



Research

The invisible thread: women as tradition keepers and change agents in Spanish pastoral social-ecological systems

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ABSTRACT. Pastoral social-ecological systems (SES) provide myriad benefits to humanity and face multiple challenges in the 21st century, including interacting climate and land-use change, political marginalization, and demographic shifts, leading to loss of traditional knowledge and practices associated with sustainable use. Research and policy increasingly recognize women's roles in sustaining pastoral SES in the Global South, yet women pastoralists in the Global North have received scant attention. In Spain, like other countries in the Global North, the rise of intensive industrialized agriculture contributed to rural depopulation, land abandonment, and the masculinization of rural spaces. In this qualitative study, we address the empirical gap in studies of women pastoralists in the Global North by investigating Spanish women pastoralists' roles in pastoral SES conservation, adaptive transformation, and abandonment (regime shift). Drawing on in-depth life-history interviews with 31 women from 4 regions of Spain, and participatory workshops with women in each region, we explored women pastoralists' diverse identities and roles in conserving, transforming, and abandoning pastoral SES, focusing on 3 levels of social organization: the household/enterprise and local community, the extensive livestock sector, and society broadly. We found that women contributed to all three processes and we highlight synergies between women's roles as tradition-keepers and change agents that could serve as a leverage point for adaptive transformation. Our analysis also revealed key contradictions in women's material and discursive practices; how these are shaped by intersecting axes of social differences such as age, class, origins, and family status; and their implications for policy and practice to foster adaptive transformation of extensive livestock systems. This work advances SES/resilience research by addressing social science critiques of resilience approaches through the application of feminist theories and methodology that center the voices and subjective lived experiences of women pastoralists and attend to the roles of gender and power in SES dynamics.

Key Words: *adaptive transformation; feminist political ecology; gender; rangelands; resilience; Spain*

INTRODUCTION

The true importance that rural women have always had, and continue to have, like the settlement of the territory and the population, like the preservation of the grand things in life, the growing things, the seeds...the guardians have been and are the women. Like the true invisible thread between the generation above and the generation below, the true order...in the end. In all of this, no?
[Sandra, Andalucía; pseudonym]

Rangelands are the most widely distributed terrestrial ecosystem type, covering nearly half Earth's land surface (Reid et al. 2014, Sala et al. 2017). Globally, extensive livestock production, including pastoralism and ranching, is the most wide-spread land use, supporting some 500 million people (Mbow et al. 2019). Pastoral social-ecological systems (SES) are co-evolved cultural landscapes that dynamically shape and are created and maintained by human use and stewardship (Plieninger and Bieling 2012, Huntsinger and Oviedo 2014). As such, pastoral SES provide multiple benefits to humankind, including forage for livestock and wildlife, biodiversity, carbon storage, and pollination, among many others (Sala et al. 2017, Bengtsson et al. 2019). However, the future of these systems is uncertain because they face a mounting suite of challenges including climate and land-use change, degradation, demographic shifts, underinvestment in public services, regulatory constraints, and increasing barriers to pastoral mobility, among others (Galvin 2009, Reid et al. 2014).

Recently, both researchers and development practitioners in the Global South have begun to highlight the importance of women's roles in pastoral systems (Köhler-Rollefson 2012, Kristjanson et al. 2014). However, women's roles in the sustainability and resilience of pastoral systems in the Global North have received scant attention (Wilmer and Fernández-Giménez 2016a, b, Bruno et al. 2020, Oteros-Rozas et al. 2021), though Wilmer and Fernández-Giménez (2016a) found that ranching women in the Southwestern U.S. play critical roles in cultural resilience.

We seek to fill this empirical gap with a study of women pastoralists in Spain and their roles in the conservation, transformation, and abandonment of pastoral SES. Specifically, our objectives are to document women's subjective lived experiences in the extensive livestock sector and examine how their actions and discourses support the continuity of traditional pastoral SES, SES adaptation and transformation, or lead to SES abandonment. This work contributes to the scant literature on women pastoralists in the Global North, while addressing criticisms that resilience studies often overlook the subjectivities and agency of people within SES.

Theoretical background

A growing literature focuses on factors that enhance SES resilience, i.e., the ability of a system to retain its essential identity while undergoing change (Berkes et al. 2003, Walker and Salt 2006), and capacity for transformative adaptation (Fedele et al. 2019) and transformational change (Pereira et al. 2020), including

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deliberate transformations (Moore et al. 2014). Adaptive capacity for resilience and capacity for transformative adaptation share emphases on social memory, combining multiple knowledges, capacity for learning, strong social networks and trust, nurturing diversity, and innovation and experimentation (Berkes et al. 2003, Walker and Salt 2006, Kassam 2013, Wilson et al. 2017, Herrfahrdt-Pahle et al. 2020). For example, Berkes et al. (2003), Wilson et al. (2017), Kassam (2013), and Barthel et al. (2013) all highlighted the importance of traditional knowledge and stewardship practices as a type of social memory and source of future innovation and adaptation for resilient systems, and Wilson et al. (2017) also pointed out how attachment to tradition can lead to path dependence and resistance to change. Transformational change also relies on bridging organizations, collaborative learning platforms, and cross-scale networks that enhance collaboration and learning across levels and scales, shifts in power and its distribution across levels, and effective leadership (Herrfahrdt-Pahle et al. 2020). In this work, we seek evidence of women pastoralists' roles in perpetuating traditional knowledge and practices, in innovating and experimenting with new practices, and in engaging in other material and discursive practices that support adaptive or transformational capacities.

Resilience and SES approaches, while offering powerful frameworks for analyzing human-environment interactions (Gunderson and Holling 2002, Berkes et al. 2003, Ostrom 2009), focus on system structure and dynamics in ways that tend to minimize the agency and subjectivities of people in the system (Cote and Nightingale 2012, Brown 2014). Social researchers have called for greater attention to culture and context, power relations, and the subjective lived experiences of agents within SES (Crane 2010, Cote and Nightingale 2012, Ravera et al. 2016). Social scientists also note that resilience is often discussed normatively, as a desired system characteristic (Olsson et al. 2015), although theorists state that resilience is neither good nor bad (Gunderson and Holling 2002). In contrast, critical social science advances an emancipatory approach, which advocates the transformation of unjust yet often highly resilient systems (Cote and Nightingale 2012). Our stance is normative in that we value the continuity and resilience of Spanish pastoral SES for the benefits they provide nature and humanity. Our stance is critical, in that we support transformation of these SES to overcome social inequities. As researchers, we seek to understand how pastoralist women's practices and discourses contribute to both SES continuity and transformation, and to abandonment.

To address some of the limitations of past resilience research, we draw on feminist theory to examine the subjective lived experiences of pastoralist women in rural Spain and their roles in maintaining, transforming, and abandoning extensive pastoral SES. We follow Smyth et al. (2018) and others in conceptualizing gender as both a system of power relations and an identity. Thus, gender is simultaneously deeply personal, socially and culturally constructed, and shaped by specific contexts as it is negotiated and performed daily (Smyth et al. 2018). As such, gender is an important and often missing dimension of culture and context in SES and resilience studies. We draw on three strands of feminist theory related to agriculture and natural resource management.

First, our work is informed by research in feminist rural geography and sociology that document women's contributions to

agriculture and natural resources (e.g., Sachs 1983) and analyzes women's intertwined roles in agricultural production and social and biological reproduction, exposing gendered power relations and inequities within farming households (Whatmore 1991, Shortall 1999) and farm organizations and communities (Sachs 1996). Recent work shows how tensions between productive and reproductive roles play out in dueling identities of farm women, farm wives, and women farmers (Brasier et al. 2014, Smyth et al. 2018, Shisler and Sbicca 2019) and reveals that women farmers often lead agricultural innovation like use of organic methods (Sachs et al. 2016) and farm diversification (Seuneke and Bock 2015, Fhlatharta and Farrell 2017). However, none of this work focuses specifically on women livestock producers.

