ORIGINAL ARTICLE

Narratives of land abandonment in a biocultural landscape of Spain

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Abstract

Rural abandonment is a significant process in the Mediterranean region, posing sustainability challenges for rural and urban areas. Although there is an increase in studies focusing on the ecological implications and impacts of land abandonment and the role of rewilding, there is a knowledge gap in the study of the socio-cultural dimension of abandonment from the local perspective, even though it is crucial for land management decision. This study focuses on a case study in Western Spain, where a social survey was used to assess the perceptions of local communities regarding land abandonment and their implication on nature's contributions to people and quality of life. A survey campaign was administered in the case study region during the summer of 2020, collecting 205 face-to-face surveys. The results show that local communities overall have a negative reaction toward rural abandonment. In addition, local respondents recognize how traditional agriculture is the main source for maintaining nature's contributions to human well-being. Additionally, four groups of narratives toward rural abandonment were identified representing clusters of respondents with different motivations and interpretations of rural abandonment. This paper calls for understanding better the perceptions, values, and motivations toward rural abandonment and how their outcomes can be used as input for landscape management. Our results indicate that the local population perceives that the loss of rural livelihoods may entail serious environmental and societal problems, as locals are forced to abandon their rural-associated ways of life and migrate to urban areas.

Keywords Agricultural abandonment · Biocultural diversity · Cultural heritage · Human nature connectedness · Cultural values · Spain

Introduction

Every landscape on Earth is influenced to some degree by people, and in turn, societies and their cultures are shaped

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by landscapes (Plieninger and Bieling 2012). Agricultural landscapes are an important example of landscapes visibly shaped by human practices: wild varieties of seeds are domesticated; lands are irrigated and fertilized to increase production; specific structures are created to modify fields and change water availability; and certain seeds are selected while others are abandoned (Calvet-Mir et al. 2016). The relationship between nature and culture in agricultural landscapes runs deep, as everyday practices and traditions have coevolved with the environment over millennia (Haider et al. 2019). The long-term interaction between society and nature results in inter-dependent biological and cultural diversity, which are merged in biocultural diversity (Agnoletti 2014). This diversity is managed, conserved, and created by different social groups (Merçon et al. 2019). Biocultural diversity is particularly high in Mediterranean landscapes, where the coevolution of people and nature has generated traditional land management systems that exemplify sustainable social-ecological systems in some areas (Martín-López et al. 2016). Many Mediterranean landscapes represent areas where positive and negative feedback cycles between cultural practices

and natural systems have kept ecosystems robust and resilient and cannot be understood without considering the history of human-induced changes (Blondel 2006). Such tightly intertwined social-ecological systems occur, however, often in the poorest regions and subject to economic development interventions that frequently threaten biocultural diversity (Haider et al. 2019).

Many rural areas are characterized by stronger levels of human nature connectedness than urban ones (Balázsi et al. 2019), because both culture and traditional ecological knowledge about nature play a more important role in rural livelihoods (Díaz et al. 2018). Traditional ecological knowledge is defined as the cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment (Berkes 1993). For instance, in some rural areas, an agricultural lifestyle may inherently connect people to their local landscapes, allowing them to observe discernible changes. This is the case of traditional *dehesa* and *montado* farms that integrate extensive production of various combinations of cattle, sheep, goats, and pigs, with forest management and, in some cases, ancillary cropping (Plieninger et al. 2021).

Mediterranean agricultural landscapes are not static and have not been impervious to environmental and socio-economic drivers of change. Agricultural systems have become highly specialized, intensified, and standardized to cover food production and demand, substantially reducing landscapes dedicated to traditional and low-intensity farming (Kuemmerle et al. 2016). Landscapes rich in biocultural diversity with high conservation value are often managed on a small scale by farmers and pastoralists (Agnoletti et al. 2015) and are related to traditional local systems. Acknowledging the importance of agricultural landscapes as areas sustaining cultural diversity and traditional knowledge is vitally relevant to biodiversity and ecosystem conservation, and more importantly, to the recovery of sustainable ways of life and practices that connect people with nature (García-Martín et al. 2022). The abandonment of such landscapes may have important implications toward biocultural diversity as well as the full range of benefits and contributions that these landscapes provide (Quintas-Soriano et al. 2022b; van der Zanden et al. 2018).

Land abandonment refers to the abandonment of any area used for agricultural purposes, including croplands and grazing areas (Rey Benayas et al. 2007). It is estimated to have affected approximately 1,200,000 km^2 in Europe since the 1990s (FAO Stats 2017; Levers et al. 2018). This phenomenon is mostly driven by economic factors (such as the lack of profitability of former agricultural land use and the low competitiveness of traditional agricultural products) or by demographic changes (such as rural outmigration into areas where new economic opportunities are offered) (Quintas-Soriano et al. 2022a, b; Rey Benayas et al. 2007). In Europe,

previous studies have identified the Mediterranean region as a hotspot of both land abandonment (Plieninger et al. 2014; Quintas-Soriano et al. 2022a, b) and biocultural diversity (Herrando et al. 2016). The study of land abandonment has been widely addressed from an ecological or biophysical perspective, i.e., by evaluating impacts on biodiversity, soil fertility and erosion, or habitat quality (e.g., Plieninger et al. 2014; Rey Benayas et al. 2007), and by identifying drivers of change (e.g., Debolini et al. 2018). However, the understanding of local perceptions, values, and opportunities in regard to abandoned landscapes is much more limited, even though it is a crucial basis for landscape-related policy and planning (van der Zanden et al. 2018). A small number of studies have investigated land abandonment from a sociocultural perspective (Quintas-Soriano et al. 2022a, b). Frei et al. (2020) explored how local actor groups perceive natural forest regrowth on abandoned land and identified three narratives associated with land abandonment: a rural fatalism narrative, a pro-forest management narrative, and a pro-nature narrative, each leading to contrasting problem definitions and solution strategies on natural forest regrowth. Martín-Forés et al. (2020) explored the effect of forest regrowth on nature's contributions to people (NCP; all the contributions, both positive and negative, of living nature to the quality of life for people, Díaz et al. (2018)) and identified how social perception of forest regrowth connected to land abandonment was highly context dependent—being primarily perceived as negative in rural areas, while it was perceived positively in urban areas. A case study in Portugal (van der Zanden et al. 2018) reported negative perceptions by local people linked to the emotional attachment to traditional landscapes. Other studies have addressed how the local public evaluates landscape impacts, livelihood, and biodiversity aspects among different future scenarios or the impacts of rural land abandonment using historical analyses (Höchtl et al. 2005; Soliva et al. 2008).

