than 95% of the properties were

covered by native ecosystems (i.e. grasslands, shrublands and native forests). Traditional cattle ranching on native grasslands was the main land-use, representing in all cases the main source of income for the families. Alternative sources of income included working for other landowners in the area, ecotourism initiatives, leasing part of their properties for other landowners to produce on them, working as rural property agent and, to a lesser extent, selling crafts made of local materials (e.g. food, leather, wool). According to our sampling design (e.g. stakeholders analysis, validation workshops), the characteristics of the interviewees adequately reflect the characteristics of the broader local landowners population.

3.2 | Sense of place perceptions

All landowners expressed that place is strongly linked to their personal identity. The main shared components associated with sense of place were as follows: (a) the appreciation of the area's nature and biodiversity (both ecosystems and species), (b) cattle ranching production and rural work (e.g. managing cattle with horses and shepherd dogs, animal husbandry), (c) good relationship and solidarity between neighbours, (d) the perception of historic legacy from their ancestors and (e) the traditional lifestyle (e.g. working in nature, following natural day/night rhythms, being independent from urban services and lifestyle).

They also expressed that singular landscape features such as hills, rivers and forests have historically shaped their ways of relating to the environment, consolidating local knowledge and productive practices that have been transferred from generation to generation. Some of them also mentioned that they perceive that new relationships with the place are evolving mostly in relation to the development of rural and ecotourism initiatives. These initiatives have prompted the appreciation of different aspects of the place in a novel way, such as bird species richness (in relation to birdwatching initiatives), trails in the forests for hiking and local music and gastronomy. Even though most landowners mentioned aspects related to their properties, the main components of their sense of place were placed at the landscape level.

3.3 | Relationship with nature

Most landowners mentioned that they found it difficult to reflect about their relationship with nature because it is part of their everyday experience and it usually is given for granted. However, they found it interesting and helpful to raise self-awareness about their experiences and benefits and conflicts they perceive from nature.

3.3.1 | Beneficial contributions from nature: Benefits

Landowners mentioned that they appreciate and enjoy experiencing nature while working on cattle ranching activities but also

nature-based activities such as fishing, hunting, birdwatching and camping. All landowners mentioned that nature is the main basis for their production, lifestyle and well-being. 'In my opinion, nature provides everything we need to live in the countryside'. According to their view, the main perceived benefits from nature were provided by native grasslands related to traditional cattle ranching activities. They mentioned that, even though average productivity might be lower than what they would get from using exotic commercial pastures, native grasslands (locally called 'campo natural') provide very good quality pastures for cattle, stability in performance and resilience to extreme climatic events (e.g. severe droughts). 'Native grasslands are Uruguay's petrol'. Regarding benefits perceived from shrublands, all landowners mentioned that, as long as they do not cover extensive areas, they are important for rainwater retention, favour nutritious grass species growth (e.g. providing shade and protection from cattle) and they represent a reservoir food source for cattle at times of severe droughts. Concerning native forests, they mentioned that they provide shade and shelter for cattle, both buffering extreme winter and summer temperatures, firewood and timber, and that they are key for providing and regulating water quality and quantity.

Some landowners also mentioned that nature in the area provides opportunities for developing ecotourism initiatives, especially related to rare or endangered birds (e.g. Buff-fronted owl *Aegolius harrisii*, Chestnut seedeater *Sporophila cinnamomea*) and mammals (e.g. Hairy dwarf porcupine *Sphiggurus spinosus*, South American coati *Nasua nasua*), subtropical forests and iconic landmarks such as hills and waterfalls. Finally, some landowners mentioned that nature also provides the opportunity for them to sustainably hunt native species for domestic consumption, mainly Capybara *Hydrochoerus hydrochaeris*, Nine-banded Armadillo *Dasyus novemcinctus* and the Dusky-legged Guan *Penelope obscura*.

3.3.2 | Detrimental contributions from nature: Conflicts

While all landowners appreciated local nature, they also stressed that it generates important difficulties and conflicts with their productive activities, mainly with cattle ranching. They mentioned that one of the main difficulties is related to the topographic characteristics of the area (e.g. hilly areas, rivers), which represents important challenges for accessibility and cattle management (e.g. gathering cattle, accessing fresh water sources). While their traditional practices are to a certain level adapted to these difficulties, all landowners mentioned that the main conflict with nature in the area is the increasing shrubland and forest encroachment, particularly by a native shrub called Whitebrush *Aloysia gratissima*. According to their perception, this spiny shrub encroaches in thick patches, reducing the grazing area covered by native grasslands. This reduction affects negatively cattle stock, generating negative impacts both in their income and

in the remaining grasslands state, due to increasing overgrazing (i.e. increasing density in the remaining grazing areas). 'Landscape characteristics and forest encroachment represent important difficulties for cattle ranching production'. They also mentioned that there is no conclusive information on the factors explaining this encroachment. However, most landowners pointed to the recent reduction of sheep stock as one of the main causes since sheep usually grazed on the shrubs saplings, controlling their abundance.

They also mentioned the existence of human-wildlife conflict in the area. Even though some landowners mentioned that there is conflict between sheep ranching and native species (e.g. Crab-eating fox *Cerdocyon thous* and Southern crested caracara *Caracara planus*), most of them expressed that native predators populations are low and do not represent a major problem for them. However, all landowners stressed the conflict with the exotic invasive wild boars *Sus scrofa* as one of the main problem affecting sheep stock and production. According to their perception, wild boars' populations are increasing in the area in the last decade, causing a significant increase in sheep killings.

3.4 | Perceptions of the main problems affecting the area

The main problems expressed by landowners were broadly related to productive and social dimensions (Figure 2). They explained that those dimensions are interrelated and both have impact in the local environment and biodiversity.

3.4.1 | Productive dimension

According to the landowners, increasing transformation of native grasslands to commercial forestry represented the most important change in the landscape. They mentioned that this land-use change negatively affects (a) their access to grazing areas since forestry occupies former cattle ranching areas, (b) their sense of place 'With these trees plantations it is not possible to see far as we were used to', there are some old houses where my family used to live that are now inside forestry plantations', (c) their health 'allergies have increased when all these pine trees flower and also when they use agrochemicals in the plantations' and (d) nature 'You see fewer birds than before, plus birds that were common before have now disappeared or became rare'. However, some landowners expressed that commercial forestry has also positive impacts since it provides job opportunities for local people and access to grazing areas for some landowners within forestry properties (e.g. leasing contracts with the companies).

In addition, all landowners expressed concerns towards the reduction of sheep stock as a productive and an environmental problem. While sheep farming was a traditional land-use in the area, rooted in their culture and contributing to the control of shrubland encroachment, both the market price instability and the impact of exotic wild boars (i.e. killing sheep) are causing this stock reduction. Other problems perceived by the landowners included: (a) challenges for developing ecotourism initiatives, both in terms of shortage of skilled workers and in terms of poor infrastructure to host tourists and (b) new challenges for improving cattle ranching production including the already mentioned shrubland and

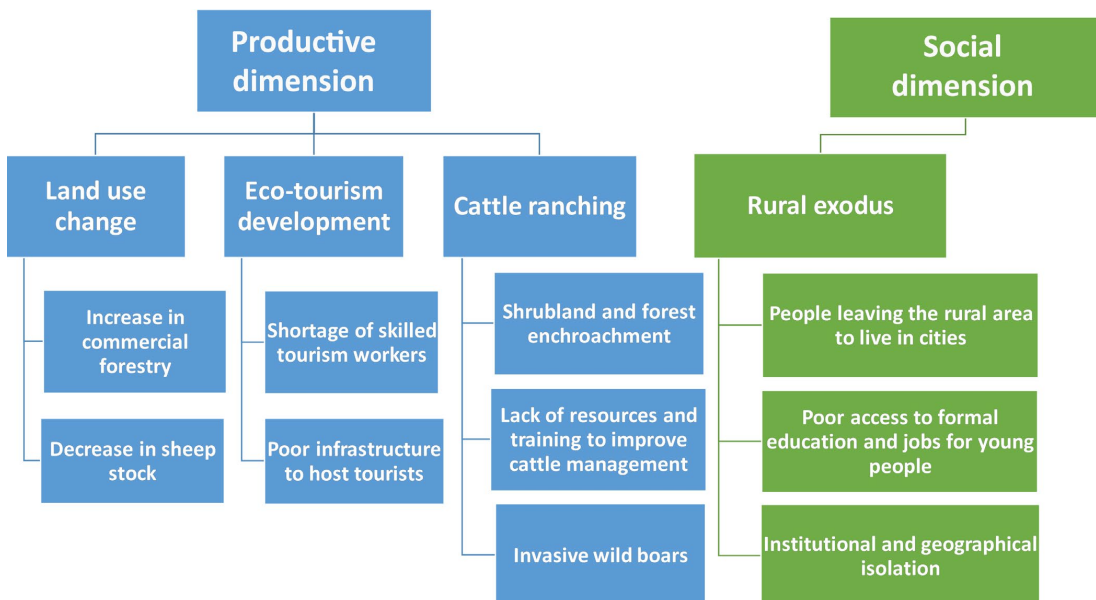


FIGURE 2 Main problems perceived by the landowners to be affecting the area. Problems were structured hierarchically to identify the main perceived dimensions, one related to production and the other one related to social aspects

forest encroachment and the increasing pressure from the invasive wild boars.

3.4.2 | Social dimension

On the social dimension, all landowners mentioned that the main problem in the area is the rural exodus, since people are increasingly leaving the rural area to live in towns or cities 'Many of our neighbours have left the area, each year there are fewer kids going to rural schools'. According to them, the exodus is driven by different factors, such as a decrease in income from traditional cattle ranching practices, poor access to rural high school education, and jobs for young people, and geographical (e.g. low accessibility) and institutional (e.g. low presence of formal institutions) isolation. According to their perception, rural exodus negatively affects other social dimensions such as the community capacity for self-organization (e.g. low participation in community activities) 'with fewer people it is increasingly difficult to get together to discuss about community issues and find solutions'. In addition, according to their perception, rural exodus also negatively affects the natural environment, by decreasing the number of people who would actively manage the properties 'with fewer farmers it is worse for nature, there is less management, less control for illegal hunting, and invasive species'. In addition, many of the landowners who leave the rural area sell their properties to forestry companies that replace native grasslands with commercial forestry.