Second, we draw on feminist political ecology, which highlights the structural sources of gender inequities in agriculture and natural resources, such as differential access to land, capital, and technical resources (Rocheleau et al. 1996, Harcourt and Nelson 2015). The field challenges simplistic dualisms (nature/culture, man/woman), especially when they essentialize women's roles as marginalized victims or virtuous care-givers with an inherent tie to nature (Arora-Jonsson 2011, Djoudi et al. 2016). Feminist political ecologists call for an intersectional approach that considers how a person's experiences are shaped by particular social locations at the nexus of multiple identities and axes of structural inequality, such as gender, race, ethnicity, class, and age (Kaijser and Kronsell 2014). First used by Black feminist Kimberlé Crenshaw (1991) to describe the multiple interlocking oppressions and violence experienced by Black women, intersectionality has been expanded to apply to other interacting forms of oppression, such as class. Recent studies analyze intersectionality in adaptation and resilience to climate change in agrarian settings (Thompson-Hall et al. 2016); however, the application of intersectional approaches in social-ecological studies remains limited. Following these examples, we use an intersectional lens to illuminate how pastoralist women's multiple simultaneous identities shape their distinct discourses and practices.

Finally, we draw on the feminist analytical framework of O'Shaunnessy and Krogman (2011), who further challenged gender dichotomies in the context of extractive natural resources. They proposed a framework focused on contradictions in women's material and discursive practices around natural resource use as an analytical approach that captures the diverse, dynamic, and nuanced nature of gendered experiences and identities. Specifically, the framework, "shifts the analytical focus from emphasizing broad (often a-temporal and a-spatial) generalizations about women's and men's experiences with resource extraction, to exploring the diversity of these experiences, and where they might result in contradictory interests, imperatives and expectations," (O'Shaunnessy and Krogman 2011:135). Under this framing, material practices shape daily life and the physical environment, and discursive practices shape the production and reproduction of ideologies, stereotypes, and cultural norms (O'Shaunnessy and Krogman 2011). Contradictions occur when participants' material practices don't align with their discourses, when they express multiple apparently incompatible ideologies, or when their interests conflict. Wilmer and Fernandez-Gimenez (2016a) applied this framework to understand women ranchers' roles in building cultural resilience

in the U.S. West. We apply it to identify material and discursive contradictions in women's narratives and practices, as well as potential synergies. We use an intersectional lens to understand how women's age, origins, class, family status, and geographic region shape specific contradictions. Aligned with feminist rejection of dichotomous thinking and simplistic generalizations, we do not aim to compare women's experiences to men's or to generalize about women pastoralists as a broad category. Rather, we use this feminist framework to illuminate the diversity and complexity of women's experiences in Spain's extensive livestock sector.

Spanish context

Rangelands managed for extensive livestock production cover 46% of Spain's land area and are critical to conserving the country's biodiversity, providing safe and healthy food, and sustaining socially valued landscapes and lifeways (Beaufoy et al. 2012). Extensive livestock production has been integral to rural Spanish landscapes, economies, and cultures for thousands of years. Indeed, extensive livestock production created and has maintained many of Spain's iconic cultural landscapes, such as the *dehesas* of the south and west (Campos et al. 2013) and the mosaic of mountain pastures, hayfields, and forests of the Pyrenees (Montserrat Recoder 2009, Fernández-Giménez 2015). These intimately co-evolved cultural landscapes are also SES that provide numerous ecosystem services (Oteros-Rozas et al. 2014). The interactions of people, land, and animals in these SES generate and maintain traditional knowledge that forms a critical self-regulating feedback that sustains these dynamic complex adaptive systems (Fernández-Giménez and Fillat Estaque 2012).

These cultural landscapes (SES) and the benefits they provide to society are threatened by linked social and environmental changes, specifically rural depopulation and resulting land abandonment. Abandonment of grazed land leads to decreasing grassland cover, increasing shrub and forest cover, and increases landscape homogeneity (Lasanta-Martinez et al. 2005, Gartzia et al. 2014). These changes are associated with a decline in plant biodiversity, increase in wildfire risk, and decrease in the provision of forage and cultural ecosystem services (Lasanta-Martinez et al. 2005, Fernandez-Gimenez 2015). Once woody plant cover dominates the landscape, recovery to a pastoral landscape mosaic is practically impossible; representing an ecological regime shift that likely precludes re-establishment of a pastoral production system and lifeway. In this context, SES resilience refers to the pastoral SES's ability to persist in its traditional form, or to adapt and re-organize in such a way that some elements of the system are transformed (e.g., economic model, community demographics) while the essential natural (e.g., grassland mosaic) and human (e.g., rural communities, extensive livestock enterprises) features and feedbacks are retained.

Spain experienced significant rural to urban migration in the mid-late 20th century, driven by technological and structural changes, including increased mechanization, intensification, and industrialization of agriculture (Guzman et al. 2018). A disproportionate number of women left rural communities to seek education and work in larger towns and cities (Camarero and Sampedro 2008). Francisco Franco's dictatorship (1939-1975) barred women from applying for jobs, owning property, or opening a bank account without a man's permission. The increased mechanization and industrialization

of agriculture also reduced women's roles and visibility in livestock production (Gomez-Sal et al. 2011). The trend toward depopulation and masculinization of rural areas persists in the 21st century, with 80% of communities of less than 1000 inhabitants and 78% of those with 1000-5000 experiencing population decline between 2011 and 2018 (de la Torre 2018). De la Torre (2018:21) attributed the masculinization of rural spaces to "the lack of equal opportunities for women in rural zones, with the result that the population of educated women of working age is increasingly concentrated in a very few areas in which they can develop their personal, family and professional projects," (translation ours). The emptying of rural spaces, and linked aging population and gender imbalance, is seen as a challenge for Spanish society and is a topic of extensive public discourse (e.g., *El Diario Rural* 2020, Belinchón 2021). Recently, however, the number of women working in the livestock sector has risen and by 2011 was nearly equivalent to the number of men (FADEMUR 2011). In 2016, over a third of operators in the youngest age group (< 25 years) were women (Instituto Nacional de Estadística 2016). Thus, although women are underrepresented in the rural population, they make up a growing share of livestock keepers.

Alongside rural depopulation, and partly in response to it, Spain is also experiencing a growing back-to-the-countryside, neo-rural or new peasant movement (Rodríguez Eguizabal and Tabada Crende 1991, Monllor I Rico and Fuller 2016). These individuals, families, or collective initiatives (mostly groups of young urban dwellers) aim to revitalize abandoned low-productivity land or towns, especially in mountain regions, and to (re-)establish an agricultural model that generates social, cultural, economic, and ecological richness under sustainability principles (Sevilla Guzmán and González de Molina 1993). As in studies on new alternative agrifood models and rural innovation elsewhere (e.g., Sachs et al. 2016), women occupy an important and increasingly visible position in this movement within Spain (Pinto-Correia et al. 2014). For instance, newcomer women facilitate pastoralist knowledge exchanges within social networks in the Sierra Norte of Madrid (Oteros-Rozas et al. 2017).

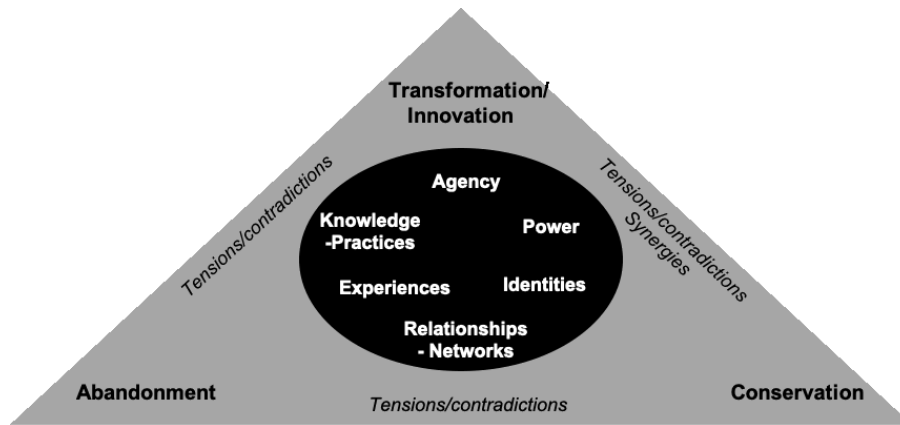
Other existing research on rural restructuring and gender has centered on women's contributions to farm work or participation in rural economic diversification, especially rural tourism (García Ramón 2005). However, the fate of rural Spain, generally, and of extensive livestock management systems and the cultural landscapes they maintain, remain open and pressing questions, and women's roles within pastoral systems remain unexamined.