The de-coupling of human activities and practices from natural systems (Riechers et al. 2022) has been translated into weakened human nature connections, most notably material, cognitive, and emotional connections (Ives et al. 2018; Riechers et al. 2020). As a result, in many societies—especially in Western ones—people have ceased to perceive that their well-being depends on the preservation of healthy ecosystems (Folke et al. 2011). It is commonly asserted in conservation science, environmental psychology, and sustainability science that humanity's growing disconnection from the natural world is contributing to the global environmental crisis (Beery et al. 2023; Ives et al. 2018) and thereby also massively affecting rural areas. In addition, there is an increasing polarization of society, where the urban population, which is more decoupled from nature, demands the protection of biodiversity and natural processes much more intensively than the rural population, which lives closer to nature (Berenguer et al. 2005). It is therefore critical to understand the different

connections that local communities establish to landscapes (Pérez-Ramírez et al. 2021). Disentangling the reasons why local people perceive abandonment as a problem or a solution is also fundamental (van der Zanden et al. 2018).

The overarching goal of this study is to understand the perceptions of land abandonment, its causes, and its impact by rural communities. The specific objectives are to (1) identify the main landscape changes and explore the drivers of change of land abandonment that are perceived by local communities; (2) assess perceptions on nature's contributions to people (i.e., beneficial contributions from nature, NCPs) provided by agricultural landscapes, both traditionally managed and abandoned ones; and (3) evaluate clusters of narratives from the local public toward land abandonment.

We highlight that all data presented in this study are perceptions of rural communities on landscape changes, their drivers, and their impacts. As our study is based on a social survey, we do not analyze objective land-use or land-cover changes that have taken place in the study area.

Methods

Study area

Our study area is the low-mountain area of Las Hurdes, located in Extremadura, a remote *region* in western Spain (Fig. 1). Las Hurdes has experienced a massive population
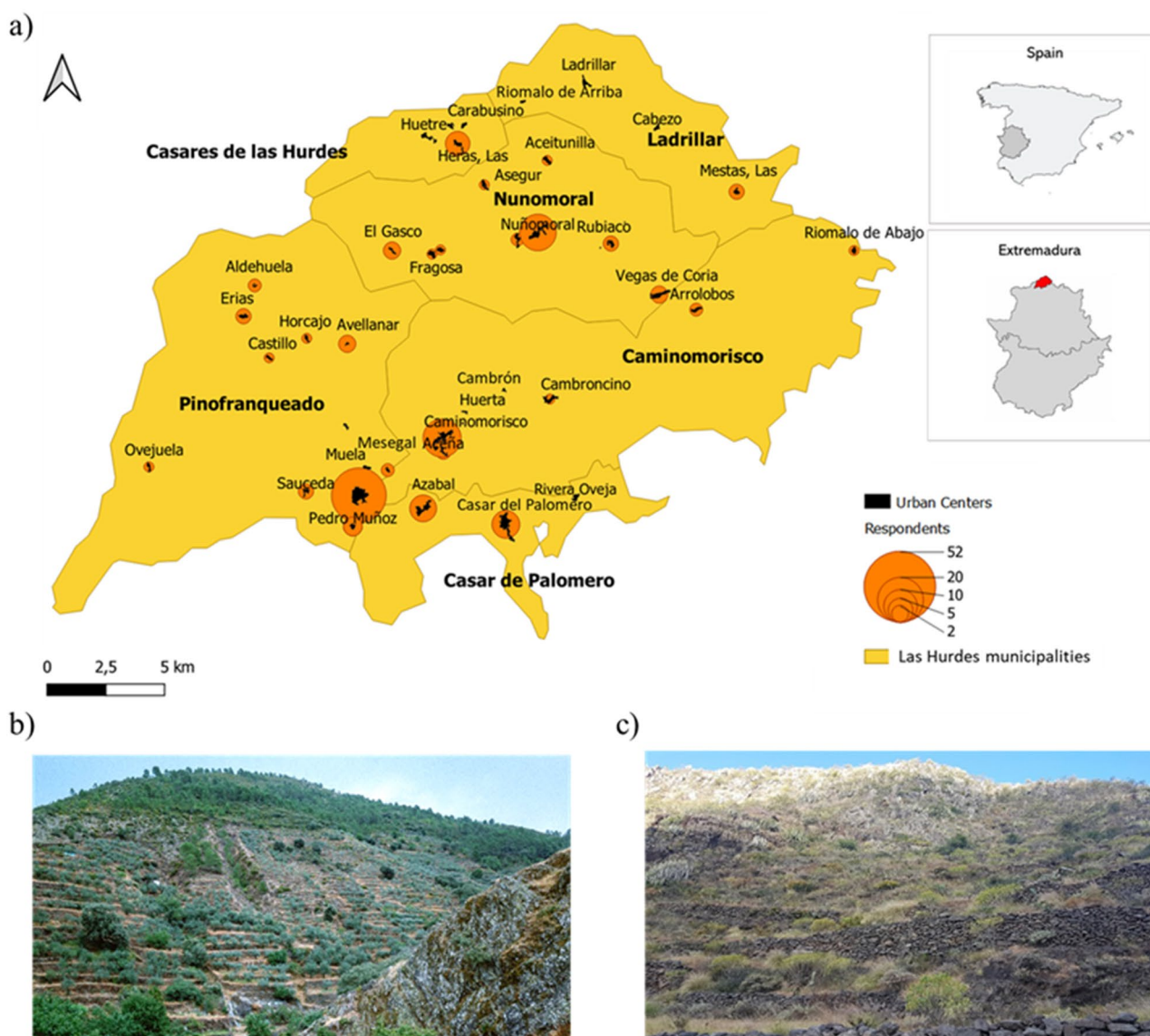

Fig. 1 a) Location of study area and distribution of the sampling across the villages and municipalities of the region. Examples of agricultural landscapes: **b**) traditionally managed and **c**) abandoned

exodus since the 1950s (in the last 20 years the population has reduced 30%; INE 2023) and it is today sparsely populated (< 40 inhabitants per km^2) (Solymosi 2011a).