3.5 | Landowners' visions for a desired future

All landowners covered social, cultural, productive and environmental dimensions in their visions for a desired future. The main elements of the visions included: (a) more people living in the area, producing and conserving nature, (b) ecotourism and production co-existing, (c) a community well aware of the importance of nature for their livelihood and well-being, (d) improved cattle ranching management based on their traditional practices that would allow them to be more competitive in the market while conserving native grasslands, (e) improved accessibility and connectivity (e.g. better roads, access to public transport and mobile phone signal), (f) better organized and informed community actively engaged in decision-making (e.g. Rural Development Boards) regarding development (e.g. improved access to education and beef production markets) in the area and (g) more education and job opportunities for young people. All of them mentioned that it would be important to create new collective spaces that would foster social cohesion and place attachment (e.g. folkloric celebrations, horse races). However, while landowners in our study area agreed on the main vision for the future, different households had specific preferences. While all landowners, for example, acknowledge the importance of ecotourism initiatives in the area, not all households would be interested in implementing them in their properties.

3.6 | Main landowners' needs

The main needs expressed by the landowners were broadly related to (a) receiving support to improve infrastructure, (b) enhancing knowledge management and building capacity and (c) strengthening social cohesion. While respondents emphasized different needs according to their personal contexts and interests, they found all needs to be important and complementary.

3.6.1 | Support to improve infrastructure

Most landowners mentioned needs related to improving infrastructure, both to enhance cattle management and productivity (e.g. building new fences) and to develop ecotourism initiatives (e.g. improving accommodation facilities for tourists). In this sense, some of the landowners mentioned that they would need financial support to implement these actions (e.g. cost-share incentives, tax exceptions). However, other landowners mentioned that they prefer non-financial support from institutions: 'I prefer to do things with our own resources, at our own pace. Support is always welcome, but not financial since you never know what they would ask you in exchange and you usually get trapped and loose autonomy'.

3.6.2 | Knowledge management and building capacity

These needs are mostly related to getting technical advice from practitioners (e.g. agronomists, veterinaries) and access to trainings and capacity building to improve cattle ranching management practices and to develop local skills to work on ecotourism. Some landowners also mentioned a clear need to co-create knowledge with academic researchers to identify solutions to local problems (e.g. how to better manage and control shrubland and forest encroachment). In addition, they mentioned the need to develop remote rural education programmes to provide young people with opportunities to study without leaving the rural area.

3.6.3 | Strengthening social cohesion

Finally, some landowners also mentioned needs related to strengthening and enhancing social cohesion and collective action. Specifically, they mentioned the need to get 'professional' support to strengthen existing local participation spaces and to create new ones according to young people's interests and needs. In this sense, they identified the need to enhance collective control of wild boars as well as collective control of wildlife poaching and sheep rusting in their properties. They also mentioned that it would be important for them to share innovative cattle ranching practices and experiences that would benefit both their income and the environment.

3.7 | Landowners' perception about the meaning of nature conservation

Landowners' meanings of conservation were diverse and complementary. Conservation is conceived from a social–ecological perspective, where the social and ecological dimensions are tightly coupled in this cultural landscape, mainly through cattle ranching production and recently through the development of ecotourism initiatives. 'Conservation is linked to production and to people living in the countryside'. All of them related nature conservation definitions to the importance of nature contributions to their well-being and livelihood, 'We conserve nature because we depend on it to make a living'. However, they expressed that conservation in the area should aim to maximize beneficial contributions from nature while controlling detrimental ones, especially controlling shrubland and forest encroachment. All landowners expressed that both them and their neighbours consider themselves stewards of local nature and culture. However, some of them made a clear distinction between being stewards and being environmentalists, 'I take care of nature but, I am not an environmentalist'. In this sense, all of them mentioned that top down approaches based on regulations and impositions would fail in the area since they generally do not take into account their perspectives, traditional practices and knowledge that have historically shaped the landscape for generations. However, all landowners expressed their willingness to get involved in eventual future environmental stewardship initiatives and actions if they would provide support to meet their needs to advance into their vision for a desired future, respecting their values and autonomy.

4 | DISCUSSION

While most studies on private land conservation policies focus on landowners' perceptions and preferences for already existing

programmes (e.g. Cooke & Corbo-Perkins, 2018; Gooden, 2019; Selinske et al., 2015; Sorice et al., 2013), this study followed a place-based approach (Balvanera et al., 2017) to assess the feasibility and identify constraints and opportunities to foster environmental stewardship in a priority area for the conservation of biodiversity on private land. In addition, our collaborative approach provided opportunities to integrate different perspectives and facilitate dialogue, learning and trust between stakeholders (de Vente, Reed, Stringer, Valente, & Newig, 2016). Specifically, our results revealed that landowners in the area agreed on a common vision for the future, while expressing specific yet complementary needs. Hence, designing a diverse set of context-specific policy instruments would be key to foster local landowners' stewardship (Cooke et al., 2012; Selinske et al., 2017) while integrating people's and nature's needs (Figure 3).

Our main results revealed that, in this cultural landscape, landowners' management decisions and their main needs were not primarily motivated by economic interests but also by a diverse set of values such as their sense of place, their relationship with nature and their traditional cattle ranching culture. In addition, we found that landowners in our study area already consider themselves and their neighbours as stewards of local nature. In line with the recent examinations of human nature relationships in social–ecological systems literature (Díaz et al., 2018; Enqvist et al., 2018; Jax et al., 2018; Pascual et al., 2017; West et al., 2018), we found that landowners' perceptions of local environmental stewardship were strongly mediated by their perceived benefits and conflicts with nature and their sense of place. Similar to the findings by Raymond et al. (2016), stakeholders showed an holistic understanding of stewardship, recognizing complex interdependencies between food production and ecological systems. In this sense, traditional cattle ranching on native grasslands was a core element of their stewardship, underlying self-identity, social cohesion and daily connections with nature (Díaz et al., 2018; Hall, 2019; IPBES, 2018; Modernel et al., 2016; Pascual et al., 2017). These results

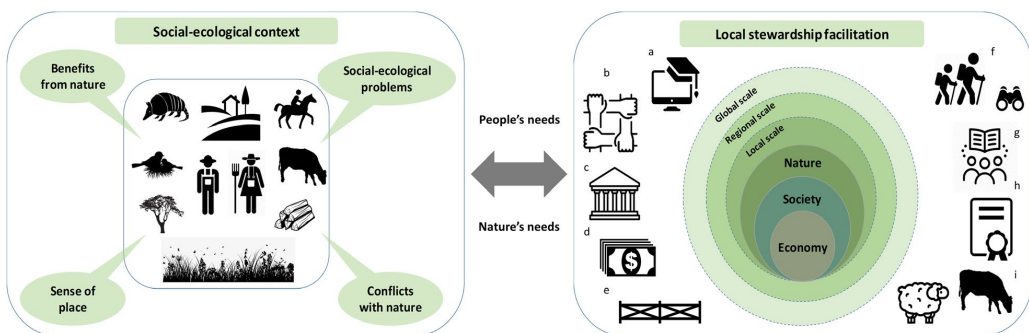


FIGURE 3 Conceptual model of our collaborative place-based approach. The approach is based on understanding landowners' perceptions on the main dimensions of the local social ecological context (sense of place, benefit and conflicts with nature and social–ecological problems) and their vision for the future to identify a set of policy instruments, based on people's and nature's needs, that would facilitate local stewardship and sustainable production in the long term. Some of the policy instruments that could potentially be implemented in our study area are as follows: (a) access to remote secondary education programmes and capacity building; (b) landowners networks; (c) technical assistance from interdisciplinary teams; (d and e) cost-share incentives to assist with the implementation of conservation actions; (f) support to develop ecotourism initiatives; (g) integration of different knowledge systems (e.g. local, academic) to find solutions to local problems; (h and i) support to develop sustainable production and ecotourism certification schemes

suggest that traditional conservation approaches failing to recognize existing links between people and nature (e.g. increasing regulations or buying property rights) are unlikely to provide long-term conservation outcomes in cultural landscapes (Bohnet & Konold, 2015; Fischer et al., 2012; Moon et al., 2019). Instead, designing policies that would support existing local environmental stewardship, aligned with landowners' motivations and needs, offer unique opportunities to meet socio-economic and ecological goals in the long term (Cetas & Yasué, 2016; Rueda, Velez, Moros, & Rodríguez, 2019).

Developing a shared understanding of the locally perceived problems and threats is key to support and further incentivize local stewardship in cultural landscapes (Bennett et al., 2018; Enqvist et al., 2018; Moon et al., 2019). In this sense, our in-depth approach helped reveal that rural exodus and shrubland and forest encroachment were among the main pressures that threaten the long-term economic, social and environmental sustainability. Far from being a local problem, rural exodus is a complex global issue, causing the shrinkage of rural communities' economies and autonomy (Li, Westlund, & Liu, 2019). Although in some cases it can lead to the restoration of degraded ecosystems and rewilding (see e.g. Aide & Grau, 2004; Pereira & Navarro, 2015), rural exodus can lead to the collapse of traditional systems with detrimental effects on biodiversity (e.g. Meyerson, Merino, & Durand, 2007; Parry, Peres, Day, & Amaral, 2010; Robson & Berkes, 2011; Uriarte et al., 2012). To decrease farm abandonment and to mitigate land-use change (e.g. from native grasslands to commercial forestry (Ehrnström-Fuentes & Kröger, 2018), future actions should aim at supporting local rural development (e.g. novel ecotourism initiatives and improving traditional cattle management). In addition, as traditional cattle ranching in the region is key to support current management and local livelihoods (de Freitas, de Oliveira, & de Oliveira, 2019), actions should also address perceived threats from shrubland and forest encroachment, which cause the reduction of the grazing area (Garibotto Carton, Caballero, & Pereira Machin, 2017). This is particularly important as failing to recognize and address locally perceived problems could result in inadequate policies, lack of landowners' engagement and support, negatively affecting the effectiveness of voluntary conservation in the area (Bennett et al., 2019; Chapman, Satterfield, & Chan, 2019). According to the landowners, to identify effective conservation solutions, there is a need to increase collaboration among different stakeholders and to foster the integration of different knowledge systems (e.g. local and academic; Paloniemi et al., 2018; Reed, Dougill, & Taylor, 2007; Tengö et al., 2017).