METHODS

Sampling and data collection

We sought to interview a diverse range of women involved in extensive livestock management, including women who own or co-own operations, work with livestock as family members or employees of an operation owned by someone else, or are family members of pastoralists who support and influence production decisions even when they don't work directly with land or animals. To capture the diversity of cultural landscapes and livestock production systems across Spain, we focused our study in four contrasting geographic areas that represent differences in land and livestock management: Andalucía (southern Spain), the Northwest (Zamora, León, Asturias, and Cantabria), the central

Fig. 1. Triangle used by women during the workshops to identify their contributions to abandonment, conservation, and transformation/innovation.



Pyrenees and lowlands of Aragón, and Catalunya. We identified interviewees (N = 31) through existing contacts, a country-wide network of Spanish women pastoralists, Ganaderas en Red (GeR), and a regional network, Ramaderes de Catalunya (Ramaderes.cat).

Most interviews took place at the participant's residence or farm and included both a formal semi-structured interview and a visit to the operation. Several involved extended participant observation or repeated interactions and interviews. We used a semi-structured life-history interview protocol, beginning with the interviewee's childhood, education, and family relationships, and how they entered the livestock industry and learned needed skills. We asked about operation characteristics, management practices, livestock product processing and marketing; gender division of labor, and challenges related to gender in the home, livestock sector and society; changes and shocks to the system and adaptations and innovations in management. Interviews were conducted in Spanish, lasted one to three hours, were audio-recorded with the participant's permission, and professionally transcribed. Research was conducted under Colorado State University IRB protocol 350-18H with participants' free, prior, and informed consent. We sent each participant their interview transcript for review and personal records. All names in this article are pseudonyms.

Following initial data analyses, we convened workshops in spring 2019 with interview participants and other members of GeR in Andalucía (n = 11 participants), Northwest Spain (n = 11), the Pyrenees (n = 3), and Catalunya (n = 5). The workshops in Andalucía and the Northwest served as regional gatherings for GeR and focused on strengthening women's relationships and confidence; collectively reflecting on local challenges and opportunities; and setting a common agenda. Workshops provided an opportunity to discuss preliminary research findings with an expanded group of participants, collect additional data on women's experiences and perspectives, and engage participants in data interpretation. Workshop participants discussed how to use the findings to advance their goals. In August 2020, we invited all participants to a virtual meeting to further discuss findings, interpretation, and implications.

Data analyses and trustworthiness

Transcribed interviews were imported into and coded in Spanish in QSR NVIVO (QSR International 1999). We initially coded for participants' roles in conserving, adapting/innovating, and abandoning pastoral SES. In this coding process, we focused on how the interviewees described and interpreted their actions (as conserving, innovating, etc.), and also coded for practices that existing research establishes as sustainable or adaptive (e.g., transhumance, livestock biodiversity, enterprise diversification). We did not attempt to measure system outcomes (i.e., system resilience, transformation, or abandonment), but rather focused on indicators that research suggests or the women believed contribute to sustaining, transforming, or abandonment of these systems. In the workshops, we asked women to discuss how they would position themselves in a triangle of conservation, abandonment, and transformation (Fig. 1) and why. We then returned to the initial transcripts and classified women's practices and discourses at three scales: within the farm household and community (local level), within the livestock sector (sectoral level), and at the level of society at large. As we synthesized findings within and across scales, contradictions and synergies among participants' practices and discourses emerged as major themes. Thus, during a final round of analysis, we applied O'Shaunnessy and Krogman's framework explicitly and considered how participants' multiple intersecting identities contributed to these contradictions. Throughout, our focus is on women's subjective lived experiences or how they report and interpret their own lives, practices, and decisions.

We ensured trustworthiness through an iterative multi-stage analysis process of initial coding and member checking (workshops in 2019), further coding, peer debriefing, and member checking (online gathering in 2020). This process ensured prolonged immersion in the data and repeated interactions with research participants. As feminist researchers, we seek both to understand women pastoralists' lives and to support their self-determination. We further hold that knowledge is always partial and never bias-free, and therefore offer transparency about our positionalities.

Table 1. Characteristics of interview participants by region.

	Region				TOTAL (n = 31)
	Andalucía (n = 9)	Cataluyna (n = 4)	North (Zamora, León, Asturias, Cantabria) (n = 8)	Pirineos/Aragó (n = 10)	
Age Group					
< 30	1	3	1	2	7
30-49	4	1	4	4	13
50-65	3	0	3	1	7
>65	1	0	0	3	4
Pathway					
Family	2	0	1	2	5
Family + Partner	2	0	2	3	7
Partner	0	0	2	2	4
From Zero	2	4	0	2	8
Zero + Family	2	0	3	0	5
Zero + Partner	1	0	0	1	2
New Rural	3	4	0	3	10
Partnered/Married	5	1	7	7	20
Single, Widowed, or Divorced	4	3	1	3	11
Parent	5	1	7	7	20
Left and Returned to Rural Community	2	0	4	3	9
Hired Shepherd	0	3	0	0	3
Sole or Joint Owner of Farm	6	1	6	6	18
Transhumant or Transterminant	0	1	1	7	9
Raises Rare or Local Breed	4	3	5	3	15
Rural or Agri-Tourism	3	0	2	0	5
Production or Marketing Innovation	3	3	2	4	12

FINDINGS

Interviewees were diverse in age (from 22 to 96 years old), pathway of entry into the livestock sector, family status, rural or urban origins, and farm ownership (Table 1). Of the 20 interviewees with children, 8 had adult children who were also livestock farmers, 6 had children who pursued other careers, and 6 had young children. Participants also engaged in a diversity of traditional and innovative management and business practices (Table 1).

We describe the material and discursive practices of women as tradition keepers, drivers of abandonment, and agents of transformative change in pastoral SES. In each instance, we consider women's roles and practices at different scales: local (household/family/community), livestock sector, and society broadly.

Social-ecological services conservation: women as tradition keepers

With few exceptions, participants lived in rural areas, often in small villages. Whether born into agriculture or newcomers, many participants described learning or perpetuating traditional knowledge, skills, practices, institutions, and even physical infrastructure.

Local level: household/family and community

At the level of the family/household and community, participants described their roles in conserving the physical environment and living/nonliving objects/entities associated with extensive livestock production: land, house, and livestock; and their roles in conserving and transmitting intangible cultural heritage, including traditional knowledge, practices, values, identity, and pride.

In some regions of Spain, the concept of house or *casa*, refers to both the physical structure that shelters the family, the productive and reproductive structure of the livestock enterprise, including the animals, and the identity of the family lineage. Continuity of the physical structure and the family line/business were important. Rosa (Northwest) was adamantly committed to maintaining and restoring buildings in her community to preserve the potential for future generations to inhabit or return to the village. She spoke passionately about her own house, in which she was born and had lived her entire life, and which she conceptualized as a building, associated lands, and a family lineage and enterprise.

For nothing in the world would I want to see this house end, nothing in the world. For as long as I have money to pay for them to keep the fields clean, I will pay it, even if I am an old [rebuída], as I say, a wrinkled and grumpy old woman. [Rosa, Northwest]

As Rosa alludes to, women also care for the land, through active use and management, keeping pastures healthy and accessible for grazing. Many interviewees reported grazing or using mechanical methods to clear shrubs and keep pastures open, and some defended the controversial use of controlled burning, a traditional management practice.