In Spain municipalities with less than 10,000 inhabitants are defined as rural by the National Statistical Institute (INE). An alternative definition of rural areas by the Spanish National Government Law for the Sustainable Development of Rural Areas (LDSMR) refers to a population density of less than 100 inhabitants per km^2 (Gómez Valenzuela and Holl 2023). In Extremadura, rural areas cover approximately 98.5% of the territory and host 88.7% of the population. GDP per capita amounts to about 56% of the EU average, and the unemployment rate is 19.5% (all numbers as of 2021, World Bank Data 2021, INE 2021). In Las Hurdes, traditional land uses include crop and vegetable production in irrigated terrace gardens, tree orchards, and animal husbandry (Solymosi 2011a). The harsh climate and site conditions forced people to create a highly adapted cultural landscape that enabled integrated use of the whole range of natural resources (Solymosi 2011b). Las Hurdes shows an even more problematic socio-economic situation than Extremadura as a whole. The population has been declining since the 1980s, and local authorities see no end of this trend. The few employment opportunities in the region require mainly unqualified labor and can be found in construction, the services sector, and to a lesser extent in agriculture (Mancomunidad de Las Hurdes 2023). The agricultural sector has deeply changed during the past few decades: traditional agricultural landscapes have mostly become unprofitable; agricultural systems have been intensified where possible or given up. Currently, the few people remaining in the agricultural sector are typically employed by agribusinesses, often outside the region and on a seasonal or even daily basis. Some residents practice traditional agriculture for (semi-) subsistence. Small-scale initiatives to market products such as olives, cherries, honey, or goat cheese have successfully established in the last decades, and some make use of geographic indication labels.

Data collection and sampling strategy

A survey campaign was administered in the case study region during summer 2020 (Fig. 1). Following a stratified sampling strategy (Zoderer and Tasser 2021), we carefully selected the survey locations to reach a representative distribution of participants across the main municipalities of the study region as well as a diverse sample in terms of age, gender, and place of residence (Fig. 1). The study area has a population size of 7276 inhabitants approximately, distributed across 43 municipalities. We estimated the sample size using the online Sample Size Calculator from Survey Software. A sample size of 200 respondents was calculated to be representative, with a confidence interval of 95% and a margin of error of 7%. Data were collected through semi-structured face-to-face surveys

with local people. We interviewed a total number of 205 participants across the study area. At each village, potential respondents over the age of 18 were randomly selected in public areas (such as main squares, bars, or simply streets) and invited to answer the survey, which was developed in Spanish. The population sample included local residents and visitors. Interviewers followed COVID-19 safety protocols and ethical guidelines. Before beginning the survey, participants were informed of the objective of the study and the use that would be made of their responses. Informed consent was obtained before any information was collected.

The questionnaire was designed to capture the main social perceptions toward (1) landscape changes, land abandonment, and impacts on these changes; (2) drivers of change; (3) NCPs attached to abandoned and traditionally managed agricultural landscapes; and in a final part (4), personal data, such as socio-demographic characteristics (i.e., age, gender, place of birth/residency, and educational level) was requested (see Appendix A for a full description of the survey). The list of NCPs used in the panel was compiled using the IPBES framework (IPBES 2022; Díaz et al. 2018) and based on previous research in the area (Díaz et al. 2018; Solymosi 2011b; Wolpert et al. 2022). The dataset is available on the Zenodo open-access repository (Quintas-Soriano et al. 2023).

Social sample description

From the 205 questionnaires compiled, 203 were complete and valid for further analyses. The final survey sample was characterized by a nearly equal gender distribution with 52.2% men and 47.8% women, and an average age of 53 years (Table 1). Most of respondents held a high school degree (38.4%), lived in a village in las Hurdes (88.3%) at the time of completing the questionnaire, and had been living in the area for more than 25 years (70.0%). Out of 203, 63.1% of the respondents were residents living in Las Hurdes, 26.1% were local farmers (i.e., residents of Las Hurdes and working in agriculture), and 10.8% were visitors (mainly tourists) (Table 1). More than 87.0% of the respondents indicated that they had a strong sense of place attached to Las Hurdes or their particular town or village. A considerably smaller share of respondents, by contrast, identified their sense of place linked to Extremadura region (10.8%), Cáceres province (4.4%), or Spain at large (3.4%).

Data analysis

First, to assess perceived landscape changes, we used an open question by which respondents were asked to name the landscape changes they had perceived in the area (Appendix A). Respondents could indicate as many perceived changes as they wanted. A qualitative analysis of the data was developed and similar landscape changes mentioned were

Table 1 Socio-cultural characteristics of the survey sample ($N=203$)

Socio-demographic variable	Survey sample (%)
Gender	
Female	47.8
Male	52.2
Age	
< 40 years	25.6
40–60 years	39.4
> 60 years	35.0
User groups	
Local farmers	26.1
Residents	63.1
Visitors	10.8
Place of residence	
Las Hurdes	88.3
Outside las Hurdes	11.7
Linkage with the area (years living in the area)	
< 5 years	7.8
6–25 years	22.2
> 26 years	70.0
Education	
Primary & lower secondary school	37.9
Upper secondary school	38.4
University level	23.6
Sense of place attached to	
My town/city	41.4
Las Hurdes	45.8
Cáceres	4.4
Extremadura	10.8
Spain	3.4
The World	8.4
Others	4.9

grouped together (Flick 2011). Relative frequencies were estimated per each perceived type of landscape change based on the total number of respondents ($N=203$) and the total number of responses ($N=347$).

Second, perceptions of drivers of change were identified based on a second open question, in which we asked about the main drivers of change in the region linked to rural land abandonment. Again, respondents could name as many drivers as they wanted. Responses were grouped into categories defined based on previous studies (Quintas-Soriano et al. 2022a, b): biophysical, cultural, socio-economic, and technological drivers. Additional subcategories were identified based on Plieninger et al. (2016). Then, the relative frequencies of each driver of change were calculated based on the total number of responses.

Third, to evaluate NCPs provided by traditional agriculture both in managed and abandoned landscapes, we used descriptive statistics. During the survey, we asked a specific question with a panel that showed a photo of one traditional

agricultural managed and one abandoned landscape with a list of contributions (Appendix A). Respondents ranked each contribution listed using a Likert scale from 1 (as strongly disagree) to 5 (as strongly agree). The relative percentage of observations for each contribution was estimated and nightingale's diagrams were created (using KutoolsTM tool for Excel) to represent the relative frequencies of both landscapes, managed and abandoned ones.

