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# Reflexivity, embodiment, and ethics of care in rangeland political ecology: reflections of three feminist researchers on the experience of transdisciplinary knowledge co-production

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Although there is a growing interest in transdisciplinary knowledge co-production approaches applied to rangeland political ecology, the research paradigms and methodologies still dominating this field of research leave little room for equitable engagement with research participants and genuine action-oriented research. In this article, we provide a reflection on new practices grounded in feminist studies of science and care ethic literature to orient transgressive and engaged transdisciplinary political rangeland ecology research. Feminist epistemologies call for reflection on who produces knowledge and how such knowledge is used and shared. Feminist practices, such as reflexivity, embodiment, reciprocity, and care, cultivate awareness of the power dynamics embedded in the research process and motivate researchers to counteract asymmetrical or extractive relationships when we identify them. We first introduce the scholarship that inspires key principles of our feminist research approach and then reflect on our experiences as researchers and as activists working with Spanish and Catalan networks of women pastoralists. Three research questions guide our reflective process: (i) how can feminist theories of knowledge co-production contribute to rangeland political ecology; (ii) how can feminist methodologies be applied in practice so that collaboration between women pastoralists, their organizations, and researchers is mutually reinforcing, care-full, and action-oriented; and (iii) what are the challenges and limitations of our experiences to foster transformation and emancipation in knowledge co-production processes?

## KEYWORDS

body and emotions, ethic of care, extensive livestock management, feminist research, gender, Spain, women pastoralists, positionality and subjectivity

## 1. Introduction

In recent decades, several approaches have emerged that aim to radically transform the practice of science, focusing on societal problems and engaging multiple social actors in knowledge co-production (Knapp et al., 2019). First, to understand wicked environmental problems, scientific processes incorporate multiple disciplines (Klenk and Meehan, 2017).

Second, to produce knowledge that may support societal solutions to those problems and involve the voices of those affected by such problems, scientists increasingly recognize the need to collaborate with society, learn together, and apply co-produced knowledge to socially legitimate actions (Lemos and Morehouse, 2005). Several scholars have explored the transformative effect of transdisciplinary processes and knowledge co-production in environmental science (Klenk and Meehan, 2017; Reid et al., 2021), while others highlight failures in achieving empowerment and societal transformation, including sometimes an increase in unequal power relations (Turnhout et al., 2020). These failures are rooted in a tendency to depoliticize transdisciplinary knowledge co-production processes, eluding “power geometries of situated knowledge” (Caretta, 2015: abstract).

In 1994, a special issue of the journal *The Professional Geographer* titled “Women in the Field: Critical Feminist Methodologies and Theoretical Perspectives” debated feminist concerns with power in knowledge production (Nast, 1994). Along the same line, in recent decades, feminist, decolonial, and postcolonial studies of science have profoundly transgressed mainstream epistemological and methodological approaches and logics of research (Lanza Rivers, 2019), focusing on the processes of knowledge production and co-production and integrating science into communities and activism (Subramaniam, 2009; Iniesta-Arandia et al., 2020). According to other feminist scholars, to be transformative, research processes, especially those dealing with sustainability and environmental wicked problems, must include both reflexivity on the positionality and subjectivities of who is researching and the care of relationships with subjects involved in the research (Caretta, 2015; Moriggi et al., 2020; Staffa et al., 2022). In this study, we are inspired by those feminist scholars who suggest new pathways toward transformative and genuinely emancipatory transdisciplinary research and work to apply them to our research in the arena of rangeland political ecology.

We met in 2016 at an international festival where participants explored the potential for transformative science and knowledge co-production in sustainability science through a dialogue between arts and scientific disciplines (Heras et al., 2021). At that moment, all of us were conscious that, after years of working with livestock managers and herders on research related to their traditional knowledge and adaptation to global changes, among other topics, we had mostly spoken and worked with men. Women were rarely present in the hands-on work of land and livestock management in the Spanish pastoral systems where we worked. However, when we talked with women in the kitchen or informally, they gave us substantial insights for reflection. Additionally, when we searched for published research on women in Spain’s livestock farming, we found none, although national statistics indicated that the number of women in the sector has been growing in recent years (Instituto Nacional de Estadística).<sup>1</sup> Women were virtually invisible in the extensive livestock sector, resulting in the erasure of their experiences and contributions and silencing their voices in decision-making. Additionally, although researchers and development practitioners in the global south began to highlight