Nina (Pyrenees) recounted another tangible act of conservation, telling how her partner's grandmother preserved the family sheep herd and bloodline (genetics) during the Spanish Civil War. When the grandmother's brothers, the family stockmen, were killed in the war, she kept the herd going until her own sons were old enough to take over.

His grandmother was a stockgrower. That is, the livestock that his father and uncles had, came from a herd that belonged to his grandmother. During the Civil War in Spain and all that, the grandmother was the stockgrower, she was the one with the operation. So for him, this thing of women livestock producers. He says, 'It's something that has always existed, you know? In my family, my grandmother was the herder. So, it doesn't surprise me to see women keeping sheep.' But well, it's good to establish a bit that this [livestock production] is not only by men, right? [Nina, Pyrenees]

Less tangible and visible are women's roles in conserving traditional knowledge and cultural values, including love for the land and occupational pride. As Sandra says in the epigraph to this article, women are "like the truly invisible thread between the generation above and the generation below." Linda (Andalucía) expressed a similar idea as she described how she learned her land ethic from her grandfather and how she hopes to pass on this sense of responsibility to her daughter.

My grandfather...always said that the land isn't yours, the land is an inheritance you receive and your mission is to try to conserve it and improve it for those who come after. If my daughter wants to study veterinary studies, she should study veterinary studies, and if she wants to study physics, she should do what she wants, but she should learn to take care of [the land] to love it...It's our responsibility to conserve it and when the next generation comes, if it's a bit better, if they get it in better condition than we did, onward. But it is a beautiful responsibility, it's not a bad responsibility, it's an inheritance that we must conserve. [Linda, Andalucía]

For some participants, this role was implicit, i.e., such as teaching children how to care for animals, instilling a sense of responsibility and affection for the animals and love of the work. As Lourdes says about her 12-year-old son:

He knows that he has to take the mares to drink and put the cows in the barn. And later on the weekend he helps me a lot around the house. But what I like about the rural world and raising livestock is that, the contact with the animals, because you become attached to them, after all. [Lourdes, Northwest]

Other women held an explicit goal of conservation and transmission of traditional knowledge and practices. For example Carla, a retired educator who started "from zero," shared why her business focuses on recuperating and transmitting traditional food conservation and preparation practices.

What was our objective?...Well, you saw that so much was being lost. The people stopped making preserves, they stopped making/doing a lot of things. Less and less. People didn't live in the countryside because the roads were better and everyone had a car. The farm manager didn't live on the farm. So all that culture of...what we produce has to last all year, well it was being lost. Before there was a culture of conserving [food] because it was the ancestral culture. [Carla, Andalucía]

Livestock sector level

At the level of the livestock sector, participants contributed to conservation of traditional land and herd management practices, and conservation of rare and heritage livestock breeds. Though not unique to women, participants' activities demonstrate the important and potentially growing role that women play in conserving traditions related to the sector.

Transhumance, the repeated seasonal movement of herds between distinct seasonal pastures located in different ecological and geographic regions, is a culturally and ecologically important practice that has declined significantly since the mid-late 20th century. Our sample included nine women who practice transhumance or support their families in doing so, each of whom plays an important role in maintaining the viability and continuity of this traditional practice (Table 1). For example, Concepción (Pyrenees), wife and mother of transhumant herders, described how she assisted her husband on moves early in their marriage and how later she helped her son establish his own transhumant operation. Juana, a young transhumant in the Pyrenees, shared how she learned the transhumant route by accompanying her father when she was a child. Now, she keeps the family herd and continues the transhumant tradition.

Several interviewees discussed using and passing on traditional animal husbandry knowledge, including ethnoveterinary knowledge. Magdalena (Andalucía), one of our oldest participants, described healing cattle more effectively than the local vet. While Laia, a neo-rural shepherdess in Catalunya, recounted learning of traditional medicines and cures from her grandparents:

He cut the horn of a male and it started bleeding...He taught me as the godparents did, to end a hemorrhage you should use a ball of cobwebs as a plug in the horn. It stopped bleeding immediately. After two days the ball fell out naturally and the wound was healed.

About half the interviewees contribute to the sector by raising local, heritage, and rare livestock breeds (Table 1), often at the expense of greater productivity of more commercial varieties. Some were deeply involved in recovery and conservation of a breed on the verge of extinction, and two are leaders in breed associations. In addition to contributing to biodiversity, locally adapted breeds may provide an important resource for future adaptation to climate change (Hoffmann 2010) and overall system resilience.

Societal level

At the societal level, women play a key role in maintaining rural life and communities, which both support and depend upon extensive livestock production. Women are essential for the biological and social reproduction of rural society, and rural women continue to do the majority of caregiving for both children and elders (Sayadi and Calatrava-Requena 2008, Lillo-Crespo and Riquelme 2018). Women's emigration from rural to urban spaces in Spain dates to the Franco dictatorship and the early decades of democracy, when many young women left villages to obtain work or education. A few of them returned to marry and settle locally, but many did not. Thus, women who deliberately choose to remain, return, or settle as newcomers in rural

communities play a critical role in the continuity of rural life and pastoral SES. As Sandra (Andalucía) pointed out, women are often the critical decision makers who determine whether a family will stay or leave a rural space. For this reason, she argues, it is important for women to take part meaningfully in extensive livestock production.

It's not only making [women's work] more visible, but also our point of view, which differs from that of men, not better or worse, as I said. But it has to be included in extensive livestock production, in pasture and environmental management. Because it's a funny thing. In any village where someone lives, [and] a family or someone from the village is leaving the village to live somewhere else...if the woman likes it [in the village], if in a family the woman says, 'I want to stay here,' the whole family will stay, eh. In general. In 8 out of 10 cases at least it's like that. So you see how important [women's perspectives] are.

Part of what Sandra seems to be saying is that when women are deeply engaged in the stewardship and care of the land, as well as animals and family, they develop an attachment to place that makes it more likely that they (and their families) will stay and fight for/contribute to a viable rural lifeway and economy.

In addition to women's roles in producing livestock and reproducing family and community, at the societal level, some participants actively work to share local knowledge and cultural traditions with a wider public audience. These women aim to increase social awareness and appreciation of the bio-cultural diversity associated with extensive livestock production and traditional rural life and agriculture generally, as Sandra describes here.

I also took on something that had been my dream always, and which my mother and grandmother inculcated in me, which is to demonstrate these traditions to people so they can live them, so that they [experience] them with their five senses and discover them and know them. If they know them, they won't forget them, and if they don't forget them, they won't be lost. So I also do a route that is called Sandra's Route, which I registered with that name, but which has become the Segureña Lamb Route, so they remember the lamb more than me. [Sandra, Andalucía]

Social-ecological systems regime shift: women's roles in rural abandonment

Despite their roles in the conservation of pastoral SES, many interviewees were pessimistic about the future of rural life and contribute in various ways to what they perceive as its inevitable decline.

Local and sector levels

Most women want their children to have options, and they encourage them to finish school to have more choices for their future. Although some are pleased when their children choose to continue in the livestock business, others don't encourage that choice. Still others actively discourage their children from staying in the business. Ana (Andalucía), a small-scale subsistence producer whose own entry into livestock husbandry came more out of necessity than choice, was one of the most adamant participants on this point.

I am happy there is no passing on to the next generation...It's a life you have to enter by choice not from obligation. So I gave my children the option to study and to choose a [different] life...And they haven't wanted the countryside and I am happy because it's a slavish life and for our children we want better things...I don't want this life for my children. [Ana, Andalucía]

Victoria (Northwest), a transhumant and co-owner of a large sheep operation reflected that her daughters' experiences helping their parents as children dissuaded them from any interest in following their parents' path. Further, although she would support anyone who asked for help, she would never encourage a young person to go into the business.

I don't encourage anybody. My daughters were the first to whom I said, 'study because look at how hard this is.' Look, if one of them had wanted to continue of course I would have supported her. But I always said, 'you study and later you decide' and neither of them wanted it, no, no, no way. So, I don't know, any woman who wants to start I will support but I won't encourage anyone because, in the long term, as our generation passes, it will get more complicated and many people are discouraged. [Victoria, Northwest]

At the level of the extensive livestock sector, women play a key role in abandonment of traditional practices like transhumance. For example, Laura explains how she persuaded her husband to give up transhumance and to switch from sheep to cattle raising when they started a family.