To increase local landowner's participation and long-term engagement in voluntary conservation, future policies in the area should offer a diverse set of incentives to account for heterogeneous needs (Selinske et al., 2017). Here, we suggest a set of potential policy instruments aiming to foster landowners' stewardship and to help address some of the locally perceived problems (Figure 3). Providing access to remote secondary education programmes (e.g. through the use of information and communication technologies; Acosta et al., 2011) and building capacity (e.g. through trainings

and workshops) might help bridge the urban-rural gap in education opportunities and mitigate rural exodus (Deotti & Estruch, 2016; Li et al., 2019). In addition, since people are increasingly leaving the rural area, strengthening already existing local participation platforms (e.g. Rural Development Boards where landowners meet to discuss about local problems; Cruz et al., 2018) might help enhance landowners networks. This is important since social-cohesion and collaboration grounded in rurality (e.g. exchange of diverse knowledge, skills and resources) can facilitate adaptation to emerging socio-ecological disruptions (Leap & Thompson, 2018). Moreover, technical assistance from interdisciplinary teams (e.g. agronomists and conservationists working together) might inform landowners on how to address land management challenges (e.g. increasing shrubland and forest encroachment; Garibotto Carton et al., 2017). Technical assistance can also contribute to improve grazing management to maximize beneficial contributions from nature (e.g. increase native grasslands resilience to extreme climatic events such as severe droughts; Modernel et al., 2019). In addition, financial incentives, such as cost-share programmes, can provide landowners with economic support to cover part of the costs of implementing conservation actions on their lands (Casey et al., 2006). Financial support might be targeted to costs related to improving infrastructure (e.g. building new fences for rotational grazing and temporary cattle exclusions on native grasslands), protecting riparian buffer areas or controlling invasive species (Kilgore & Blinn, 2004; Ma, Butler, Kittredge, & Catanzaro, 2012; Vecchio, Bolaños, Golluscio, & Rodríguez, 2019). Finally, recognizing current management practices that contribute to biodiversity conservation and sustainable production could help foster landowners' stewardship while increasing economic benefits (Disselhoff, 2015; Enqvist et al., 2018). For example, certification schemes for sustainable beef production would help landowners to access high-quality markets and increase profits (Modernel et al., 2016). However, future long-term success of conservation outcomes strongly depends on designing legitimate institutional arrangements (e.g. new partnerships between governments, private sector and nongovernmental organizations) to plan, implement and monitor voluntary conservation policies (Clement, Moore, Lockwood, & Mitchell, 2015; de Vente et al., 2016; Gooden & 't Sas-Rolfes, 2020; Lambin & Thorlakson, 2018; Rissman, Owley, L'Roe, Morris, & Wardropper, 2017; Selinske et al., 2019).

To conclude, our results showed that biodiversity conservation goals in this cultural landscape cannot be pursued in isolation from social and rural development goals (Hanks, 1984; Mikulcak, Newig, Milcu, Hartel, & Fischer, 2013) and need to consider already existing local environmental stewardship. Overall, while there is a global growing tendency to increase landowners' engagement in conservation by providing financial incentives (Cortés-Capano et al., 2019), policies relying mainly on these instruments might marginalize other motivations for environmental stewardship and increase the programmes dependency on external financial inputs (e.g. Chapin & Knapp, 2015; Cooke & Corbo-Perkins, 2018; Selinske et al., 2017; Yasué & Kirkpatrick, 2018; Yasué, Kirkpatrick, Davison, & Gilfedder, 2019). In turn, strengthening existing links between people

and nature and addressing local needs could confer both social and conservation benefits in a fair and sustainable way. Since this area has been nationally and internationally recognized as a priority for biodiversity and cultural conservation (BirdLife International, 2019; Di Minin et al., 2017; UNESCO, 2015), traditional management practices in place by local landowners should be respected as part of 'Other effective area-based conservation measures'. Specifically, these areas are 'a geographically defined space, not recognized as a protected area, which is governed and managed over the long-term in ways that deliver the effective in-situ conservation of biodiversity, with associated ecosystem services and cultural and spiritual values' (IUCN-World Commission on Protected Areas Task Force, 2019; Mitchell et al., 2018). Hence, supporting and reporting these areas as OECM could potentially increase their long-term contribution to biodiversity conservation while also help achieve conservation targets at the national level (Di Minin et al., 2017). Although we are aware that our results are context-dependent (i.e. low transferability; Moon et al., 2016), we believe our approach and lessons learned can provide insights to inform actionable research (Beier et al., 2017) in other cultural landscapes globally.

ACKNOWLEDGEMENTS

We are very grateful to all the participants in this study for sharing their perspectives and experiences. We are also grateful to Vida Silvestre Uruguay and to the National System of Protected Areas in Uruguay. The project was supported by the Uruguayan Ministry of Housing, Land Planning and Environment project URU/13/G35. G.C.-C. was supported by the National Research and Innovation Agency, Uruguay (grant number POS_EXT_2015_1_123575). E.D.M. thanks the European Research Council (ERC) for funding under the European Union's Horizon 2020 research and innovation programme (grant agreement #802933). T.T. thanks the Osk. Huttunen Foundation and Clare Hall College in Cambridge. Finally, we are grateful to the editors and anonymous reviewers whose comments and suggestions improved the quality of the manuscript.

CONFLICT OF INTEREST

Nothing to declare.

AUTHORS' CONTRIBUTIONS

G.C.-C. conceived the central idea and coordinated the research team; G.C.-C. with the contribution of G.G.-C., A.F. and C.D. designed the methodology; G.C.-C., G.G.-C., A.F. and C.D. collected the data; G.C.-C., G.G.-C. and A.F. analysed the data; E.D.M. and T.T. provided insights to frame the manuscript; G.C.-C. and E.D.M. led the writing of the manuscript; E.D.M. prepared the map in Figure 1; T.T. and A.S. provided critical comments to the drafts. All authors gave final approval for publication.

DATA AVAILABILITY STATEMENT


All data used in this manuscript are present in the manuscript. Reports in Spanish, prepared as a result of the project 'Conservación voluntaria de la naturaleza en Uruguay: perspectivas de productores

rurales de las Quebradas del Norte' supported by the Uruguayan Ministry of Housing, Land Planning and Environment project URU/13/G35, can be provided upon request to the corresponding author, and with permission of all parties involved with the research.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Cortés-Capano G, Toivonen T, Soutullo A, et al. Exploring landowners' perceptions, motivations and needs for voluntary conservation in a cultural landscape. *People Nat.* 2020;2:840–855. <https://doi.org/10.1002/pan3.10122>

Supporting landowners' stewardship in cultural landscapes to benefit people and nature

Gonzalo Cortés-Capano, Tuuli Toivonen, Alvaro Soutullo, Andrés Fernández, Caterina Dimitriadis, Gustavo Garibotto-Carton, Enrico Di Minin

In many rural areas, people have been living in close relationship with nature for generations. In these cultural landscapes, rural communities play a key role in conserving nature through environmental stewardship, which involves caring for and responsibly managing the land. However, many of these places are currently under threat from land-use change and people are increasingly leaving rural areas and abandoning traditional practices. Many cultural landscapes across the world occur on private land. Hence, developing culturally appropriate policies to engage landowners in voluntary conservation is key to support both people and nature. How can we inform such policies to foster landowners' environmental stewardship in cultural landscapes?

We interviewed landowners in one of the most important areas for nature conservation in Uruguay, where traditional cattle ranching has been conducted on native grasslands for generations. Our aim was to understand landowners' relationship with nature, their perceptions of the problems affecting the area, and their main needs and vision of a desired future, in order to identify constraints and opportunities to inform voluntary conservation policies. Our results revealed that landowners in the area had a close relationship with nature and considered themselves and their neighbours as local environmental stewards. Traditional cattle ranching on native grasslands was a core element of their stewardship, underlying self-identity, social cohesion, and daily connections with nature. However, rural migration to urban areas and the reduction of grazing areas, due to uncontrolled shrubland expansion, were perceived to be the main threats to landowners' livelihoods. In order to adequately support landowners' stewardship, future policies in the area should offer a diverse set of incentives addressing local needs. These incentives should be developed in close collaboration with landowners, respecting

their needs and preferences. For example, providing access to remote education programs might help bridge the urban-rural gap in education opportunities and mitigate rural exodus. Nature conservation goals in cultural landscapes cannot be pursued in isolation from social and rural development goals. Our approach and lessons learned can provide insights to inform actionable research in other cultural landscapes globally.



Picture of the study area located in North Eastern Uruguay. "Cuchilla de Laureles y Cañas" cultural landscape. The area has been identified at the national and international level as a priority area for biodiversity, ecosystem services, and cultural heritage conservation. (Photo credit: Gonzalo Cortés Capano).

Kulttuurimaisemien maanomistajat kannattaa sitouttaa suojeluun - case Uruguay

Gonzalo Cortés-Capano, Tuuli Toivonen, Alvaro Soutullo, Andrés Fernández, Caterina Dimitriadis, Gustavo Garibotto-Carton, Enrico Di Minin

Monilla maaseutualueilla maailmassa ihmiset ovat eläneet tiiviissä yhteydessä luontoon sukupolvien ajan. Monilla maatalousalueilla kaupungistumisen on johtanut väestön nopeaan vähenemiseen ja perinteisten viljelymenetelmien hylkämiseen ja niihin liittyvien taitojen katoamiseen. Suuri osa luonnon monimuotoisuuden kannalta tärkeistä kulttuurimaisemista sijaitsee yksityisten omistamilla mailla. Kulttuurimaisemien suojelussa paikalliset asukkaat ja erityisesti maanviljelijät ovat tärkeässä asemassa ja heidän osaamisensa hyödyntäminen on välttämätöntä onnistuneen suojelun kannalta. Vapaaehtoinen suojelu voi olla yksityismailla tehokas keino suojelun toteuttamiseksi, erityisesti jos se on mahdollista toteuttaa kulttuuria ja elämäntapaa kuulemalla ja kunnioittamalla. Miten sitten toteuttaa tällaista suojelupolitiikkaa?