Fourth, narratives for land abandonment were explored through another open question in which we asked respondents to provide three thoughts about rural land abandonment (see Appendix A). Respondents were given the option to not provide a thought if they did not have any (Sherren and Verstraten 2013). Additionally, thoughts could be both positive and negative. A qualitative analysis of the data was developed based on the interpretation of keywords and their meanings in relation to the research question. We coded the responses to identify similar text elements and to group them according to categories (Flick 2011). From the thoughts provided by the respondents, we identified several main topics by grouping the statements by similar themes deductively. We then developed initial categories for these topics and grouped similar arguments by each narrative identifying the most representative categories (24 final items). The first coding round was done deductively under thematic categories to give an overview of the data. In a second-round categories were clustered to define the final themes of the narratives. The relative frequencies of each category were calculated based on the total number of respondents. A cross-validation statistic was carried out and tested 10% of the codification to validate it (See Appendix B; Fagerholm et al. 2020).

Finally, to identity clusters of narratives for land abandonment inductively, we grouped land abandonment items through statistical analyses (Fagerholm et al. 2020). We calculated the percentage of respondents mentioning each of the land abandonment items extracted from the open question and then conducted a multiple correspondence analysis (MCA) and a hierarchical cluster analysis (HCA) to identify the clusters of narratives for land abandonment. Cluster analysis is a widely recognized methodology used in sustainability science to delineate for instance social-ecological systems (Aho et al. 2022; Martín-López et al. 2017), identify groups of social preferences from local stakeholders (Martín-López et al. 2012), human well-being components (Fagerholm et al. 2020), or ecosystem services bundles (Queiroz et al. 2015; Quintas-Soriano et al. 2021, 2019; Torralba et al. 2020). We performed a MCA to avoid correlations between the items of land abandonment and to explore the relationships between the responses on land abandonment items. MCA was conducted with those items that were mentioned by more than 3% of respondents (i.e., 6 items; Appendix B). To decide the number of factors to retain, we used the scree test to identify those that proportionally explain more variance than the rest,

leading to an exponential increase of the accumulated variance. Second, we performed an HCA with the land abandonment item scores represented by those MCA factors with the highest explained variance. We used Ward's linkage method and Euclidean distance as agglomerative techniques to conduct the HCA. The resulting clusters identified the groups of land abandonment items provided by respondents. The clusters were created statistically through a process of automatic truncation that is based on the entropy difference between the neighboring clustering results (Fagerholm et al. 2020). XLSTAT 2018 was used to perform the descriptive and statistical analysis. We used QGIS3 Geographical Information Systems to develop the maps.

Limitations

Our study involved some uncertainties. First, the COVID-19 pandemic imposed challenges to perform the semi-structured surveys. Fortunately, a stratified random selection of the number respondents across all municipalities could be performed, and the social sampling was developed after the peak of the pandemic. Hence, most of the respondents that were asked to fill in the survey accepted, and we can thus consider our sample representative of residents of Las Hurdes. Moreover, our study included photos in the survey to evaluate social perceptions of abandoned and managed agricultural landscapes, which may add some bias through the selection of the photo motives (Polednikova and Galia 2021). However, this limitation can be eradicated by a proper methodology of the research and a photo selection that follows similar characteristics, such as panoramic color pictures with similar color saturation and containing the main characteristic features of each landscape (García-Llorente et al. 2012). In addition, the validity of this technique has been demonstrated in previous studies of social preferences toward biodiversity, landscapes, and ecosystem services (Martín-López et al. 2007; Otamendi-Urroz et al. 2023). Finally, to achieve representativeness the cluster analysis of the narratives of land abandonment was developed using most of the mentioned items from respondents and following previous studies (Fagerholm et al. 2020; Martín-López et al. 2012). This cluster analysis may imply to not include some minority views or perceptions that are not incorporated in the statistical analysis. This should be taken into account for the interpretation of our results.

Results

Landscape changes perceived by local communities

Four main groups of landscape changes were perceived by the respondents: landscape simplification and homogenization (64.0% of respondents), ecological degradation (36.4%), land-use intensification (32.4%), and urbanization and migration (28.7%) (Table 2). The two most important types of landscape changes observed by respondents were associated with wildfires and the loss of traditional agriculture (32.0% and 26.6% of respondents respectively). Other landscape changes perceived as relevant were agriculture intensification (16.7%), increase of pine forests and reforestation (13.3%), abandonment of mountains and regrowth of vegetation (12.8%), loss of diversity and autochthonous species (11.3%), and the increase of olive and cherry trees (10.3%). Among the less-mentioned landscape changes were river deterioration (4.4%) and the absence of livestock and shepherds (5.4%) (Table 2).

Perceived drivers of change for land abandonment

Main drivers of land abandonment perceived by respondents were economic ones (48.4% of the responses), referring mainly to the prices for agricultural products (36.2%), low household incomes (11.1%), and structural changes in agriculture and forestry (0.7%), followed by cultural drivers mentioned in 32.4% of the responses (Fig. 2). Perceived cultural drivers were related to public attitudes, values, and beliefs (17.4%) and through population numbers, distribution, and age structure connected to outmigration of rural people (14.9%). Political and institutional drivers were recognized in 9.6% of the responses, referring to the lack of incentives and proper management decisions for rural areas. Natural and spatial drivers were only identified in 5.7% of responses and technological ones in 3.9%. Natural and spatial drivers were linked to the topographic and spatial changes of the landscape, most notably to the distance and inaccessibility of marginal lands (5.7%) and to disturbances such as wildfire incidents (0.4%).

Nature's contributions to people provided by managed and abandoned agricultural landscapes

Local respondents identified multiple and diverse NCPs provided from both traditionally managed and abandoned agricultural landscapes. However, there were relevant and significant differences for all NCPs between both types of agricultural landscapes (Appendix C). Respondents indicated higher values in managed landscapes for all NCPs (Fig. 3). The biggest differences were found for food provisioning (Mann–Whitney $U = 26{,}582$, $p < 0.001$), where respondents ranked their provision on an average of 4.5 (SD = 0.66) out of 5 in managed landscapes versus 1.64 (SD = 0.84) in abandoned ones, and for non-material NCP, such as identity and sense of place ($p < 0.001$), cultural heritage ($p < 0.001$), beautiful and enjoyable landscapes ($p < 0.001$), and the conservation of landscapes for future

generations ($p < 0.001$). The item of local economy showed also strong differences between managed and abandoned landscapes ($p < 0.001$) (Appendix C). On the other side, regulating NCP were the ones which showed less differences among the two landscapes. For instance, air quality and habitat for species were contributions perceived as highly provided by managed and abandoned landscapes, but they obtained higher values for managed landscapes. Finally, medicinal plants were also perceived as highly provided by both landscapes.