So what happened within two or three years of getting married, we got rid of the sheep because he had to be in the mountains four or five months up in the mountains and me alone in the house. I had my little girl and it wasn't the plan because the husband five months in the mountains and you alone at home with a little kid then that isn't a family. Then, well the family too, you have to look after the family. [Laura, Northwest]

Societal level

At the societal level, the masculinization of rural spaces is driven both by women's decisions to leave, often because of inadequate services, and the reluctance of women from urban areas to marry rural men/herders and settle in small and often isolated communities where it may be impossible for them continue their own professional careers.

Rosa, who wants her son to stay and continue the tradition, acknowledged the difficulty of finding a spouse willing to move and the challenges women who make such moves face.

Man, that's the issue. All of it. And then, of course, let's see, a young woman who comes here, a girl who comes to the village, of course, let's see, it's not for everyone. It's certain that it will be difficult. You know? It's really difficult and you have to get used to it. [Rosa, Northwest]

Marina (Northwest) articulates a fundamental tension between the work she and her husband must do to keep their operation going and their ability to spend time with and raise their daughter.

Her teen-aged daughter attends boarding school because there is no high school in her remote rural location. Marina sees women as fundamental to the future but the contradictions in women's productive and reproductive roles as too great to ensure that future. Specifically, she argues that the lack of adequate schools and health facilities in remote rural communities leads many women to persuade their families to abandon rural spaces for better-served locations in larger towns and cities.

I think this sums it up perfectly: without women there is no population replacement. And a woman, the most valuable thing she has is a child, and she is never going to consent to her child not being able to study, not having health services. Before having a child without education and health services, she will refuse to live in a rural setting and will go to the city. I have had to give up my daughter at 12 years old, right? I am not with my daughter. My daughter doesn't sleep at home every night. There are many women who are not willing to do this, and they leave... [Marina, Northwest]

Marina also spoke somewhat disparagingly of neo-rural women, expressing doubts about their capacity to persist in the sector. Thus, although she believes women are vital to maintaining rural populations, she questions the role of neo-rural women in rural repopulation. For their part, some of the neo-rural women interviewed objected to what they described as the "instrumentalization" of their bodies in rural communities, i.e., where they are valued for their roles in biological reproduction over their contributions to agricultural production, innovation, or community building.

Social-ecological systems adaptive transformation: women as innovators and change agents

Women work to adapt and transform extensive livestock production in Spain in various ways across multiple levels of social organization. Sometimes women's innovations at the household level spread through communities leading to sector-level changes. In other instances, participation in local or sector-level livestock organizations or networks scale up and out to national or international outreach and advocacy.

Local level

Interviewees reported introducing a wide range of innovations at the household/enterprise level. On one hand, even the oldest women in the sample described how their actions and decisions changed the course of family livestock operations to capture greater convenience, efficiency, productivity, or profitability. For example, Concepción (Pyrenees, 75), described how she introduced multiple lambing seasons per year and infrastructure like portable metal corrals (in the days before portable electric fencing) to increase profitability and ease of livestock handling. The eldest participant, Nelia (Pyrenees, 96), recounted how she and her husband completely changed their operation three times to adapt to changing market forces: from a chicken farm to a pig farm, and later from pigs to sheep. On the other hand, Erika (Catalunya), a young newcomer, describes innovations that improve well-being, while recognizing and valuing the thread of continuity with traditional practices and knowledge that permeates relationships with beings, products, and objects on the farm:

I think it's possible to combine the two [tradition and innovation]. Really I do. Actually, the more ancestral tradition and knowledge that comes from multiple generations of women...It's probably not in whether I graze this pasture first, or tomorrow, or in a week, or when it's a new moon or an old moon, but rather in how we relate to the animals, to the products, to the things...Probably the innovation goes much more for making life more comfortable in terms of management, and I think that the wisdom and all the knowledge are much more around everything that goes on the farmstead.

Participants also described innovative methods for reducing environmental impacts. Marina (Northwest) implemented a system for worm composting barn waste that she claims reduces greenhouse gas emissions from manure, binds carbon, and provides a natural source of fertilizer for her fields. Others, like Sandra (Andalucía), plant native aromatic shrubs to attract pollinators and use agroecology practices like seeding and grazing leguminous cover crops under their almond or olive trees to increase soil nitrogen, decrease erosion, and provide additional forage for sheep.

Women in our sample often took the lead in diversifying on-farm income streams by adding new dimensions to the agricultural enterprise, like agri-tourism. The most common approach was opening a *casa rural* or rural holiday home. Several complemented the *casa rural* by offering other educational or interpretive activities like traditional food preparation workshops, family summer camps, or guided tours of the local natural and cultural heritage. Marina developed a "be a stockgrower for a day" experience for all sectors of the public. She constructed all of her barn and corral facilities to be wheelchair accessible and offered her experiences for groups of adults with physical and cognitive disabilities.

Sector level

At the sector level, participants reported taking part in scientific studies; developing innovative institutional and business arrangements; participating in or leading livestock and agricultural organizations; and joining networks of women producers for mutual support and to raise the visibility of women's roles in the sector. Perhaps the most critical area of innovation for the sector's future is development of approaches to adding value to and direct marketing of livestock products based on geographic location, conservation values or food quality characteristics associated with their production system (e.g., organic, transhumant, extensive).

For example, Lourdes (Northwest), whose flocks graze in a national park, collaborated with a conservation NGO to market her family's lamb under a locally grown, pro-biodiversity branding and direct marketing strategy. According to the NGO, this strategy has led to increases in producer prices of 50-300% over the previous market price, without raising costs to consumers in restaurants (Europa Press 2010). Lourdes is pleased with the result.

We have been fighting to sell our lambs for years. When cheap meat began to be imported into Spain, our lambs were worth the same as 30 years ago, very little money. And now, via the mediation of the [Environmental NGO]

...they wanted to introduce [endangered bird species] into these mountains and I loved it. For me, every time I come and I see the [bird] I call them because it makes me happy... So we have been doing this since last year and we are very happy because we sold at a price that covers the grain for the sheep, buying hay, for... They are interested in having sheep so that when the sheep die the [bird] can eat their bones and we are interested in having someone give us a hand getting our product out there and in this case, the truth is we are very satisfied and very grateful to this environmental organization. [Lourdes, Northwest]

In Cloé's (Catalunya) case, challenges to entering the sector drove innovation. A Latin American immigrant and newcomer to farming, Cloé and her partner started a sheep farm and artisanal cheese factory, but had difficulty accessing grazing land. To address this challenge, they negotiated a novel arrangement with a landowner and the local protected area through which they gained access to grazing land in exchange for the environmental service of grazing to reduce wildfire risk and maintain pasture conditions. The project represents a novel way to support young people interested in returning to rural communities and agriculture. To avoid costs for a fixed farm building, Cloé also created a "circus farm." Like a circus, the infrastructure, including the cheese factory, is mobile, enabling them to move from place to place.

Several interviewees hold leadership roles in livestock organizations or have been recognized with prizes for their innovative or agroecological production systems. We speculate that the trend of increasing women's participation, and especially, women's leadership in livestock sector organizations, could support a transition to a more sustainable, just, and equitable extensive livestock sector, although women leaders still reported barriers to implementing innovation within traditional patriarchal livestock associations.

A fourth indicator of women's roles in transforming the extensive livestock sector is the recent rise of women producers' networks, facilitated by various social media and digital communication applications. To our knowledge, the first of these was Ganaderas en Red (GeR), founded in 2016 by a group of women pastoralists and women advocates for pastoralism, who were tired of attending meetings about the extensive livestock sector in which women's perspectives and voices were not represented. One of the founding GeR members recounted her "aha" moment that contributed to the formation of GeR.