the importance of women’s roles and power relations in pastoral social-ecological systems (see as examples Köhler-Rollefson, 2012; Coppock et al., 2013; Kristjanson et al., 2014; Wangui, 2014; Aregu et al., 2016), gender studies in ranching and pastoralism in the Global North remain scarce. The few empirical works on women and gender in ranching or pastoralism in the Global North are mainly from the United States (e.g., Finan, 2011; Wilmer and Fernández-Giménez, 2016; Munden-Dixon, 2019), Australia (Hay and Pearce, 2014), and Northern Europe (Buchanan et al., 2016). To fill this lacuna, we agreed to focus our collaborative ethnographic research projects on the everyday lives of women, gendered knowledge, roles, and power relations in pastoral systems in different Spanish regions. Echoing Towandson (2005, p. 14): “As feminists we wanted to give to women the opportunity to represent themselves, their problems and their solutions, while recognizing that only partial success in these aims is possible. There will be no solution without these voices.”

In our first meetings, we also realized that, to date, rangeland and pastoralism studies have seldom employed a political ecology focus coupled with transdisciplinary knowledge co-production (but see Reid et al., 2021, who compiled experiences of science with society partnerships in pastoralist and rangeland cases). Moreover, feminist scholarship in rangeland and pastoral studies is almost entirely absent. Thus, we debated why and how to design a genuinely engaged transdisciplinary project grounded in feminist theories and working with and knowing about women in extensive livestock management and pastoralism.

Inspired by Haraway (2015) refugia metaphor<sup>2</sup> and her feminist work on situated character of knowledge to face the systemic crisis of this new Capitalocene era to transform it (for the critical debate among the use of Anthropocene vs. Capitalocene, see Moore, 2016), we reflected on ourselves, questioning our practice of science within a productivist and extractivist Academia and looking for refugia of a different way of doing science from a feminist perspective. To counter the prevailing academic culture, we worked with each other and with our research participants/co-researchers to engage with social justice and cultivate caring relationships throughout the research process. The aim of the article is to reflect on and analyze our own attempt to put into practice key principles of feminist research to support transgressive and engaged transdisciplinary science within the domain of political ecology of rangelands and pastoralism.

In this article, we first clarify the theoretical and conceptual feminist scholarships that inspired us, focusing on three dimensions of analysis: (1) reflexivity, positionality, and subjectivities of researchers; (2) embodiment and emotions at play throughout the research process; and (3) reciprocity and an ethic of care. Then, after situating our auto-ethnographic research in the context and projects that frame the research, we share the results of our (self)observations and (self)reflection, focusing on two dimensions of transformation; the inner and

1 [https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica\\_C&cid=1254736176851&menu=ultiDatos&id=1254735727106](https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176851&menu=ultiDatos&id=1254735727106)

2 In her book *Staying with the Trouble*, Haraway (2016) introduces the term Chthulucene. She alerts that the planet is full of refugees, and she invites to create new refugia, that means we need to strive for a sympoietic coexistence—i.e., collective existence of living and non-living entities—which for her might be the only way to replenish the vitality of the planet.

personal dimension of change; and the relational engagement with women through bodies, emotions, and the ethic of care that guided the research. Finally, we link our (self)analysis to how feminist perspectives may transform the practice of science, creating conditions for catalyzing partnerships between scientists and society to transform social-ecological systems and increase community capacity to respond to global changes.