Narratives of land abandonment

Sixteen final themes of land abandonment were used to develop the cluster analysis of the narratives. The most mentioned items were "sadness" associated toward land abandonment (45.0% of respondents), followed by "low return in agriculture" (18.7%), "depopulation process" (17.2%) and the complaint associated with that "people is more comfortable and is less hardworking" (16.7%) (Appendix B). On the other side, items less mentioned were the "lack of

Table 2 Perceived landscape changes in the study area since beginning of 1990s and description. Number of responses, percentage of respondents that have indicated a particular feature and examples of quotes provided by respondents

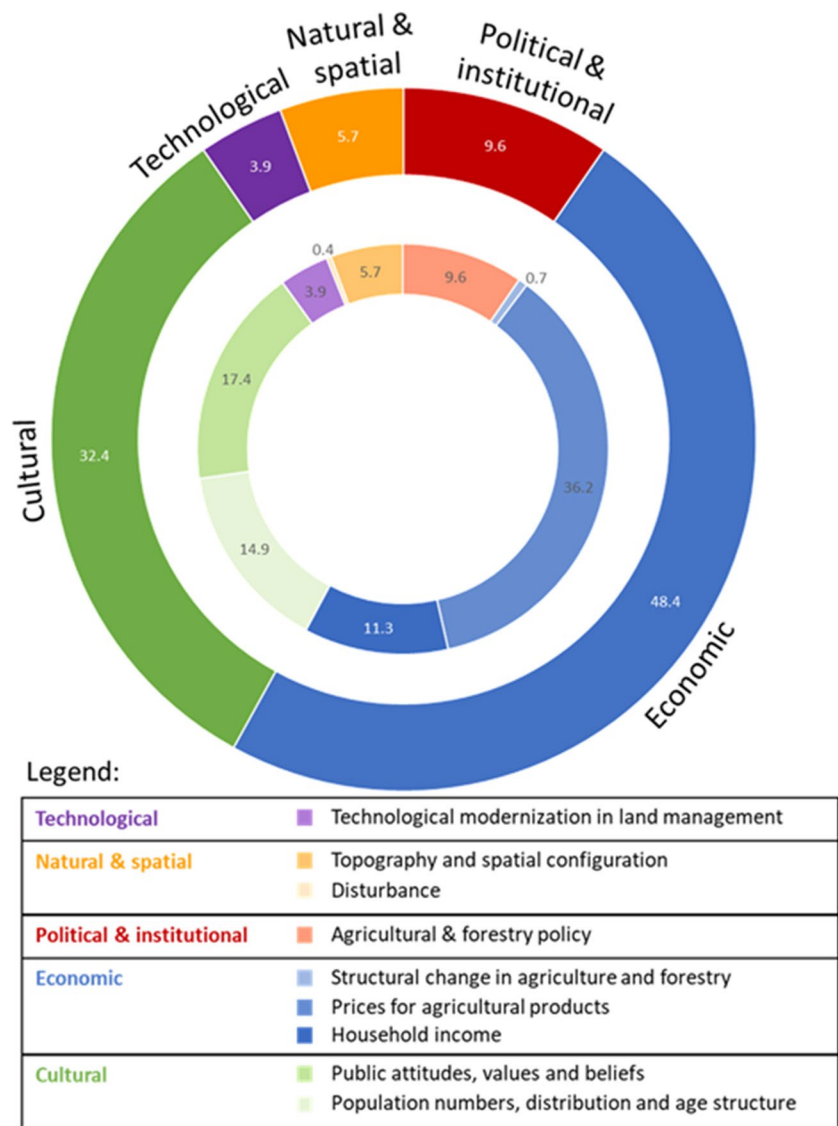|	Landscape change	N° of responses	% of respondents ($N = 203$)	% of responses ($N = 347$)	Quotes
Ecological degradation	Increase of wildfires	65	32.0	18.7	"The most important thing is that the forest mass has burned several times." #id36; "Forest fires have changed everything." #id79; "Fires have changed the landscape" #id150
	River deterioration	9	4.4	2.6	"The rivers are in bad conditions. The banks of the rivers are completely abandoned." #id9; "The rivers are a pity to see them, they do not carry water as they used to. Before everything had more life, now it is abandoned." #id53; "The riverbeds have also changed" #id55
Landscape simplification and homogenization	Loss or abandonment of traditional agriculture	54	26.6	15.6	"Before, we lived from farming, there was nothing else, everything was better cared for because everybody worked the fields, but now there is a lot of neglect." #id152; "The abandonment of small orchards to a high percentage." #id176; "The abandonment that exists. People no longer sow, it is not profitable." id 143
	Abandonment of mountains and vegetation regrowth	26	12.8	7.5	"The hills are too dirty, the roads are full of brush." #id75; "Before, it was much nicer because people cleaned the forest, worked on it" #id195; "The mountain and forests are dirty, there is no one to clean them up anymore." #id53
	Loss of diversity and of autochthonous species	23	11.3	6.6	"Before there was more variety of species. They have been changing and adding more pines to replace what was always there." #id136; "The introduction of pine and the loss of oak and chestnut (autochthonous species)" #id85
	Increase of pine forests and reforestation	27	13.3	7.8	"Where there used to be cherry and chestnut trees, now there are only pine trees." #id125; "Only pines and pines do not give us anything, there is only more danger when there are more fires." #id197

Table 2 (continued)

	Landscape change	N° of responses	% of respondents (N=203)	% of responses (N=347)	Quotes
Land-use extensification/ intensification	Lack of livestock and shepherds	11	5.4	3.2	"At that time there were 500 goats in every village, and they kept the forest at bay." #id79; "Everything has changed. You no longer see shepherds passing through the village." #id19
	Agriculture intensification	34	16.7	9.8	"Before, the plots were smaller. There were several crops on the same farm, now they are all the same." #id44; "Overexploitation of crops, monotony in the landscape" #id139; "Intensive agriculture is expanding greatly" #id29
	Increase of olive and cherry trees	21	10.3	6.1	"Agriculture, they have planted a lot: olive trees, cherry trees. before it was all forest" #id111; "Agricultural crops, especially cherry trees, have increased" #id16;
Urbanization and migration	Increase of mountain tracks	20	9.9	5.8	"The number of tracks and roads" #id121; "now there is machinery to work with so there are more paved roads." #id148
	Depopulation and rural–urban migration	19	9.4	5.5	"The abandonment of the villages, the migratory flow to the big cities" #id34; "All the houses used to be inhabited, and now they are abandoned." #id171
	Urbanization	19	9.4	5.5	"Roads, infrastructures, now there are many more than before." #id14; "The village has grown a lot." #id92
Other		19	9.4	5.5	"A lot of fauna and flora have been lost due to insecticides. The machinery, replacing what used to be done manually, has destroyed a lot of the landscape." #id99; "Loss of values, typical buildings are very deteriorated." #id1

generational replacement" (3.4%), "lack of jobs opportunities" (3.9%), "anger" and the "loss of rural areas dedicated to agriculture and grazing" (4.9%) respectively. Subsequently, a MCA analysis was developed.