And I look around and I say, 'holy virgin and that place was full, but full of men...hardly any women. That was when I said, 'let's see here, if we now have more possibilities than we have ever had, the woman, they open the doors for us so that we can be part of this and visible everywhere, if we are the ones responsible for opting not to participate, because there were only three of us, more of us could have come. Sometimes we get too comfortable [with the status quo]. Other times the husband won't let you, literally, or makes it really hard. [Sandra, Andalucía]

Since its genesis, with the support of the NGO Entretantos Foundation, GeR has grown to over 180 members across Spain, all women who are extensive livestock producers (and four non-producers who act as group facilitators, including the third author). Several other groups have spun off from the initial network, including one specific to Catalunya (Ramaderas.cat). Ganaderas en Red has become a point organization for sector groups and the media that seek producer perspectives on extensive livestock production, with the result that women are more often consulted and represented. Ganaderas en Red also serves a key role as a network of mutual support and knowledge exchange among women pastoralists across Spain. All the GeR participants interviewed mentioned GeR as an important source of information and support. For some isolated women, joining the network was life changing. For many it was profoundly empowering. For at least one, it was life saving when other network members helped her flee a violent domestic relationship, provided shelter, and employment. Ana (Andalucía), who lives on an isolated subsistence farm, is a GeR member whose life has improved because of her participation.

It opened a window to see that you are not alone...I've been here for many years but I haven't had any friends and now since I am part of [GeR], I call one or another of the GeR women every day. It's totally different. We all have a bit the same...It's that suddenly you meet people that have the same problems you do. The problem of being a pastoralist, which includes men and women, but the specific problem of being a woman. A woman and a pastoralist in this world, a completely masculine world.

Societal level

At the larger level of Spanish society, the participants described contributing to social change in several ways.

First, counteracting the outmigration of women from rural spaces, newcomers are repopulating rural communities and reviving or sustaining local livestock production traditions. Often these neo-rural women are motivated by specific ideas about sustainability, such as those expressed by Erika (Catalunya):

It's unsustainable to have a city so big or an urban zone so big that you have to feed. The issue is that people from the cities need to return to rural areas. The debate is whether repopulation means building more in the villages, or returning to the village without building more, but restoring, because there is a lot to restore.

Newcomers also express a tension between their love for animals and the need to change how farm work is organized to make it sustainable. As Laia (Catalunya) explains:

If it doesn't follow the generational change, things will go pretty badly. I have made a business plan to set up a farm from zero, without having family or assets but, I would say, it's practically impossible...All these families that do not have an heir for their farm should try to find some young people and try to train them and, from there, then, that they can leave their heritage, in one way or another, to these young people, and be able to

continue...There are many young people who come from the School of Shepherds, but they abandon when they see that it does not pay. Many love animals and want to continue, but many also see it as very hard work, with a lot of dedication and sacrifice and little economic compensation.

Second, participants are engaged in educating the public about the ecological and cultural values of extensive livestock production by talking with children and youth in public schools and educating adults through on-farm tours and workshops. Women who visited local schools sought to counteract misinformation about livestock impacts on the environment due to conflating intensive industrial animal agriculture and extensive livestock production, while also combating negative perceptions of herding as a profession. The goal of developing curricula on extensive livestock production for different school levels emerged from one of the workshops as a key strategy that GeR plans to pursue.

Third, some interviewees articulated clear identities as feminists engaged in local, regional, or national ecofeminist or feminist agro-ecology movements. Such political consciousness and activism represent a contribution to social change at the societal level. As Ana (Andalucía) shared:

It's what I say, here the men see feminism like we want more than they have, but that's not what we want. What we are looking for is equality, not to be more but rather to be equal and to be better, but not to be more.

Sandra (Andalucía) reflected on the mechanisms through which patriarchy maintains dominance in society, by playing on women's insecurities. She gave the following advice to women who aspire to become pastoralists.

Well I would tell them that, more than anything as women in general, what the patriarchy has really done is to instill in us insecurity. I think that is the patriarchy's best weapon to maintain everything exactly as it is. Although I am also an insecure person. Very advanced in some things and very insecure in others. So they should work very hard and be sure of themselves, because if you have that [self-confidence] you will get ahead for sure.

This feminist consciousness is not yet widespread among all participants, however, and some perceived a danger of “over-empowered women,” and emphasized that men are essential partners in their operations and in the sector. For example, Rosa (Northwest) said:

In any case, all this about women, it's possible that we have gone from being completely invisible to being too visible. We also have to be careful. There's a point beyond which we mustn't go because we can't be saying all day 'the women, the women, the women.' Because here, the women without the men are nothing. Do you understand? We have to be careful.

The engagement of some participants within feminist environmental movements also led them to open the discussion on animal well-being within the livestock sector and society at large. Most participants believe extensive livestock farming minimizes animal suffering compared to intensive industrial livestock production, but they also recognize the need to innovate.

It's true that it should be managed as a closer circle. The ramaderes.cat are discussing the slaughterhouses. If you have local slaughterhouses, these animals do not suffer so much because you take them from the farm to the village next door. The transport is short, the conditions will be better, because there will be fewer animals to take to the slaughterhouse so both transport and slaughter will be more closely monitored...I would see this as a measure of animal welfare. At the time of sacrifice, you can sacrifice it, let the animal suffer, or you can sacrifice it so that it does not even feel anything. So, of course, with that I am quite positioned to try, then, to make the circle of production closer and the sacrifice less painful. [Laia, Catalunya]

These women now find themselves at the center of a public debate within the Spanish feminist movement wherein some academic feminists claim that extensive livestock farming is incompatible with feminism because it relies on the exploitation of domestic livestock. Study participants, however, defend their right to self-identify as feminists, even if they are not anti-speciesist, because they recognize their livelihood depends on animals.

Fourth, a few of the participants engaged in political advocacy in regional, national, and European Union levels, often pushing for policies that recognize and reward the environmental services of extensive livestock husbandry. Marina successfully ran for political office at the level of the autonomous region on a platform of “rescuing rural life” by fighting depopulation and bringing needed resources and support to the “primary industries” including extensive livestock production, fisheries, and forestry. Another participant ran for local office in her village. Several others have spoken to regional and international delegations (e.g., UNFCCC COP 25 in Madrid, EU Commission) on issues related to extensive livestock production and environmental subsidies.

Finally, in an era when social media has gained disproportionate influence on public opinion, women pastoralists are taking advantage of these platforms to highlight their roles in livestock husbandry and advocate for their sector. Both GeR and Ramaderes.cat have gained large social media followings.

DISCUSSION

In light of our findings, are women pastoralists the invisible thread that stitches new knowledge to old, passing on a complex patchwork of cultural and ecological values, knowledge, and practices that maintain a functioning pastoral SES? Do they lead the exodus from rural spaces, portending a regime shift? Or do women unravel and reweave the fabric of rural society into something new, as agents of transformative change? Our findings suggest “yes” to all of these questions: women contribute to all three processes: system conservation, system abandonment, and adaptive transformation of pastoral SES in rural Spain, revealing fundamental contradictions as well as synergies in women's discursive and material practices.

We build on our findings to describe such contradictions and synergies and to identify how power relations related to women's social locations, shaped by origin, class, family status, and region, influence their diverse experiences and identities in their interaction with other actors. We consider how this analysis contributes to SES and resilience theory, and its implications for sustaining and transforming Spanish pastoral SES.

Women's contributions to social-ecological systems conservation, adaptive transformation, and abandonment: synergies and contradictions

Women's contributions to conservation and innovation in extensive livestock production are not new (Sachs et al. 2016) but have evolved and shifted over several generations. Although acknowledging that resilience is not always desirable, we focus on women's contributions to the continuity of socially valued pastoral SES. In our sample, participants exemplify women's agency in building social-ecological resilience in pastoral SES, by taking active roles at the farm, sectoral and societal levels, seeking to transform the industry, economy and governance, while conserving extensive pastoralism as a lifeway and land use. For example, women who lived under the Franco dictatorship like Concepción, Nelia, Magdalena, and Nina's husband's grandmother, drove innovations at the enterprise and community scales despite their limited autonomy. They played critical roles in conserving family livestock lineages, enterprises, and traditional practices.