## 2. Theoretical and conceptual background

### 2.1. Reflexivity: subjectivity and positionality as researchers

Reflexivity refers to the examination during the research process of one's own beliefs, judgments, and practices that are culturally and socially bound and reflect power and values influencing the research (Schnabel, 2014). When we refer to the reflexivity process, we mean the feminist practice of critical self-reflection about choices that drive how and why we study what we study. Such critical reflection is also related to the power dynamics that exist between researchers and subjects of research and their impacts on generating and circulating knowledge (Rose, 1997). Reflexivity on power dynamics implies that science has legitimated its powerful position with respect to other systems of knowledge, based on a dominant and biased vision of knowledge as universal, objective, and rational. Thus, we explore two main components of reflexivity: subjectivity and relational positionality. Subjectivity opens up the intimate relations of the researcher with the research, recognizing emotions, expectations, and desires about what and how to research. Positionality refers to our self-examination as researchers on how our social positions as urban, white, and educated subjects, ages, and status within Academia may influence knowledge production. This includes reflecting on how our positionalities shape relationships among us as researchers and with our research participants (see, for instance, Harcourt and Nelson, 2015; Faria and Mollett, 2016). To explore our own choices and observe ourselves and our relationships with the participants involved in the research, autoethnography has become an increasingly necessary methodological tool for feminist scholars (e.g., England, 1994; Kobayashi, 1994; Ellis and Bohner, 2005; Caretta, 2015). Feminist studies of science resist considering knowledge as “objective” and “universal,” proposing instead an interpretation of reality that depends on the geographical and historical context and the conditions where knowledge is produced (Haraway, 1988). This perspective implies that acknowledging, understanding, and representing relationships with nature and its management may be very different according to the system of knowledge employed (de Sousa Santos, 2010). Deconstructing Western epistemologies and authority taken for granted as the only way to construct objective, impartial, and universal knowledge (especially about environmental issues, such as climate change) is a common objective of feminist studies of science and decolonial feminist studies, where Indigenous, Black, Chicana, and Latina scholars converge (among others; see, for instance, Maldonado-Torres, 2007; Harding, 2009; Lugones, 2010; Pulido, 2017; Caretta et al., 2020; Guy-Antaki, 2022).

As a privileged way of knowing the world, Western science defines how to study environmental phenomena as well as to identify solutions and priorities, often reproducing hierarchies and exacerbating environmental problems. Feminist and decolonial literature highlight the relevance of bringing to the table multiple voices and knowledge systems, such as from Indigenous peoples and farmers' systems, within processes of knowledge co-production in environmental studies (Schnabel, 2014; Carey et al., 2016; Goldman, 2020). However, to be truly transformative and emancipatory, research processes from the global north must go beyond inviting and including women farmers' and Indigenous communities' voices and knowledge for the primary goal of diverse representation. In fact, such approaches risk ignoring, coopting, and depoliticizing the work of decolonial scholars, with a boomerang effect of increasing invisibility and colonial violence (Rivera Cusicanqui, 2012). Moreover, structural barriers to the intersectional inclusion of voices based on race, location and origin, ethnicity, education system, and other individual and collective social identities frequently remain. Feminist political ecologists (e.g., Mollett and Faria, 2013; Sultana, 2014) call for environmental studies to move “beyond gender,” to include analyses of multiple and intersecting power inequities and (in)justices, and to challenge dominant assumptions of Western knowledge systems (Harris, 2015), which prevent effective co-production.

### 2.2. Embodiment and emotions within the research process

These reflections call for novel ontological and epistemological approaches that often lead to new methodological proposals. Feminist methodological debates have engaged with issues of power in the research process (Gibson - Graham, 1994), concluding that new hybrid methodologies are needed to reveal lived experiences (Rocheleau, 1995; Nightingale, 2003, 2015). Insights may be gained by converging reflections through (i) triangulating data from different disciplines, methods, and tools to bring the voices and capture alternative worldviews of diverse subjects, such as combinations of visual storytelling, mapping oral testimonies, and social media analysis (see, for instance, Hayman et al., 2015; Williams and Golovnev, 2015), (ii) having more inclusive projects that use collaborative methods to work with research participants (rather than on or about), such as collaborative filmmaking, mapping or co-writing (see, for instance, Sundberg, 2004; Sharp, 2005; Perkins and Figueiredo Walker, 2015), (iii) working with literature and arts (see, for instance, Benessia et al., 2012), and (iv) looking at silences and probing the way that contradiction or uncertain results may also emerge, as in a kaleidoscope. Feminist scholarship has also invited researchers to overcome the duality of mind and body as another way to challenge an exclusive positivist science-based knowledge production. Especially facing environmental global changes, scholars remark that the gap between knowing and feeling hinders the human ability to understand warnings and react to the speed and magnitude of potential risks (see, for instance, Wright et al., 2022). In contrast, through the body's senses and emotions—both negative, like fear, anger, and anxiety, and positive, like hope and joy—we