Each factor of the MCA represented a different pattern of relations between land abandonment items that tended to associate positively or negatively with each other. The first four factors of the MCA absorbed 60.9% of the variance and presented an inertia of 5.09 (Appendix D). Using the scores of the land abandonment items represented by the first four factors of the MCA, which explained more than 10% of the variance each, we identified four well-defined clusters (Fig. 4). These encompassed the groups of land abandonment items perceived by the residents and visitors of Las Hurdes. Cluster 1 represented a defeatist reaction toward land abandonment that includes the belief that people are more comfortable, less hardworking, and indifferent toward this land abandonment. This first cluster was conformed mostly by the older respondents and conformed only by locals. Cluster 2, defined as socio-demographic lament, covered the conception of land abandonment associated with depopulation, rural–urban migration, linked to the loss of jobs' opportunities, lack of generational replacement, and the increase of wildfires. This cluster was associated with the younger respondents. Cluster 3, named emotional reaction, comprised items strongly connected with emotions, such as disillusionment, anger, and sadness toward land abandonment, as well as agriculture's elements, such as the low return of agriculture. Respondents within this cluster were the one living the longest in the area and mostly represented by local farmers. Finally, cluster 4 characterized agricultural landscapes as production-oriented landscapes, named as productivity complaint. This cluster focused on the economic dimension covering items such as the low productivity, impoverishment, public administration neglect, aged population, and forest overgrowth and the majority of respondents were male and had lived in the area for the least amount of time on average. However, the socio-demographic results attached to the clusters were based on mixed compositions of respondents so there were not possible to analyze with significant differences.

Fig. 2 Perceived main drivers of land abandonment

Legend:

Technological	■ Technological modernization in land management
Natural & spatial	■ Topography and spatial configuration
	■ Disturbance
Political & institutional	■ Agricultural & forestry policy
Economic	■ Structural change in agriculture and forestry
	■ Prices for agricultural products
	■ Household income
Cultural	■ Public attitudes, values and beliefs
	■ Population numbers, distribution and age structure

Discussion

The starting point of this research was to contribute to a better understanding of the perceptions of local communities around land abandonment in terms of landscape changes, drivers, NCPs, and narratives. How people perceive, value, and interact with their natural environments shapes the goals and paradigms of society (Abson et al. 2017), and, thereby, societal actions and decisions. Thus, the consideration of the social perceptions of local communities, as well as their needs and values, is key for approaching social-ecological challenges and developing strategies for transitioning toward a more sustainable future (Plieninger et al. 2020; IPBES et al. 2022; El Ghafraoui et al. 2023). Our results disentangle how local people recognize multiple ecological, social, and cultural consequences of land abandonment that have negative impacts on their well-being. People overwhelmingly

considered land abandonment as a cause of serious environmental and societal problems, ultimately leading to an erosion of biocultural diversity in the region (c.f. Riechers et al. 2020). However, our results also highlighted the trade-offs emerging from perceptions and narratives toward land abandonment. Economic development strategies and policy action were indicated as ways to address the future sustainability of the rural region. Results express the urgency of tackling the abandonment of rural areas from a social-ecological perspective.

Implication of social perceptions toward land abandonment

Previous studies have analyzed how locals perceive nature regrowth and rewilding (Frei et al. 2020; Martín-Forés et al. 2020). However, very few studies have focused on the
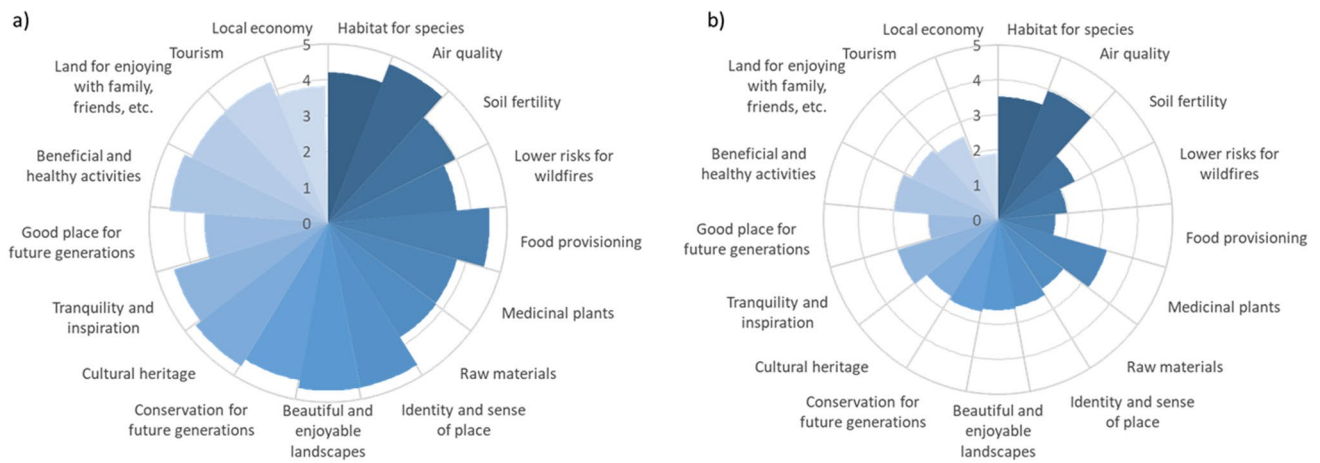
Fig. 3 Nature's contributions to people perceived by local people in **a**) traditionally managed agricultural landscape, and **b**) an abandoned agricultural landscape

perceptions toward land abandonment, traditional agricultural landscapes (van der Zanden et al. 2018), or landscape impacts of abandonment (Höchtl et al. 2005; Quintas-Soriano et al. 2016; Soliva et al. 2008). Our study presents a first attempt to understand profoundly how land abandonment and its impacts are interpreted by local communities, both in regard to the territory and to human well-being. Additionally, we developed an in-depth content analysis to determine the main groups of narratives to interpret different social positions toward abandonment. Our results indicated a general negative attitude toward land abandonment from local communities, which is in agreement with previous studies in other countries (Benjamin et al. 2007; Höchtl et al. 2005;