At the household level, certain narratives, such as those of Sandra and Carla, who use traditional practices as the basis for educational and agri-tourism enterprises, point to synergies between SES conservation and innovation/adaptive transformation. Sandra and Carla preserve and teach traditional cultural practices via new enterprises that add value and increase household income, while building social awareness of and support for extensive livestock production systems. Reinterpreted and revalued as agro-ecology or agri-tourism, these traditional practices and knowledge enhance SES resilience by diversifying income sources and management practices. Through their public education activities, Sandra and Carla advance discourses that value and link tradition and innovation in a narrative of hope rooted in their particular cultural landscapes.

Younger, neo-rural interviewees also perceived synergies or compatibility between women's roles in conservation and transformation. As Erika, the neo-rural from Catalunya, suggested, it's possible to combine traditions and innovation in ways that improve living and working conditions while drawing on relational aspects of tradition. Erika's view resonates with Darnhofer et al.'s (2016) relational understanding of resilience, reflecting the idea that the most important aspects of traditional knowledge lie not only in specific material practices, but rather in people's relationships with each other, animals, products, and land. Under this view, innovations can make farm life and work easier and more environmentally, socially, and economically sustainable. Participants like Erika and Sandra explicitly acknowledged the lineage of women that transmits inherited ancestral knowledge and traditions that support relationships to all objects and beings that constitute the farm. This lineage and the inherited knowledge embedded within it can also be seen as a biocultural refugia, based on stewardship memory that could contribute to renewal and reorganization of social-ecological systems (Barthel et al. 2013). Drawing on the concept of rooted networks (Rocheleau 2011), the synergy between conservation and innovation or tradition and transformation is also expressed by the gendered social movement of GeR and Ramaderes, whose members connect with each other in opposition to patriarchy and gender inequities in the livestock sector, while defending the tradition of extensive livestock management and working collectively to generate more circular economies.

Our findings also highlight a significant material and discursive contradiction between SES conservation or adaptive transformation and abandonment at different scales. At the household scale, as in other studies in rural Spain (e.g., Díaz Méndez 2005, Monllor I Rico and Fuller 2016), women in our study both recognize the need to conserve traditions and highlight the challenges of living and working in remote areas, like limited access to schools and health facilities, the physical and time demands of pastoralist work, and low economic returns. For these reasons, some women don't want their own children, especially daughters, to continue with a profession that they nevertheless would like to see preserved. For example, Victoria's commitment to maintaining transhumance contributed to her daughters' decisions not to continue in the livestock business. Similarly, Marina's achievements building a highly diversified and innovative livestock and tourism business cost her the opportunity to raise her teenage daughter at home. In both these examples, the women's dedication to their work and business in the present came at the cost of future intergenerational continuity of the operation and transfer of traditional knowledge, values, and practices. Both women enacted material practices and discourses to conserve or innovate to transform pastoral SES, yet both also engaged in discourses to discourage their own daughters and other youth from entering the sector.

Contrasting with the synergies found by Sandra, Carla, and Erika, the contradictions faced by Victoria and Marina highlight the differences between geographic regions within Spain, suggesting that geographic and political contexts (more liberal or conservative regions) may condition women's experiences. Salamaña et al. (2016) reported similar findings regarding neo-rural women. Victoria and Marina, who found it difficult to reconcile family and work life, both live in remote, sparsely populated and politically conservative northwest Spain. In contrast, Sandra and Carla are from Andalucía, and Erika from Catalunya, where the socio-demographic situation, proximity to urban settings, and more liberal political contexts entail greater access to markets and opportunities to combine tradition and innovation.

A discursive contradiction between conservation/tradition and transformation/innovation also emerges strongly in young newcomers, but it is also present in the discourse of older male pastoralists (Fernández-Giménez 2015). Laia (Catalunya) explicitly adopts the negative social discourse, common among traditional multi-generational pastoralists, about livestock farming as "sacrificial" work, even as she contradictorily recognizes that she chose this profession for the sense of freedom and relationship with nature it affords her. Maren (Pyrenees) expressed a similar tension in her narrative, blending dominant discourses about the relentlessness of pastoral work with discourses about personal autonomy and lifestyle.

At the societal level, women's decisions about education and profession, marriage, childbearing and childrearing, all strongly influence and perhaps even drive social and demographic trends, including rural depopulation, on the one hand, and neo-rural resettlement movements on the other (Salamaña et al., 2016). The overarching contradictions here are between women's critical roles and identities related to social and biological reproduction of rural life and its preservation, their roles and identities related to agricultural production/pastoralism and its adaptive

transformation, and their roles in rural abandonment. In this larger societal arena, women's material and discursive practices and the contradictions therein appear strongly shaped by women's multiple interacting identities, including origins (rural or urban), class, and parenthood.

Significant discursive-discursive and discursive-material contradictions play out at the intersection of gender with other axes of structural inequality, especially origin and class, in the differential attitudes toward and treatment of neo-rural women and women from traditional rural agricultural backgrounds. Although public discourse calls for repopulation of rural spaces and revitalization of the extensive livestock sector, women newcomers are subject to different discourses and practices than women from rural backgrounds. In our sample, as in other studies (Baylina et al. 2019), neo-rural women tend to have more formal education, but less access to land, local knowledge, social and political capital, and financial resources vital to establishing a new enterprise. In addition, the women working as hired shepherds were all from urban non-agricultural backgrounds, further highlighting differences in class and associated differential resource access. The discursive contradiction occurs when established pastoralists, including other women, ostracize or discourage neo-rural pastoralist women, even when the latter contribute in multiple ways to mitigating rural depopulation and land abandonment, and innovating land management and livestock business practices. Newcomers like Laia, Maren, and Cloé exemplify material contradictions as they enact practices that conserve and/or transform pastoral SES, while facing significant material barriers to entry, such as limited land and housing access, hostile bureaucracies, and poor working conditions. All our interviewees overcame these barriers, some through perseverance and assistance from local allies, and others by inventing new ways to access land and organize labor through novel business strategies, alliances, and institutional arrangements.

A further contradiction emerges when women do not have children. Women who are not parents are especially sensitive to and affected by a discourse and dynamic related to the way that women's roles in social and biological reproduction are instrumentalized in discussions of rural depopulation and repopulation. Such instrumentalization may exclude single women and women without children from entering the industry and repopulating villages. In our study, Maren (Pyrenees), a 40-year old single woman in the process of incorporating as a livestock producer, experienced discrimination from multiple government officers that another newcomer interviewee who was married with two young children and incorporating as a sole operator in the same village did not experience. Gender alone could not explain differential treatment and experiences of two neo-rural women in the same village. Rather, traditional cultural markers of status (i.e., motherhood) intersected with gender to define a discursive-material contradiction. The public discourse about the need to stem rural de-population and welcome newcomers conflicted with the material reality of how certain newcomers were treated. Maren's experience exemplifies the tendency of a singular construction of "woman" in the rural setting, as hardworking supporter of the man farmer and dedicated mother (Whatmore 1991, Sachs 1996, Brandth and Haugen 1997, Brasier et al. 2014). As Shisler and Sbicca (2019) argued, when motherhood becomes a salient descriptor of a

worker, this evokes a discriminatory bias distinct from that produced by gender alone.

Finally, across all levels of social organization, i.e., family/community, sector, and society, a contradiction emerged among some of the interviewed women in relation to their gender identity and gendered roles and division of labor. Many of the interviewed women see their role in taking care of humans and non-humans, i.e., the *casa*, the animals, and the environment, as fundamental for system conservation. However, their vision of rural womanhood eludes essentialism and challenges dominant farmwife and motherhood paradigms. Instead, many of our participants perform an alternative feminine approach to rurality by promoting innovative projects and practices like agri-tourism, public education, short supply chains, and organic farming, thereby shifting their carework from the exclusively private to the public sphere. As suggested by Shisler and Sbicca (2019), women are contradictorily aware that such synergy of conservation and innovation through carework helps them to embrace their multiple identities and experiences and subvert masculine assumptions, but also potentially reproduces traditional gender roles, such as food preparation and hospitality as women's work (Wilbur 2014).