Tutkimuksessamme haastateltiin maanomistajia yhdellä Uruguayn luonnon monimuotoisuuden kannalta tärkeimmällä alueella. Alue on merkittävä ruohostoalue myös maailmanlaajuisesti biodiversiteetin suojelua ajatellen. Alue on lähes kokonaan yksityisten maanomistajien hallinassa. He ovat kasvattaneet alueen luontaisesti ruohostoilla alueilla karjaa usean sukupolven ajan. Haastattelimme paikallisia maanomistajia pyrkimyksenämme ymmärtää heidän suhtautumistaan ympäristöönsä, näkemyksiään ympäristöön kohdistuvista paineista sekä kartoittaaksemme heidän tulevaisuudentoiveitaan. Pää tavoitteena oli tunnistaa yksityismailla tapahtuvaan suojeluun liittyviä vaikeuksia ja mahdollisuuksia, jotta alueella aikaisemmin epäonnistuneiden suojelutoimenpiteiden virheet voitaisiin välttää. Tuloksemme osoittivat maanomistajien olevan kiintyneitä ympäristöönsä ja näkevän oman roolinsa alueen luonnon ylläpitäjinä laiduntaessaan karjaansa ruohostomailla. Karjankasvatus oli monelle merkittävä osa omaa identiteettiä sekä tärkeä tekijä

sosiaalisen yhteisön sekä luontosuhteen ylläpidon kannalta. Maaseutualueiden autoituinen kaupungistumisen seurauksena sekä ja laidunalueiden väheneminen pusikoitumisen myötä nähtiin pääasiallisena uhkana luonnon ympäristön säilymiselle. Tulostemme perusteella tulevaisuuden suojelutoimenpiteitä kannattaisi kehittää tiiviissä yhteistyössä maanomistajien kanssa käyttäen monimuopuolista keinovalikoimaa. Esimerkiksi etäopiskelumahdollisuudet nähtin keinona tarjota nuorille mahdollisuuksia myös maaseudulla, kaupunkiin muuton vaihtoehtona. Tulosten perusteella näyttää ilmeiseltä, että kulttuuriympäristöjen yksityismailla tapahtuva suojelu on osa laajempaa sosiaalista kokonaisuutta. Suojelun onnistuminen edellyttää kokonaisuuden tarkastelua paitsi luonnon näkökulmasta, myös sosiaalisen ja maaseutupolitiikan kannalta. Johtopäätös lienee sama monilla maaseutualueilla maailmassa.



Photo credit: Gonzalo Cortés Capano.

Supporto alla gestione responsabile delle risorse nei paesaggi culturali per il beneficio della gente e della natura

Gonzalo Cortés-Capano, Tuuli Toivonen, Alvaro Soutullo, Andrés Fernández, Caterina Dimitriadis, Gustavo Garibotto-Carton, Enrico Di Minin

In molte aree rurali, la gente ha vissuto per generazioni a stretto contatto con la natura. In questi paesaggi culturali, le comunità rurali giocano un ruolo importante nel conservare la natura, prendendosi cura e gestendo in maniera sostenibile le risorse naturali. Purtroppo, molti di questi luoghi stanno cambiando sotto pressioni esterne e la gente sta abbandonando le aree rurali e le pratiche tradizionali. Molti paesaggi culturali in giro per il mondo si trovano all'interno di proprietà privata. Di conseguenza, è importante sviluppare politiche culturalmente appropriate per fare in modo che i proprietari terrieri si impegnino in forme volontarie di conservazione che possano sostenere la natura e lo sviluppo sostenibile. Ma come possiamo generare l'informazione scientifica necessaria a sostenere queste forme di conservazione volontaria privata nei paesaggi culturali? Abbiamo intervistato dei proprietari terrieri in una delle aree più importanti per la conservazione della natura in Uruguay. In questa zona, l'allevamento di bestiame allo stato brado è stato praticato da generazioni nelle praterie naturali. Il nostro obiettivo era di capire la relazione dei proprietari terrieri con la natura, le loro percezioni dei problemi che affliggono la zona, e i loro bisogni e visione per il futuro, in modo da identificare problemi e opportunità per informare politiche per la conservazione volontaria della natura. I nostri risultati rivelano che i proprietari terrieri vivono a stretto contatto con la natura e si identificano come dei custodi della natura. L'allevamento di bestiame allo stato brado nelle praterie naturali è un elemento centrale che caratterizza il ruolo di custodi della natura dei proprietari terrieri, il loro senso di identità, la coesione sociale, e le connessioni quotidiane con la natura. La migrazione dalle aree rurali alla città e la riduzione delle aree di pascolo dovute all'espansione delle aree arbustive sono percepiti come i problemi principali dai proprietari terrieri. In modo da

supportare i proprietari terrieri, le politiche future dovranno promuovere incentivi indirizzati ai bisogni locali. Questi incentivi dovranno essere sviluppati in collaborazione con i proprietari terrieri, rispettando i loro bisogni e preferenze. Per esempio, offrire accesso a programmi remoti di educazione potrebbe riuscire ad ovviare all'assenza di opportunità educative nella zona e prevenire la migrazione verso le aree urbane. La conservazione della natura nei paesaggi culturali non può prescindere dallo sviluppo sociale e rurale. I nostri metodi e risultati sono importanti per stimolare ricerca in altri paesaggi culturali in altre aree del mondo.



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Apoyo a la custodia ambiental de productores rurales en paisajes culturales para beneficio de la gente y la naturaleza

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En muchas áreas rurales, la gente ha vivido en relacionamiento cercano con la naturaleza por generaciones. En estos paisajes culturales, las comunidades rurales juegan un rol fundamental en la conservación de la naturaleza a través de la custodia ambiental, la cual involucra el cuidado, el uso y el manejo responsable de la tierra. Sin embargo, muchos de estos paisajes se encuentran amenazados por cambios en el uso del suelo, por la migración rural hacia áreas urbanas y por el abandono de prácticas tradicionales. Muchos de estos paisajes culturales ocurren en tierras privadas. Por lo tanto, el desarrollo de políticas culturalmente apropiadas para involucrar a los propietarios rurales en acciones de conservación voluntaria de la naturaleza es clave, tanto para beneficio de la gente como de la naturaleza. Ahora, ¿cómo podemos informar dichas políticas para promover la custodia ambiental de los productores en paisajes culturales? En este estudio, entrevistamos a productores rurales en una de las áreas más importantes para la conservación de la naturaleza en Uruguay, donde los productores a través de generaciones han desarrollado ganadería pastoril tradicional sobre campo natural (i.e. pastizales nativos). Nuestro objetivo fue comprender la relación de los propietarios con la naturaleza, sus percepciones sobre los problemas que afectan el área, sus principales necesidades y su visión de un futuro deseado, como forma de identificar barreras y oportunidades para informar políticas de conservación voluntaria. Nuestros resultados revelaron que los propietarios en el área tuvieron una relación cercana con la naturaleza y se consideraron a sí mismos y a sus vecinos custodios del ambiente local. La ganadería pastoril tradicional sobre campo natural fue un elemento central de su custodia ambiental, de su identidad, de su cohesión social y de sus conexiones diarias con la naturaleza. Sin embargo, el éxodo rural

(i.e. la migración rural hacia áreas urbanas) y la reducción de áreas de pastizal disponibles para el pastoreo del ganado debido al avance no controlado de arbustales, fueron percibidas como las principales amenazas a su forma de vida y sustento económico. Para apoyar adecuadamente a los productores, las futuras políticas en el área deberían ofrecer un conjunto de incentivos variado, que aporte a la conservación de la naturaleza y aborde las distintas necesidades locales. Estos incentivos deberían ser desarrollados en colaboración con los productores, respetando sus necesidades y preferencias. Por ejemplo, proveer acceso a programas de educación remota puede contribuir a acortar la brecha en el acceso a la educación entre espacios urbanos y rurales, y así mitigar el éxodo rural. Las metas de conservación de la biodiversidad en paisajes culturales no pueden ser alcanzadas sin estar alineadas con metas sociales y de desarrollo rural. Nuestra aproximación colaborativa y nuestras lecciones aprendidas pueden contribuir a informar investigaciones orientadas a acción en otros paisajes culturales a nivel global.



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CHAPTER III

Cortés-Capano, G., Hanley, N., Sheremet, O., Hausmann, A., Soutullo, A., Toivonen, T. & Di Minin, E. (2021). Assessing landowners' preferences to inform voluntary private land conservation: a case study from Uruguay. Manuscript under review in *Land Use Policy*.

Assessing landowners' preferences to inform voluntary private land conservation: the role of non-monetary incentives

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Type of article: research article under review in *Land Use Policy*

Keywords: private land conservation; landowners' preferences; choice experiment; policy instruments; sustainability.

Abstract

Private land conservation (PLC) is an increasingly recognized strategy to help address the global biodiversity crisis. Understanding landowners' context-dependent preferences for different PLC policies is key to designing and implementing successful voluntary strategies aiming to foster participation and long-term engagement. However, funding shortfalls and diverse cultural values mean that traditional approaches such as land acquisition or payment for ecosystem services policies may not be the best approaches to increase landowners' participation in PLC. In this study, we examine how non-monetary incentives can be used to increase participation in PLC, and their relative effectiveness compared to monetary payments. We also address a geographical gap in PLC literature by assessing landowners' preferences for voluntary PLC policies in Uruguay, a country located in the Río de la Plata Grasslands ecoregion (South America), one of the most endangered and least protected biomes worldwide. This case study provides a useful test-bed of non-monetary incentives, since 96% of the land is privately owned and no voluntary PLC strategies are in place yet. Using a choice experiment, we found that landowners were more willing to engage in voluntary PLC if policies align with their values and needs. Non-monetary incentives, such as access to training and technical support, were preferred over monetary payments, highlighting opportunities to develop context-specific policies that would foster environmental stewardship and long-term engagement. Designing policies by including a diverse set of instruments, flexible contract lengths, and integrating the context-specific social and cultural characteristics underlying landowners' identities and values, are crucial aspects for increasing participation and effectiveness.

1. Introduction

We are currently facing a global environmental crisis that threatens biodiversity and human well-being (Cardinale et al., 2012; Ceballos et al., 2015; Díaz et al., 2019). Even though protected areas have expanded rapidly over the past few decades (Watson et al., 2016), their locations have not always been optimal for protecting biodiversity (Venter et al., 2018). Moreover, since privately-owned land accounts for large areas of the world, private land conservation (PLC) is an increasingly-recognized strategy to complement protected area networks (Bingham et al., 2017; Cortés-Capano et al., 2019; Kamal et al., 2015; Mitchell et al., 2018; Stolton et al., 2014). Many strategies have been developed worldwide to promote PLC (Casey et al., 2006; Disselhoff, 2015; Kamal et al., 2015). These include non-voluntary approaches such as regulation and government acquisition; and voluntary approaches such as conservation easements, payments for ecosystem services and agro-environment schemes (Casey et al., 2006; Cortés-Capano et al., 2019; Disselhoff, 2015; Doremus, 2003, Hanley et al 2012, Sheremet et al 2018). The voluntary nature of many PLC strategies implies that their success mainly depends on landowners' willingness to participate (e.g. in terms of enrolment, permanence and security of conservation agreements) and on their management capabilities in terms of resources and knowledge (Farmer et al., 2017; Hardy et al., 2017; Knight et al., 2010; Selinske et al., 2015). Implementing PLC strategies successfully requires conservation organizations to understand how policy design might influence landowners' participation decisions (Clement et al., 2015; Clements and Cumming, 2017a, 2017b; Epstein et al., 2015; Greiner, 2016; Hanley et al., 2012).