can experience ourselves and the world differently and therefore potentially connect with empathy and change our perceptions and behaviors (Pulcini, 2009). Wright et al. (2022) call for exploring grounded and embodied knowledge spaces, which do not exclude the scientific method but enrich it. As an example, drawing from activist research and critical decolonial anthropology from Latin America, Ruiz Trejo and García-Dauder (2019) propose epistemic-corporeal workshops as spaces from which to explore collaboratively (researchers and non-researchers) embodied and experiential knowledge about the territories and the environment. Such methods also have the goal of taking care of the self and others during the research process through the expression of bodies and emotions.

### 2.3. Reciprocity and ethics of care guide attentive, responsible, and responsive social research

A third body of feminist scholarship suggests critically re-thinking and re-orienting our practices as researchers toward a care-full model of scholarship, both for the planet and people (see Pulcini, 2009; Tronto, 2013; Tschakert and St.Clair, 2013; Moriggi et al., 2020; Care et al., 2021, among others). A commitment to reciprocity and care emerges from the practice of reflexivity, which motivates researchers to counteract asymmetrical or extractive relationships when we identify them (Smith, 1999). Recently, a slow and care-oriented scholarship in feminist geography (Caretta, 2015; Mountz et al., 2015; Carr and Gibson, 2016) has challenged the neoliberal model of science, based on extractive, transactional, competitive, and exploitive relationships among researchers and with social actors who participate in research. Moreover, such an ethic of care should guide how we conceive and do science. Inspired by Tronto (1998), Moriggi et al. (2020) draw on a framework of five dimensions of care-full scholarship. *Caring about* calls for reflexivity and positionality, as mentioned before, to clarify our motivations and values that may inform the practice of research and be attentive to the questions and needs of local research partners. *Caring for*, which means becoming responsible in pursuing responses to such needs and demonstrating long-term commitment. *Care giving* refers to actively performing caring tasks. *Care receiving* focuses on mechanisms for returning results, evaluating the research process for a better understanding of new needs, and offering training and capacity building. Finally, *caring with* implies nurturing a new culture of collaborations, shared learning, and relationships of trust, respect for time, and conviviality, all of which are essential for understanding complex social and spatial processes (Caretta and Faria, 2019).

## 3. The research process

### 3.1. Situating the research

In Europe and specifically in Spain, rural sociologists and geographers have produced a rich literature on women and gender in rural areas, agriculture, and natural resources since

the 1980s (García-Ramón, 2005; Oteros-Rozas et al., 2021), but work focusing specifically on women in the livestock management sector is rare. Until recently, this gap reflected the invisibility of women's participation in extensive livestock management systems in most areas of Spain. Little research exists on women's roles, knowledge, or experiences in these systems, despite the fact that women's participation in the livestock sector, together with intensive horticulture in southern Spain, is higher than in other agricultural sectors (García Ramón and Baylina, 2000; Majoral and Sánchez Aguilera, 2002).

Yet, understanding women pastoralists is critical due to their potentially pivotal role in the future of Spanish pastoral systems. Recently, several studies have begun to fill this gap in knowledge, analyzing the different origins, motivations, and profiles of women involved in pastoral systems in terms of pathways into farming, animal and land tenure, and training (see, for instance, Fernández-Giménez et al., 2021). Some studies evidence women's key role in the conservation of transhumance practices (Oteros-Rozas et al., 2013), while others confirm that the lack of women in pastoralist societies may compromise generational renewal, contributing to rural masculinization and ultimately land abandonment and rural depopulation (Fernández-Giménez and Fillat Estaque, 2012; Oteros-Rozas et al., 2013). Recent research recognizes women's contributions to conserving and transmitting livestock management knowledge, culture, and identity, as well as innovating and transforming extensive pastoral systems toward greater sustainability (Fernández-Giménez et al., 2022). Such roles and relations frame women's knowledge and their perceptions and responses to changes (Ravera et al., 2022).