Limitations of the study

We acknowledge several limitations to this research. First, the place-based qualitative and small sample nature of the research precludes broad generalizations, although the geographic scope and the regional workshops support the transferability of our findings to other pastoralist women within the study regions. Second, our intersectional lens was limited to analyzing differences in age, class, newcomer status, parenthood, and region. Our sample did not allow us to address intersectionality related to the experiences of women pastoralists who identify as BIPOC, LGBTQ or differently abled. Also, our focus on women's subjective lived experiences limited our ability to analyze structural causes of observed differences in women's experiences. Third, our approach focused on women's material and discursive practices rather than SES outcomes. Thus, our conclusions about women's roles in conservation, transformation, and abandonment are based on inferred or logically deduced relationships between these practices and factors that theory or past research indicate are linked to system resilience or adaptive capacity. Finally, the qualitative methodology we applied does not permit conclusions about the prevalence of some observed patterns, such as discrimination against women who are not mothers. Our findings indicate that such discrimination can and does occur, but not how common it is.

IMPLICATIONS FOR SOCIAL-ECOLOGICAL SYSTEMS THEORY, POLICY, AND PRACTICE

The synergies and contradictions discussed hold implications for future SES research, policy, and practice. First, they suggest that SES conservation and transformation are not necessarily alternative and mutually exclusive pathways. Rather, the actions that agents like Sandra and Carla take that draw upon and maintain the system's socio-cultural memory may also support innovation toward system transformation, as others have suggested (Berkes et al. 2003, Wilson et al. 2017, Zagata et al. 2020). Zataga et al. (2020) called this purposeful revival of historic practices for the development of sustainable agriculture "retro-

innovation.” Importantly in our study, participants seeking a deliberate transformation did not desire a regime shift toward an entirely different cultural landscape/SES. Rather, these change agents pursue deliberate SES transformation toward a more equitable and sustainable food system that values the cultural and environmental contributions of extensive livestock farming, provides opportunities for everyone to participate fully in the sector, and ensures that workers have access to high quality social services, infrastructure, and working and living conditions (Moore et al. 2014, Pereira et al. 2020).

Second, these contradictions reveal the complex subjectivities and multiple identities of Spanish women pastoralists, showing how pastoralist women’s diverse experiences elude essentializing stereotypes (Arora-Jonsson 2011). At the same time, the contradictions illuminate how a woman’s social location explains some of these differences because their rural or urban origins, geographic region, education, class, age, and family status interact to shape their motivations and practices; access to resources, knowledge, markets, and social capital; their interactions with other women pastoralists, and their outlook on the future. As such, this work builds on Ravera et al. (2016) and Wilmer and Fernández-Giménez (2016a) to address social science critiques of resilience/SES theory by centering the voices and subjective lived experiences of women within pastoral SES. However, much work remains to develop a fully intersectional analysis of Spain’s extensive livestock sector.

Third, our findings draw attention to three potential leverage points for adaptive transformation toward more just and sustainable pastoral SES, while maintaining valued elements of the cultural landscape and pastoral lifeway. The first is capitalizing on the synergy between tradition/conservation and innovation/transformation (i.e., retro-innovation), while avoiding the potential for conservation to reinforce potentially limiting traditional gender roles and identities. The second is working to overcome the rural/urban, newcomer/traditional pastoralist dichotomies and contradictions, replacing animosities with alliances. Our findings suggest that alliances formed via broad-scale social networks like GeR and Ramaderes.cat provide an effective forum for dialogue and learning across social differences including age, region, origins, and ideologies. Interviews and participant observation also revealed individual cases of older rural women mentoring and advocating for younger neo-rural women, or younger neo-rural women shifting discourses and forging alliances with older rural men and women. Such women may serve as bridges to help span cultural and ideological divides between neo-rural pastoralists (and the urban communities they hail from), and traditional pastoralists and their rural communities. Finally, as Sandra and Marina point out, women themselves are a fundamental leverage point and women’s decisions to stay or leave rural spaces are critical drivers of SES conservation, transformation, or abandonment. This leads us to recommendations for policy and practice.

For Spanish pastoral SES to continue to provide key ecological and socio-cultural benefits, social regard for herders and inherent benefits of being a pastoralist must outweigh the sacrifices and contradictions this lifestyle currently entails, especially for women. Government and cross-sectoral collaborations could provide support for adaptive transformation. Echoing priorities identified by other mixed-gender workshops in Spain (Oteros-Rozas et al.

2013), workshop participants identified the five priorities to support extensive pastoral SES in Spain. (1) Educate the public about the value and benefits of extensive livestock production and differentiate its climate, environmental, and health impacts from those of intensive industrial livestock production. (2) Develop markets and policies that monetize these values via payment for ecosystem services, value-added processing, and local origin labeling. (3) Provide trainings tailored for women pastoralists to build necessary skills in value-added processing and marketing. (4) Improve rural infrastructure (e.g., cell service, local/mobile slaughterhouses) and social services (e.g., schools, clinics, support for elderly). (5) Develop programs to alleviate the triple burden on women and improve working conditions for all pastoralists (e.g., job-spelling or work-sharing programs). If we heed women’s priorities and work to make rural spaces and pastoralist livelihoods good for all women who aspire to be pastoralists, women will more likely stay, and in staying work toward transforming the system to one that will be better for everyone.

Responses to this article can be read online at:
<https://www.ecologyandsociety.org/issues/responses.php/12794>

Author Contributions:

Maria Fernandez-Gimenez, a rangeland ecologist and social scientist, has worked in the livestock sector and is committed to reciprocal relationships with research participants that support their goals. She participated in most of the interviews, co-facilitated three of the regional workshops and the on-line gathering, and developed personal relationships with research participants in the Aragonese Pyrenees study site, which contributed to her interpretations of the research findings. She led the analysis and writing of the paper. Federica Ravera works in the Catalan Pyrenees on pastoralism, gender, and global environmental change. Beyond her academic work, she is also involved in activism, which places her in contact with Catalan women pastoralist networks. Participant observation in daily life of shepherdesses and personal relationships with them influence her data collection and interpretation of findings. She conducted interviews and organized the workshop with the Catalan participants, informed the coding strategy, and contributed to writing the paper. Elisa Oteros-Rozas does participatory research with pastoralists in Spain and is co-founder and co-facilitator of Ganaderas en Red, which situates her between researcher, practitioner, and personal lenses. She has a daily and personal relationship with some of the research participants, which frames her interpretation of explicit discourses in light of her knowledge of implicit and omitted information. She conducted interviews in Andalucía and led workshops in Andalucía and Northwest Spain. She participated in coding the interviews and writing the paper.

Acknowledgments:

Funding for this work was provided by the Asociación Trashumancia y Naturaleza, with support from the MAVA Foundation, and a Fulbright Global Scholar Award. The corresponding author FR was funded by AXA Research Fund (2016) and by the Spanish Ministry

of Science, Innovation and Universities through the project GENDER- ERANET SEQUAL and the senior fellowship RAMON Y CAJAL (RyC2018-025958-I). EOR was supported by a Juan de la Cierva Incorporation Fellowship of the Ministry of Science, Innovation and Universities (IJCI-2017-34334). We are deeply grateful to the women who participated in this study as interviewees and workshop participants, and who shared their lives and homes with us. We thank Isabel Madrigal and Ganaderas en Red, who helped to connect us to many of our research participants and Fundación Entretantos, which supported regional workshops. Marta Torres Herrero helped translate project materials and organized pilot interviews.

Data Availability:

The data code that support the findings of this study are available on request from the corresponding author, F.R. None of the data code are publicly available because they contain information that could compromise the privacy of research participants. Ethical approval for this research study was granted by Colorado State University IRB protocol 350-18H.

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