Globally, many studies in the PLC literature focus on understanding factors driving landowners' decisions to participate in already existing PLC programs (e.g. Brenner et al., 2013; Drescher et al., 2017; Farmer et al., 2017; Farmer et al., 2015; Kabii & Horwitz, 2006; Ma et al., 2012; Moon et al., 2012; Selinske et al., 2015; Selinske et al., 2019). These include understanding which policy instruments are preferred and how these preferences vary according to socio-economic background

of landowners (Drescher et al., 2017a; Januchowski-Hartley et al., 2012). Among different policy instruments, financial incentives, buying property rights or direct payments for management activities have been widely assessed as a way to provide *monetary* benefits in exchange of the implementation of conservation actions on landowners properties (Casey et al., 2006; Cortés-Capano et al., 2019; Ma et al., 2012; Ruto and Garrod, 2009; Selinske et al., 2017; Sheremet et al., 2018; Villanueva et al., 2017). However, policies relying mainly on such monetary benefits are problematic for conservation organizations which face funding challenges, and might marginalize other motivations for environmental stewardship (“crowding out”) (Chapin and Knapp, 2015; Chapman et al., 2019; Cooke and Corbo-Perkins, 2018; Fischer et al., 2012; Gooden and ‘t Sas-Rolfes, 2020; Selinske et al., 2017; Yasué et al., 2019; Yasué and Kirkpatrick, 2018). In this sense, non-monetary incentives, such as providing training to enhance farmer’s human capital, become more attractive to conservation organizations (Disselhoff, 2015). Moreover, such non-monetary incentives could improve conservation outcomes by strengthening social networks, and developing landowners’ capacities to implement conservation actions in the future (Cetas and Yasué, 2016; Cortés-Capano et al., 2020; Selinske et al., 2017). However, the importance of non-monetary incentives to meet landowners’ preferences and needs in PLC is still poorly understood (Cortés-Capano et al., 2019).

The main purpose of this paper is therefore to investigate how effective non-monetary incentives can be in enhancing participation in conservation actions, in a setting where most land is privately-owned. Addressing this gap is particularly important in the Global South, where resources for conservation are likely to be scarce, and where there is an urgent need to identify and implement a set of policy instruments that would help achieve more equitable and sustainable outcomes (Cortés-Capano et al., 2019; Zafra-Calvo et al., 2020).

Landowners possess a heterogeneous set of values and preferences for PLC according to their contexts and background (e.g. Adams et al., 2014; Greiner, 2016; Moon et al., 2012; Sheremet et al., 2018; Sorice et al., 2013). Socio-economic characteristics such as land tenure, residency, productivity of the land, personal circumstances (e.g. lifestyle and wellbeing, financial security) and social factors (e.g. social norms and networks, previous participation in environmental organizations) have all been found to affect PLC effectiveness (e.g. Cross et al., 2011; Drescher et al., 2017a; Farmer et al., 2017; Moon et al., 2012; Ruto and Garrod, 2009). Most of the factors driving participation and satisfaction with PLC policies are, moreover, highly context-dependent, with preferences for PLC policies varying across different geographical areas and cultures (Cooke et al., 2012). Most of the studies in PLC literature have been conducted in a limited set of geographical regions and with a long PLC tradition (e.g. different areas in the United States of America and Australia; Cortés-Capano et al., 2019). The transferability of findings from such settings to other countries adopting PLC strategies is poorly understood.

Since many countries are currently developing PLC policies to achieve national and global conservation targets (Disselhoff, 2015; Stolton et al., 2014; WCPA, 2019), there is a clear need to explore landowners preferences for different policy instruments to inform policy-making at early stages in under-represented regions (Cortés-Capano et al., 2019; Selinske et al., 2019). Among these areas, South America's temperate grasslands are one the most threatened and least protected biomes in the world and are mainly found on private land (Bilenca and Miñarro, 2004; Henwood, 2010; Hoekstra et al., 2005; Jacobson et al., 2019; Overbeck et al., 2007).

Our paper focuses on private land conservation decisions in these temperate grasslands. We consider the relative effectiveness of non-monetary incentives for PLC in the Río de la Plata Grasslands ecoregion in South America. Within the region, we focus on Uruguay, where most land (~96%) is

privately owned, while the National System of Protected Areas covers only ~1% of the land (Di Minin et al., 2017). As a signatory to the Convention on Biological Diversity (CBD) and with very limited resources for acquiring land for conservation, voluntary PLC in Uruguay is key to help meet national and international biodiversity conservation targets in the ecoregion. Hence, there is a need to understand landowners preferences for novel policy instruments in terms of how these might influence participation and long-term engagement (Cortés-Capano et al., 2020; Greiner, 2015; Hanley and Czajkowski, 2019). Specifically in our study, we used a choice experiment approach to assess: i) landowners preferences for different policy attributes, including monetary and non-monetary incentives, and costs (conservation action and contract length); ii) whether heterogeneity in landowners preferences is linked to differing socio-economic backgrounds; and iii) under what conditions landowners would be willing to sign conservation agreements.

2. Methods

2.1 Study area

The Río de la Plata Grasslands is one of the largest grasslands in South America, covering more than 750,000 km² in central-east Argentina, southern Brazil, and Uruguay (Paruelo et al., 2007; Soriano et al., 1992). The wide variety of ecosystems occurring in the ecoregion (e.g. different types of grasslands, shrublands, wetlands, forests) are the habitat of ~4000 native plant species, ~500 species of birds, and ~100 species of mammals (Azpiroz et al., 2012; Bilenca and Miñarro, 2004; Modernel et al., 2016). These diverse “old-growth” grasslands (Behling et al., 2007; Veldman et al., 2015) have been used for traditional extensive cattle ranching production since European colonization. However, over the last decades, the region has experienced drastic land use transformations, replacing the low-intensity cattle ranching on native grasslands with commercial crops and afforestation (Modernel et al., 2016). This has negatively affected both biodiversity and the provision of ecosystem services to

people (IPBES, 2018; Medan et al., 2011; Modernel et al., 2016). Although land-use change in Uruguay has been relatively moderate compared to other countries in the ecoregion (i.e. ~60% of the country is still covered by native grasslands; Altesor et al., 2019), the area occupied by native grasslands has decreased at least 23% between 1961 and 2011 (OPP, 2015), and still continues to decrease due to the expansion of commercial forestry, crops and pastures (Altesor et al., 2019; Brazeiro et al., 2020; Cortés-Capano et al., 2020; Soutullo et al., 2020). Cattle ranching, predominantly on native grasslands, is one of the main economic activities in Uruguay (MGAP-DIEA, 2019) and it is a core element of landowners' stewardship, underlying self-identity, social cohesion and daily connections with nature (Cortés-Capano et al., 2020).

2.2 Choice experiment design

Choice experiments are used to assess people's demands for non-marketed goods and services and novel policies (Adamowicz et al., 1998; Hanley et al., 1998; Hanley and Czajkowski, 2019). They have been used to understand preferences for agri-environmental schemes (e.g. Espinosa-Goded et al., 2010; Hanley et al., 2012; Kuhfuss, Préget, Thoyer, & Hanley, 2016; Kuhfuss, Préget, Thoyer, Hanley, et al., 2016; Ruto & Garrod, 2009), payment for ecosystem services (Geussens et al., 2019; Khan et al., 2019; Sheremet et al., 2018), and PLC (e.g. Adams et al., 2014; Romy Greiner, 2015; Kreye et al., 2017; Sorice et al., 2013). Respondents to a survey are asked to indicate their preferred choice between alternative options showing a combination of attributes, defined by their levels, of the good or service of interest (Hanley and Czajkowski, 2019). People's choices allow the relative values placed on each attribute to be statistically estimated (Adamowicz et al., 1998; Hanley et al., 1998; Hensher et al., 2005). In the context of participation in PLC schemes, these attributes reflect the nature of the agreements which landowners could be offered to support or change their production practices in favour of environmentally friendly methods, or to forgo the opportunity to intensify production in an unsustainable way. Compared to what is observable in real world situations

(Adamowicz et al., 1998; Rabotyagov and Lin, 2013; Train, 2009), choice experiments allow for more variation in the attributes and levels defining policies and can be used to predict willingness to accept contract payments according to the socio-economic background of respondents. The use of these methods in countries like Uruguay, with its absence of observable participation behaviour in voluntary conservation programmes, can provide valuable information to assist the development and design of novel policies at an early stage (Greiner et al., 2014; Hanley and Czajkowski, 2019).

In our study, the selection of policy attributes and levels for the choice experiment is aimed at identifying context-specific attributes that would likely have a significant influence on landowners' willingness to participate in novel PLC policies (Ruto and Garrod, 2009). To do this, we followed a multi-stage collaborative process (Greiner, 2015), involving a literature review (e.g. Adams et al., 2014; Greiner, 2015; Hanley et al., 2012; Hanley and Czajkowski, 2019; Kreye et al., 2017; Sheremet et al., 2018; Sorice et al., 2013; Villanueva et al., 2017b), and face-to-face focus groups discussions and interviews with a diverse group of stakeholders (15 participants) from the public, private and non-governmental sectors (e.g. practitioners, decision-makers, academics and landowners). During the focus groups, participants were asked to provide feedback on the selection of relevant attributes and levels that were perceived to be understandable and important to landowners, while being feasible to implement by conservation organizations working in the country. In addition, respondents were asked to provide feedback related to the use of culturally appropriate content and clarity of the CE survey.