Ruskule et al. 2013; van der Zanden et al. 2018). However, previous literature focused on attitudes toward rewilding found more positive attitudes (Bauer et al. 2009; Van den Berg and Koole 2006) toward this landscape transformation. In our case, it might be that such positive attitudes to passive rewilding do also exist among the local community. Some respondents have highlighted land abandonment as an opportunity for rewilding—but that land abandonment is a very passive form or rewilding, which may explain why societal perceptions of land abandonment and those of rewilding may differ substantially. However, these opinions on rewilding were almost not expressed, which might indicate that the positive aspects of nature's regrowth, uncontrolled

Fig. 4 Dendrogram of clusters for land abandonment items (land abandonment narratives) associated with rural landscapes of Las Hurdes and identified through hierarchical cluster analysis
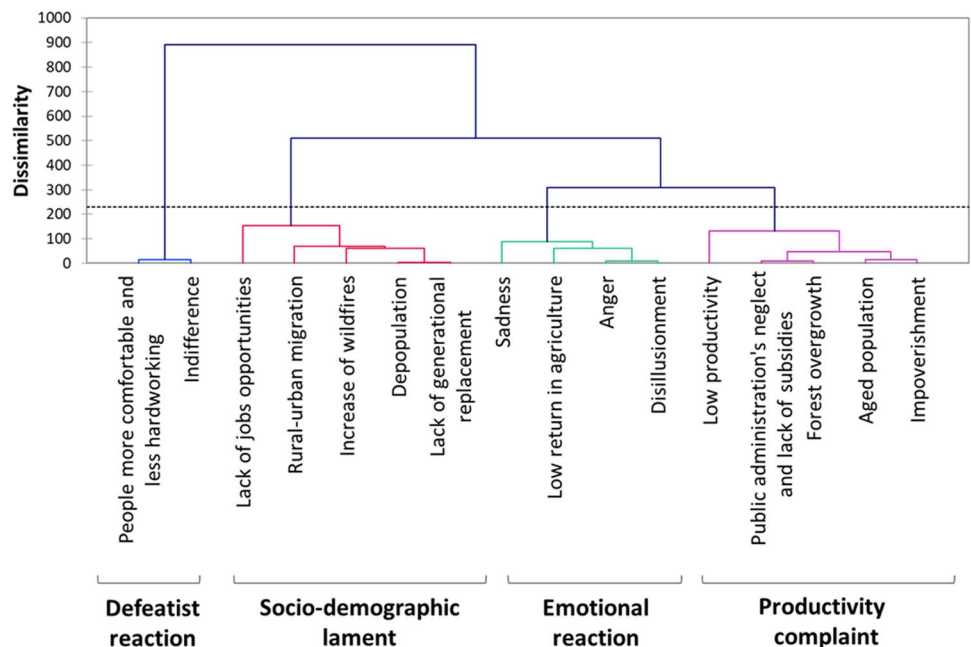
regrowth in the region of Las Hurdes, appear secondary in relation to a general negative perception of the loss of a cultural landscape.

In our study, local communities perceived the increase of wildfires, the abandonment of traditional agriculture, and the intensification of agriculture as the major landscape transformations that had occurred in Las Hurdes region in the last decades. Those perceived changes are in line with actual land-use change patterns identified by biophysical studies: the area has been recognized as important region for abandonment of agriculture within Spain (Fernández et al. 2022; Perpiña Castillo et al. 2021) as well as one with major increase of wildfire risks since the 1970s (Iriarte-Goñi and Ayuda 2018; Pulido et al. 2023). According to our survey, local communities understand very well the links of land abandonment to the increase of wildfire risks in the Mediterranean region (Bertomeu et al. 2022; Wolpert et al. 2022). These results are in agreement with previous studies highlighting the role of multifunctional and traditional agriculture and the incorporation of integrated landscape management practices to prevent wildfires as well as to promote landscape sustainability (Mann et al. 2018; Ruiz et al. 2020). An example of such strategies is the MOSAICO initiative, developed in Las Hurdes (Bertomeu et al. 2022), that aims to mitigate wildfire risk by promoting multifunctional and integrated forest management in a bottom-up process.

Our results indicate that local people's views are in line with scientific evidence that land abandonment is driven by a variety of interwoven economic, social, and political factors (Dolton-Thornton 2021), such as changes and innovations in agricultural technology (van Vliet et al. 2015), agricultural market globalization, changes in the lifestyles of rural populations and inadequate social infrastructure and services (Lasanta et al. 2017). Our results show that the perceived drivers of land abandonment in Las Hurdes include socio-economic factors, such as the increasingly low prices for local agricultural products (mostly connected to global markets and large-scale products demand), the decreasing attractiveness of rural lifestyles for a substantial part of the local population (linked to processes of urbanization and socio-economic development), or the loss and aging of the population (linked to processes of rural–urban migration). In addition, our results underline the role of cultural drivers in land abandonment as observed by local communities, particularly in relation to young people (King and Church 2013; Rye 2006).

Our results provided evidence of the continuing importance that local communities attach to traditional farming in our study area, as highlighted by their appreciation of its social, cultural, and environmental values. In particular, our findings demonstrate how respondents perceived that managed agricultural landscapes provide a wider range of NCP compared to abandoned landscapes. This is not entirely

surprising since traditional agriculture has been identified to be intrinsically and culturally connected to local people (Howley et al. 2012). Respondents clearly identified major contributions for those landscapes that are managed through traditional agricultural practices. However, it is surprising how perceptions of all NCP categories were statistically significantly higher in traditionally managed landscapes. This is in agreement with previous studies showing that local people value traditional farming systems for their multifunctionality and diversity (García-Llorente et al. 2012). Comparatively, abandoned landscapes were perceived to provide lower benefits, a result that is consistent with previous studies on perceptions of land abandonment (Höchtl et al. 2005; van der Zanden et al. 2018). This is mostly linked to the role of rural areas in the maintenance of multiple NCPs such as local identity, cultural heritage, esthetic values, or tourism (Sardaro et al. 2021). The four narratives identified exemplified the different social positions of the local communities, and all of them represented negative comprehensions of land abandonment: some locals giving up (defeatist reaction), other showing frustration by the loss of agricultural productivity (productivity complaint) or social capital (socio-demographic lament), and the last narrative representing emotional links to the territory (emotional reaction). Thereby, local respondents did hardly identify any positive attributes toward rural land abandonment in their territory.