The voluntary conservation agreements (contracts) were defined by 6 attributes including a monetary benefit (yearly monetary support per hectare for those participating), non-monetary incentives (enhanced access to markets; technical support; training) and two conservation contract requirements (required conservation actions and contract length) - see Table 1. We included monetary support as

an attribute in order to assess whether it affected landowners' preferences for voluntary conservation policies. Following the focus groups discussions, we included three levels of increasing payment per hectare and year (US\$ 5/ha/year; US\$ 20/ha/year and, US\$ 40/ha/year) and a baseline level of no payment. The non-monetary incentives are strategies designed to build landowners' long-term capacity to implement conservation actions (Casey et al., 2006; Cetas and Yasué, 2016; Cortés-Capano et al., 2019; Selinske et al., 2017). In Uruguay, landowners have expressed interest in receiving support in the form of technical assistance, training and enhanced access to markets (Cortés-Capano et al., 2020). Accordingly, we included these three type of incentives as three separate attributes with presence/absence levels for each. For example, these incentives can include access to assistance from interdisciplinary teams to improve grazing management or support from agencies to develop certification schemes for sustainable beef production on native grasslands and ecotourism.

In terms of conservation action requirements, we included an attribute stating whether the participant had to maintain native vegetation cover, or restore it (in case it had been already lost), according to three levels: up to at least 33%, 66% or 90% of their properties. Respondents were aware that cattle ranching on native grasslands would be allowed in the areas allocated to biodiversity conservation. Finally, the length of the agreement to be signed in PLC policies has been shown to affect participation in voluntary conservation policies in a number of contexts (Hanley et al., 2012; Lennox et al., 2012; Ruto and Garrod, 2009; Sorice et al., 2013). Hence, we included the length of agreement as a final policy attribute. We considered three levels of increasing duration: i) a short term agreement reflecting preferences observed in literature (5 years duration), ii) a middle-term agreement targeting landowners willing to collaborate but who may not be willing to make inter-generational commitments (20 years) and, iii) a long-term agreement which would allow for higher conservation permanence and security (50 years).

Table 1. Choice experiment attributes and levels and the socio-demographic variables.

Type	Attributes	Levels
Monetary benefit	Annual monetary support	Absent; U\$S 5/ha/year; U\$S 20/ha/year; U\$S 40/ha/year
Non-monetary benefits	Enhanced access to markets (e.g. production certification schemes, eco-tourism)	Absent; Yes
	Technical support (e.g. production, management, biodiversity)	Absent; Yes
	Training and courses	Absent; Yes
Cost	Agreement length	5 years; 20 years; 50 years
	Conservation action: Maintain native vegetation cover or restore up to at least	at least 33%; at least 66%; at least 90%
Socio-demographic	Gender	Woman; Man
	Age	Open question
	Higher level of formal education	Multiple choice question
	Property location: Department (Administrative unit)	Multiple choice question
	Live in the property	No; Partially; Yes
	Land tenure	Landowner; Landholder; Other
	Property size (ha)	Open question
	Native grassland coverage (ha)	Open question
	Economic dependency on the income generated in the property	low 0-25%; medium-low 25-50%; medium-high 50-75%; high 75-100%
Participation in groups or organizations	Open question	
Motivations and preferences	Willingness to implement grassland conservation and sustainable production actions	Likert scale: 1-4 very low to very high willingness; 5 already implementing
	Willingness to implement forest conservation and sustainable production actions	Likert scale: 1-4 very low to very high willingness; 5 already implementing
	Willingness to sign each of the respondents preferred agreements for each choice scenario (8 choice cards per respondent)	Likert scale: 1-4 very low to very high willingness
	Willingness to sign an agreement with different organizations	Multiple options: conservation non-governmental organization; landowners organization; Governmental organization
	Needs, motivations and general opinions about conservation policies	Open question

Once the attribute and level selection process was completed, we developed the choice scenarios by following a Bayesian D-efficient design procedure. Such design generates sufficiently low D-error while accounting for uncertainty surrounding true parameter values by assuming random rather than fixed priors for model parameters (Hensher et al., 2005; Scarpa and Rose, 2008). The design was generated in Ngene software (ChoiceMetrics, 2018), with the Multinomial logit (MNL) as the base model. The posterior coefficient distributions were derived from the pilot survey data, resulting in the mean D-error of 0.0042 (std. dev. 0.0002) for the final CE design. The pilot had a sample of 20 landowners (10% of the study targeted sample size), covering a wide spectrum of contexts (e.g. property size, education level, age) representative of the study population (see Table A1, appendix A). The final design consists of 40 choice scenarios divided into 5 blocks, so that each respondent answers to 8 choice scenarios from a randomly assigned block.

2.3 Survey structure and sampling

The survey was structured in three parts: 1) an introduction to obtain informed consent; 2) the choice cards; and 3) the questions about socio-demographic background and other preferences and motivations.

In the first part of the survey, respondents were introduced to the aim of the study, the content of the survey, and their rights as respondents, in plain Spanish, which is the main language in Uruguay. Informed consent was obtained after respondents understood that participation to the survey was voluntary and anonymous and that they could withdraw with no consequences at any time. The contact details of the researchers and institutions involved in the study were provided in case the participants wanted to express doubts, concerns or to withdraw from the study, even after completing it. In addition, we explained that data would have only been collected after finalising the survey and

confirming the submission of the responses. Respondents were informed that their responses would be fully confidential. By following these ethical criteria, our approach complied with the ethical principles of research in the human sciences both in Finland (Finnish National Board on Research Integrity, 2019) and Uruguay (Asociación Uruguaya de Antropología Social y Cultural, 2013).

The second part included a set of choice scenarios, in which respondents were asked to indicate their preferred option between two agreement (contract) alternatives and a “none” or opt-out alternative. Each option represents a specific, hypothetical voluntary PLC contract that the landowner could be offered. An example choice card is provided in Figure A1, Appendix A. In order to estimate the overall willingness to sign a voluntary PLC in the future, respondents were also asked to indicate how likely they would be willing to sign their chosen option (on a scale from 1 - not at all, to 4 - very much) after each choice scenario.

In the third part, respondents were asked about their socio-economic contexts including their age, formal education level, and their relationship with their properties (e.g. land tenure, residency, economic dependency) (Table 1). In addition, respondents were asked to provide information about their properties such as their size, broader administrative unit location, the current percentage of their properties covered by native grasslands and other native ecosystems. They were further required to indicate the productivity of their land according to the widely used national soil productivity index CONEAT (Duran, 1987; Durán, 1995). This index expresses an increasing relationship between livestock production and the type of soils present in the land. Next, the landowners needed to indicate if they were willing to implement management actions to conserve native grasslands and forests in the lands. In order to assess if participation in different groups would influence landowners’ preferences for contracts, we included a question as to whether respondents were already engaged in any group related to their activities in their land (i.e. landowners’ production organizations,

conservation organizations). Finally, in order to assess which type of organization landowners would prefer to sign an agreement with, we offered them multiple non-exclusive generic options including conservation non-governmental organizations, landowners' organizations and/or governmental organizations.

Responses to the survey were collected between the 28th of January and the 5th of March 2020 through the open-access online platform Google Forms (<https://docs.google.com/forms>). Although online surveys (e.g. computer, mobile phones, tablets) can introduce self-selection and non-response biases potentially affecting the generalisation of results, it has been shown that they are suitable means of collecting data for CE studies (e.g. Lindhjem and Navrud, 2011; Menegaki et al., 2016). Uruguay has a wide internet network, covering 89% of the population at the national level (AGESIC-INE, 2019). In our case, compared to face-to-face interviews, an online survey allowed us to i) carry out a country-wide survey where we reached out a larger proportion of the landowners' population; ii) ensure full anonymity of respondents (no personal identifiers were collected); and iii) avoid an intrusive approach which may motivate strategic responses (Lindhjem and Navrud, 2011). We distributed the link to the survey within landowners' networks at a national level by inviting potential respondents to participate through pre-existing email lists and social media groups, and via radio interviews. In order to cover a diverse variety of opinions, we used a snowball sampling technique by urging respondents to share the survey with other landowners in their own networks (Newing et al., 2011).

2.4 Data analysis

Respondents' preferences for policy attributes were estimated by using a mixed logit model (MIXL), which is among the most frequently used models to analyze choice data. Compared to the multinomial logit (MNL) models, MIXL are considered to be behaviorally more appropriate to address policy

relevant questions since they take into account heterogeneity of the preferences among respondents (Broch and Vedel, 2012; Greiner et al., 2014; Hanley and Czajkowski, 2019; Mariel et al., 2013). The model formulation builds on an MNL, which assumes that respondent n , choosing an alternative j in the choice scenario t , receives utility U equal to:

$$U_{njt} = \alpha_j + \beta X_{njt} + \varepsilon_{njt} / \sigma$$

where α_j is an alternative-specific constant, β are estimated parameters of attributes X , and ε is the unobservable random component of the utility function with σ as a scale, which is normalized to 1 in the MNL. The probability that a respondent n will choose an alternative j is equal to:

$$\Pr(y_{nt} = j) = \frac{\exp(\alpha_j + \beta X_{njt})}{\sum_{q=1}^J \exp(\alpha_q + \beta X_{nqt})}$$

In MIXL models both the taste parameters β , specific to individuals, and the alternative-specific parameters α are not fixed across all respondents, but vary around their average values. The parameters were estimated as:

$$\beta_{nk} = \beta_k + \delta_k Z_n + v_{nk}$$

$$\alpha_{nj} = \alpha_j + \delta_j Z_n + v_{nj}$$

where β_k is the overall population mean of k -attribute coefficient, and v_{nk} refers to the unobserved heterogeneity of respondent preferences. Similarly, α_j is the alternative-specific constant, and v_{nj} refers to its unobserved heterogeneity. We assume that the error terms that model heterogeneity for all preference parameters, are independently normally distributed with zero means and parameter-specific variances. Both formulas account for respondent's socio-economic characteristics Z_n with weights δ_k and δ_j , which is the way we model interactions between a respondent's stated preferences and her demographic background. In our CE design, non-monetary attributes were represented as categorical variables (not available, available), which were modelled as dummy variables (coded as 0,1). All the models were estimated using Nlogit software (Econometric Software, 2020).

Serial opt-out effect is a well-known phenomenon in CE decision making. It occurs in the situation when respondents prefer not to change away from “business as usual” (i.e. the *status quo*) and thus refuse to select any policy proposed in the choice alternatives. In the context of this study a respondent is classified as a serial opt-out if they choose not to participate in all of the hypothetical agreements offered to them. In order to understand whether respondents’ background contributes to explaining the probability of choosing the opt-out across all proposed alternatives, we implemented a binomial log-log model (clog-log) (Hardin and Hilbe, 2007; Zuur et al., 2009). Unlike the logit and probit functions which are symmetrical, the response curve of the cloglog is asymmetrical, with a fat tail as it departs from zero and sharply approaches one (e.g. zero-inflated binomial; Kitali et al., 2017; Taneichi et al., 2014). This characteristic makes the cloglog model appropriate for data sets in which there are relatively few opt-out outcomes (Kitali et al., 2017; Zuur et al., 2009), as it is in our sample.

3. Results

3.1 Descriptive statistics

A total of 222 respondents completed the online survey. Of these, 16 respondents chose the opt-out alternative in every choice scenario (i.e. were classified as serial opt-outs), and 24 respondents left some of the socio-economic questions incomplete. Thus, the survey yielded 182 responses to be included in the choice experiment analyses. These covered 18 departments out of 19 across Uruguay (Figure 1). The department of “Montevideo”, covered mostly by urban areas, was the only one not represented in the study. Overall, our sample adequately reflected the main characteristics of the broader landowners’ population in Uruguay according to official statistics (Instituto Nacional de Estadística Uruguay, 2011; MGAP-DIEA, 2019; MGAP-OPYPA, 2016).

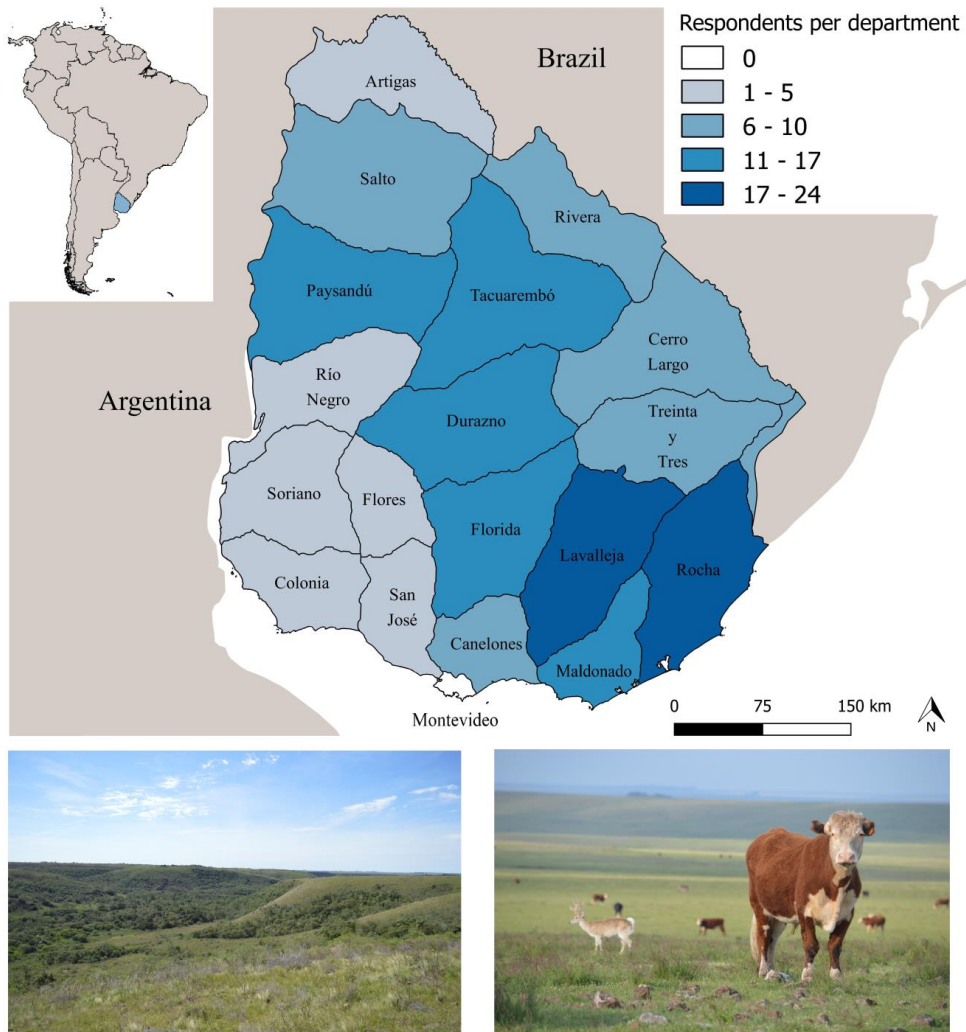


Figure 1. Number of respondents to the online survey aggregated per administrative unit (Departments) at the national level in Uruguay. Pictures show traditional cattle ranching landscapes on native grasslands in Uruguay (credit: Gonzalo Cortés Capano).

Respondents were 49 years old on average (min: 20 years, max: 78 years) and mostly men (74% of the sample, similar to the national percentage 75%; MGAP-OPYPA, 2016). Most respondents (56%) had completed a university degree, 29% finished secondary school and 15% did not complete secondary school. The majority of respondents were landowners (79%, similar to the national average 75%; MGAP-OPYPA, 2016). Most respondents (41%) partially resided on the property (i.e. spend more than two nights per week in the property on a regular basis), or fully (39%) resided on the property. similar to the national averages (34-58%; MGAP-OPYPA, 2016). Dependency of respondents' income on the revenue generated from the land was relatively evenly distributed, with 30% expressing a high dependency, 27% expressing a low dependency, 21% expressing a medium-high dependency and 21% expressing medium-low dependency. Property size was on average 539.8 ha, covering a wide range of sizes between 3 ha and 5300 ha. The share of native grasslands in the respondents' property was on average 74.7% (min: 2%, max: 100%). The average productivity of the properties (CONEAT index) was 88.6 (min: 11, max: 220), which was close to the national average (91; MGAP-OPYPA, 2016).

In terms of respondents' participation in landowners' groups, 42% of the respondents did not participate in any group, while 35% were members of landowners' "production oriented groups", and 23% of "conservation or sustainable production groups". The majority of respondents (68%) stated that they already implement actions to conserve grasslands where their cattle graze, and 32% expressed high or very high willingness to start implementing new conservation actions. A very small share of respondents (0.6%) expressed low or very low willingness to make grassland conservation efforts. Willingness to implement native forest management for conservation was mostly high or very high (64%), followed by 32% of those who are already doing so, and only 4% of respondents with low or very low willingness to implement such actions. Many of the landowners preferred to sign the agreements with a landowners' organization only (45%). On the other hand, 21% expressed that they

would be willing to sign an agreement exclusively with a governmental organization and 14% with a conservation non-governmental organization. Finally, 5% of the respondents said that they would sign an agreement with any type of organization.

3.2 Choice Modeling

Overall, the results of the simple MIXL (i.e. without interactions with demographic variables) showed that the estimate of the alternative-specific constant (ASC) had a significant negative sign (Table 2, first column), meaning that respondents perceived a higher utility from choosing one of the voluntary conservation programs offered compared to the option of not joining any program. Regarding the contract attributes, respondents significantly preferred higher support in accessing markets (e.g. certification schemes), higher monetary benefits, and allocating smaller proportions of their properties for biodiversity conservation and shorter length of conservation agreements.

The MIXL model with interactions between respondents' demographic characteristics and their preferences, fitted the data better than the simple MIXL (i.e. without interactions) (Table 2). We found significantly higher preferences for technical support and training, for allocating larger proportions of properties for biodiversity conservation, and for shorter length of conservation agreements (Table 2, second column).

Table 2. Estimation results for simple Mixed Logit model (MIXL) and MIXL with interactions with demographic variables (MIXL + interactions). Significance at 1%, 5%, and 10% levels is indicated by ***, ** and * respectively. Standard errors are in parentheses.

	MIXL	MIXL + interactions
<i>Means</i>		
ASC	-1.820*** (0.285)	-0.346 (1.626)
Markets	0.322*** (0.114)	0.683 (0.650)
Technical support	0.183 (0.112)	2.170*** (0.640)
Training	0.191 (0.123)	2.349*** (0.693)
Payment	0.057*** (0.003)	0.019 (0.033)
Contract length	-0.022*** (0.007)	-0.079** (0.033)
Conservation area	-0.009*** (0.003)	0.039** (0.018)
<i>Interactions</i>		
ASC* Property size		-0.002*** (0.0004)
Technical support*Education		-0.414*** (0.146)
Technical support*Land dependency		-0.241** (0.096)
Training*Education		-0.420*** (0.159)
Training*Property size		-0.0004** (0.0002)
Payment*Education		0.020*** (0.008)
Contract length*Participation		0.013** (0.007)
Conservation area*Property size		-0.18e-04*** (0.51e-05)
Conservation area*Land productivity (CONEAT)		-0.0003*** (0.0001)
Conservation area*Participation		0.009** (0.004)
<i>Std Dev</i>		
SD (ASC)	2.045*** (0.308)	1.992*** (0.362)
SD (Markets)	0.627*** (0.213)	0.539*** (0.203)
SD (Technical support)	0.414* (0.248)	0.025 (0.412)
SD (Training)	0.739** (0.203)	0.534** (0.257)
SD (Payment)	0.053*** (0.007)	0.050*** (0.007)
SD (Contract length)	0.053*** (0.008)	0.050*** (0.007)
SD (Conservation area)	0.031*** (0.004)	0.025*** (0.003)
N. observations	1456	1456
AIC	2402.90	2367.50
Log likelihood	-1187.45	-1134.76
McFadden R ²	0.258	0.291

In addition, we found high heterogeneity in landowners' preference for enhanced access to markets, as shown by a high standard deviation (0.539) relative to the mean parameter effect (0.683). Significant interactions between policy attributes and demographic variables showed that landowners with lower formal education level preferred access to technical support and training. In addition, landowners with higher formal education level preferred higher monetary benefits, while landowners with lower economic dependency on the activities implemented in their land were more interested in receiving technical support. Landowners who owned smaller properties were more interested in

accessing training support and in allocating a higher proportion of their land for conservation, while landowners with less productive properties (i.e. with a lower CONEAT index) preferred to allocate a higher proportion of their land for conservation. Finally, landowners already participating in either production or conservation groups preferred to engage in longer-term agreements and were more interested in allocating larger proportions of their properties to biodiversity conservation.