Local people's views on land abandonment as identified in this study are partially in disagreement with some studies on rewilding approaches since no regulating NCP was perceived as improving with abandonment, including air quality, soil fertility, or biodiversity. Also, several studies identified rewilding as being perceived as positive (called pro-nature and pro-management narratives) by different social actors (Frei et al. 2020; Zoderer et al. 2020). Thereby, some authors advocate for rewilding as a management strategy option that can enhance biodiversity and ecosystem services (Pettorelli et al. 2018). Contrary to that point of view, local communities in Las Hurdes saw largely negative impacts of land abandonment and the passive rewilding that happen in the region. Rather, they pointed toward the desirability of strategies that dynamize areas undergoing process of abandonment and promote the restoration of cultural landscapes (García-Ruiz et al. 2020). Several authors have proposed that rewilding could serve as a conservation response to farmland abandonment in regions where low-intensity farming is no longer socially or economically viable (Navarro and Pereira 2015). Rewilding appears to have overall beneficial benefits on biodiversity and may thus serve as alternate land-use strategy in marginal mountain areas. However, there is an ongoing discussion about the consequences of land abandonment-driven rewilding on biodiversity and ecosystem services (Navarro and Pereira 2015; Quintas-Soriano et al. 2022a, b). For instance, the question

of how to prevent that rewilding leads to an increase of wildfire risks in the Mediterranean region has not yet been fully answered. Our results point to substantial social conflicts that rewilding approaches may imply in landscapes formerly shaped and used by agriculture.

Crucial to the promotion of sustainable land management will be the consideration of the multiple drivers behind land abandonment (Gradinaru et al. 2020), most notably between its ecological, social, and economic dimensions. A key step is to recognize traditional agricultural landscapes as multifunctional landscapes in which rural people depend on and simultaneously may help to achieve the Sustainable Development Goals (SDGs) of the UN 2030 Agenda. Multifunctional landscapes concurrently provide food security, livelihood opportunities, biodiversity maintenance, and ecological functions, and have high cultural and social values (O'Farrell and Anderson 2010). Safeguarding these benefits requires inclusion and consideration of non-material contributions and good quality of life components, especially when making land management decisions (Riechers et al. 2020). The consideration of land abandonment should therefore move from a sectorial focus on agriculture production and biodiversity effects to a more holistic consideration of rural areas as multifunctional landscapes (Dolton-Thornton 2021). Given that land abandonment has mixed effects across different socio-cultural contexts, a better understanding of drivers, patterns, processes, consequences, and trade-offs of land abandonment is essential.

The "empty Spain" and future pathways

In Spain, the widely unfolding process of land abandonment has been politically discussed under the headline of "La España vaciada" (the empty Spain) that highlights large extensions of land that are increasingly uninhabited (Pazos-Vidal 2022). The fight against depopulation of rural areas, and the maintenance of quality of life through diversification and local capacity building have been declared nationally overarching priorities in rural development, as set out in the Spanish Rural Development Framework (https://www.redruralnacional.es/). However, the reality is that Spain's rural communities are increasingly affected by multiple impacts, such as climate change, biodiversity loss, and socio-economic decline, as for instance manifested in the decreasing economic value of agriculture, land concentration, and outmigration (Facchini et al. 2023). Despite several policy initiatives, such as the Spanish Rural Development Framework, the abandonment of rural areas continues (Stockdale 2006). Recent research on rural vulnerability in Spain highlighted social and institutional aspects (such as household characteristics, urbanization patterns, and the degree of coordination among authorities) as important research gaps (Facchini et al. 2023). Our results point to the need of adding a focus on the social and cultural impacts of land abandonment to this list.

Agricultural land abandonment is a policy challenge since its management is debated given concerns for the loss of traditional agricultural and cultural landscapes and potential impacts on biodiversity and NCP (van der Zanden et al. 2018). However, most policy actions have addressed land abandonment as an agricultural problem, rather than framing abandonment as a dynamic process driven by a variety of factors including socio-economic, cultural, environmental, and policy drivers, as well as spatial–temporal processes (Ustaoglu and Collier 2018). To face land abandonment in the absence of a comprehensive and coordinated governmental management response, diverse civil society initiatives have emerged to motivate the development and conservation of rural areas (García-Martín et al. 2016). For instance, integrated management initiatives are currently on the rise as a tool for incentivizing economic activities in rural areas. Some of these initiatives embrace the notion of "landscape products," as defined by García-Martín et al., (2022). Landscape products are products that originate in a distinct landscape and that are typically sold at prices higher than those of mass-market agricultural commodities (García-Martín et al. 2021, 2022). The goal is to add value to those systems (such as traditional agricultural systems in the Mediterranean) that provide important food commodities, but that also ensure environmental, social, cultural, and economic sustainability. Likewise, it is necessary to foster alliances between farmers and consumers, promoting fair prices and innovative marketing mechanisms (Marchant Santiago et al. 2022). Parallel strategies to expand infrastructure and diversify the labor market will be key to ensuring rural development. At the international level, many different considerations have been defined to highlight the value of rural areas and their culture, such as the World Cultural and Natural Heritage, adopted by UNESCO in 1972, and the European Landscape Convention, which aims to raise awareness among scientists, policymakers, and the general public regarding the importance of landscapes for individual and societal well-being. Future research needs to focus on describing strategies to foster social-ecological sustainability for rural areas. To do so, these efforts should involve local communities and incorporate them through transdisciplinary processes that ensure the viability of future solutions.

Conclusion

Many rural agricultural landscapes in the Mediterranean region are currently experiencing profound transformations, leading to either intensification or abandonment. Our results highlight that local people who are affected by land abandonment in Las Hurdes region, do not perceive positive

opportunities from abandonment in terms of NCPs. On the opposite, a vast majority of local population express negative perceptions that are in particular related to negative impacts on economic development and on their well-being. Our study identified four groups of narratives, all of them centered on different negative outcomes of land abandonment over the territory. To increase the sustainability and future resilience of rural landscapes, strategies to balance nature conservation and the preservation of cultural values of local people will be key. We call to prevent land abandonment and the resulting loss of traditional agriculture in those regions with high levels of cultural values, as a strategy to maintain the biocultural diversity of Mediterranean rural areas.

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