3.3 Willingness to sign and serial opt-outs

The average willingness to sign one of the hypothetical conservation agreements chosen by the landowners in choice scenarios was very high. Specifically, 87% of the responses expressed high and very high willingness to sign, while only 13% expressed low and very low willingness to sign the chosen agreements. Serial opt-out respondents revealed that the respondents who had lower formal education levels, who owned smaller properties, and with smaller proportion of native grasslands on their lands were more likely to choose the opt-out option in all choice situations (Table 3). In addition, the probability of opting-out increased with higher land productivity and with higher economic dependency on the activities implemented on their lands. On the other hand, younger landowners who resided on their properties and who already participated in landowners' production or conservation groups were less likely to choose the opt-out option in all cases. In the open-ended questions, some serial opt-out respondents explained that they preferred autonomy over their land and were not interested in receiving subsidies to support their livelihood. Other respondents mentioned the need to develop a comprehensive policy focused on rural development and conservation and other landowners questioned the need to conserve native ecosystems, claiming that intensive agriculture could be sustainable.

Table 3. Estimation results for the binomial complementary log-log model of serial opt-out choices, where the dependent variable coded as 1= opt-out in all choices. Significance at 1%, 5%, and 10% levels is indicated by ***, ** and * respectively. Standard errors are in parentheses.

<i>Variables</i>	<i>Estimates (Std. error)</i>
Intercept	-1.48* (0.577)
Age	0.047*** (4.99e-03)
Gender	-0.178 (0.044)
Education	-0.466*** (0.089)
Residence in the property	-0.549*** (0.090)
Land tenure	0.985*** (0.169)
Willingness to conserve native grasslands	0.459*** (0.098)
Willingness to conserve native forests	-0.596*** (0.064)
Property size	-5.34e-04*** (1.26e-04)
Percentage of native grasslands in the property	-0.022*** (1.91e-03)
Land productivity (CONEAT)	6.63e-03*** (1.58e-03)
Dependency	0.713*** (0.062)
Participation	-1.920*** (0.155)
N. respondents	198
AIC	1476
Log likelihood	-1134.76
Pseudo R ²	0.40

4. Discussion

This study presents the first assessment of landowners' preferences for different voluntary PLC policies in the Río de la Plata Grasslands ecoregion, in which the relative attractiveness of monetary and non-monetary incentives to participate in conservation programmes is compared. Overall, landowners showed positive interest in joining voluntary PLC programs with heterogeneous preferences for policies according to their socio-economic background. While monetary incentives have been found to be key instruments to increase landowners' participation in different contexts (Hanley et al., 2012; Horne, 2006; Moon and Cocklin, 2011; Pannell and Wilkinson, 2009), monetary attributes were not included in our best-fitting model of landowner preferences for PLC policies (MIXL model with interactions between respondents' demographic characteristics and their preferences). On the other hand, our results revealed that non-monetary incentives were mostly

preferred in Uruguay, as two of the non-monetary attributes (access to trainings and technical support) showed large, significant positive effects on explaining preferences. In addition, we found that landowners overall preferred allocating larger proportions of their properties to biodiversity conservation, given that low intensity cattle ranching on native grasslands would be allowed in those areas. However, in line with findings from other regions (e.g. Espinosa-Goded et al., 2010; Hanley et al., 2012; Sheremet et al., 2018; Sorice et al., 2013), landowners in Uruguay were more interested in policies involving shorter length of conservation agreements than longer-term agreements. Finally, our results highlighted potential barriers to participation among those landowners who had already transformed native grasslands to other land uses and expressed higher economic dependence on activities implemented in their lands. Similar to agricultural landowners in Colorado and Wyoming in the USA (Cross et al., 2011), higher economic dependence on their property may generate hurdles to join PLC strategies in landowners in Uruguay.

Beyond the importance of monetary incentives, other type of instruments aiming at fostering landowners' stewardship and increasing their management capabilities may contribute to increasing the effectiveness of PLC policies, generating both social and ecological benefits (Cetas and Yasué, 2016; Cortés-Capano et al., 2020; Farmer et al., 2015; Yasué et al., 2019). In our study, we found that facilitative incentives such as access to training and technical support were preferred by landowners in Uruguay. These incentives typically involve institutional strategies designed to build landowners' capacity to implement long-term conservation and sustainable production actions (Casey et al., 2006; Cortés-Capano et al., 2019). While a policy centred around monetary incentives may create financial dependency and increasing expectations among landowners (Clements and Cumming, 2018; Elmendorf, 2003; Gooden and 't Sas-Rolfes, 2020; Selinske et al., 2017; Yasué and Kirkpatrick, 2018), including non-monetary facilitative incentives such as training opportunities might foster landowners' autonomy and competence, enhancing their intrinsic motivations and

stewardship in the long-term (Cetas and Yasué, 2016; Gooden and Grenyer, 2019). Providing landowners with opportunities to access training and technical assistance according to their needs might, for example, help them develop new management skills to improve production in line with biodiversity conservation goals (Cortés-Capano et al., 2020; Modernel et al., 2019). As in our study we found that these incentives were particularly important for landowners with lower formal education levels and owning smaller properties, PLC policies in the country might help address conservation while fostering broader social and rural development aims (Cortés-Capano et al., 2020; Hanks, 1984; Mikulcak et al., 2013).

Understanding and effectively communicating co-benefits and trade-offs of different policies is crucial in order to identify effective strategies (Torabi et al., 2016), which in this case would help address biodiversity conservation goals while promoting sustainable food production (McElwee et al., 2020). In our study, landowners showed positive preferences for avoiding the conversion of native grasslands to intensive agriculture and commercial afforestation in larger proportions of their properties, given that cattle ranching would be allowed inside those conservation areas. Previous findings in Uruguay revealed that cattle ranching on native grasslands is a core element of landowners' sense of environmental stewardship, underlying self-identity, social cohesion and daily connections with nature, and integral part of cultural aspects underlying local livelihoods (Cortés-Capano et al 2020). In the country, traditional low intensity grazing on native grasslands is also a key aspect to support land management inside and outside protected areas (Cortés-Capano et al., 2020; de Freitas et al., 2019; Lapetina, 2012; Modernel et al., 2019). Worldwide, improving land grazing and livestock management were among the few interventions found to benefit both Sustainable Development Goals and Nature's Contribution to People, with no significant adverse trade-offs (Hall, 2019; McElwee et al., 2020; Proença and Teixeira, 2019). Integrating the context-specific social and cultural characteristics in developing PLC policies is thus a crucial aspect to

maximize landowners' participation (Cooke et al., 2012; Moon et al., 2014; Raymond and Brown, 2011). Our study showed that promoting sustainable cattle ranching management on native grasslands should be a key focus of conservation actions in PLC policies aiming at harmonizing conservation and food production in Uruguay, and other in other regions where traditional cattle ranching on native grassland occurs.

Similar to other contexts, landowners in Uruguay also preferred policies with shorter contract length agreements (e.g. Espinosa-Goded et al., 2010; Hanley et al., 2012; Horne, 2006; Layton and Siikamäki, 2009; Sheremet et al., 2018; Sorice et al., 2013). Interestingly, we also found the opposite among landowners who were already participating in a production or conservation group, and that these landowners also preferred to allocate larger proportions of their properties to conservation. These results suggest that offering a variety of options regarding the agreement length, would contribute to increase overall landowners participation (Lennox and Armsworth, 2011). While short length contracts might compromise long-term conservation security (Kamal et al., 2015; Roberts and Lubowski, 2007), they may provide opportunities for more frequent extension officer visits (e.g. agronomist, conservation practitioner) and adaptive collaborative management, possibly resulting in increasing landowners' satisfaction after enrolment (Farmer et al., 2017; Hardy et al., 2017; Selinske et al., 2015, 2019). In addition, fostering existing landowners' networks (e.g. exchange of diverse knowledge, skills and resources) may increase engagement in the long term while facilitating the coordination of conservation actions across property boundaries and social learning (Banerjee et al., 2017; Cortés-Capano et al., 2020; Duff et al., 2017; Hoffman, 2017; Kuhfuss et al., 2016a; Maciejewski et al., 2016). Since most respondents would prefer to sign an agreement with landowners' organizations, these organisations should ideally be engaged in the development and implementation of future policies, in order to foster trust between stakeholders groups (i.e. landowners, governmental and non-governmental organizations)

and generate transparent and effective outcomes (De Vos et al., 2019; Duff et al., 2017; Rissman et al., 2017)

To conclude, our results revealed that landowners in Uruguay showed high willingness to engage in voluntary conservation initiatives if future policies would meet their heterogeneous preferences and if they would align with their values and needs. In this sense, since cattle ranching is a core element of their identity, culture and livelihoods, PLC policies aiming to improve grazing management on native grasslands remains an opportunity to foster conservation in line with broader sustainable development goals (e.g. food security). Designing a diverse set of policy instruments, including monetary and non-monetary incentives and flexible options regarding contract length, would help foster participation and long-term engagement based on addressing the diversity of participants' values, motivations, expectations, and experiences, rather than focussing solely on monetary incentives (Chapin and Knapp, 2015; Chapman et al., 2019; Cooke and Corbo-Perkins, 2018; Cortés-Capano et al., 2020; Fischer et al., 2012; Selinske et al., 2017; Yasué et al., 2019; Yasué and Kirkpatrick, 2018). Improving land grazing and livestock management should be a central aspect of conservation actions in future PLC policies in grassland ecosystems and this would benefit both Sustainable Development Goals and Nature Contribution to People. In addition, since barriers for implementation are often subjective and hard to quantify, a better understanding of these key issues would require the implementation of in-depth place-based approaches to complement and expand our results (e.g. (Balázs et al., 2021; Balvanera et al., 2017; Cortés-Capano et al., 2020; Fagerholm et al., 2020; Oteros-Rozas et al., 2015; Raymond et al., 2016). We believe our approach and findings provide insights to conduct further research to identify opportunities to promote PLC in other underrepresented regions in literature worldwide.

Declarations of Competing Interest

None.

Acknowledgements

We are very grateful to all the people and institutions who participated in this study either by providing feedback in the focus groups, filling the survey and/or sharing with their contacts. G.C.C was supported by the National Research and Innovation Agency, Uruguay (grant number POS_EXT_2015_1_123575). A.H. and E.D.M thank the European Research Council (ERC) for funding under the European Union's Horizon 2020 research and innovation program (grant agreement #802933). We thank Christoph Fink for technical support during the online survey implementation.

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