Statistics indicate that women make up only 24% of farming labor in Spain (Sabaté, 2018), and the industrialization of agriculture and abandonment of rural areas in Spain greatly affected rural women's knowledge and practices (Siliprandi and Zuloaga, 2014). However, in pastoralist families, women often contribute to every activity on the farm. For example, they contribute to a myriad of invisible tasks such as cleaning, maintenance, caring for newborn and mother animals, pasturing and watering, and milking, often daily. Sometimes, women take salaried work off-farm but support the family in specific moments of particularly heavy workloads, which is critical for the viability of the operation. Although the number of women operators, especially young women, is growing [i.e., farms where women are primary operators increased to 22% in the last decade, according to the Instituto Nacional de Estadística (see text footnote 3)], statistics can be misleading in some regions, as men often remain primary decision-makers even if the farm is registered in a woman's name to obtain more subsidies from the EU. Few women have obtained shared ownership under the new Law of Shared Ownership (Ley 35/2011) (Senra Rodríguez, 2018), because the procedure requires approval by the husband, is costly, and administrative officers have not been sufficiently trained to assist women.

Furthermore, women's pastoral roles and visibility in the household, the community, and the livestock sector differ regionally (García-Ramón, 1989; García-Ramón et al., 1993). In northern regions of the country like Galicia, Asturias, Cantabria, and the northern areas of Castilla y León, women have traditionally been in charge of caring for cattle. Therefore, women pastoralists

in these regions are socially visible but frequently have no legal or economic recognition of their work. In other regions, such as Catalunya, recent publications recognize the innovative role of young women in re-ruralization processes (Salamaña et al., 2016; Baylina et al., 2019). In the rest of Spain, diverse situations persist, but overall, women's roles in livestock management largely remain socially, economically, and institutionally invisible.

### 3.2. Methods adopted for the research

In this section, we briefly outline the research with women pastoralists that is the context for our auto-ethnographic study. Then, in the following section, we describe our auto-ethnographic methods.

Our research with pastoralist women was embedded in different research projects and activism that aimed to understand and support women's lives and needs in extensive livestock systems over several years. We designed our projects using a common approach at two scales (such as national and regional) and in four geographical areas, carrying out interviews ( $n = 46$ ) and participant observation in Andalucía (southern Spain), the Northwest (Zamora, León, Asturias, and Cantabria), the Aragonese and Catalan Pyrenees, and Central Catalunya. We identified potential interviewees through existing research and personal contacts with Ganaderas en Red (GeR), a national network of women pastoralists, and a regional network, Ramaderes de Catalunya (Ramaderes.cat). In the Catalan and Aragonese Pyrenees, we identified interviewees through snowball sampling during long-term fieldwork.

We shared the research process with a diverse range of women directly and indirectly involved in extensive livestock farming, including women who own or co-own flocks and own or rent land, women who work with livestock as family members, and women employees of an operation owned by someone else. The terminology we usually use to define women involved in livestock management systems (and their self-identification) differs across regions and types of livestock. We mostly define women in the first two groups as women livestock managers (i.e., "ganaderas" in Spanish and "ramaderes" in Catalan), and the last group self-identifies as shepherdesses or women herders (i.e., "pastoras" in Spanish and "pastores" in Catalan). We also included women who are members of livestock farming families, provide essential support to the operation, and influence production decisions, even when they do not work directly, or on a daily basis, with land or animals. In this article, we refer to women pastoralists when we talk generally about all the different profiles, and in particular to shepherdesses when their status as an employed herder working for others is relevant. Women's ages ranged from 22 to 96 years. Most interviews took place at the participant's residence or farm, were audio-recorded, and included visits to the operation. Several involved extended participant observation or repeated interactions and interviews.

To collect the women's stories, we used a life-history interview protocol, which is a situated ethnographic method where the researcher orients the narration of the story of the life of the subject through a semi-structured interview. In the interviews, we explored

women's backgrounds and pathways into livestock farming, their roles in the conservation, abandonment, and transformation of extensive livestock farming, their perceptions of challenges and environmental changes, as well as their strategies to cope with them. All women gave their informed consent for inclusion before their participation. The study was conducted in accordance with the protocol approved by the Colorado State University Institutional Review Board (United States) and the Ethics Committee of the University of Vic (Spain). We sent each participant their interview transcript for review and personal records.

After initial data analysis, we convened in-person workshops to co-interpret preliminary findings, collect additional data on women's experiences and perspectives, and discuss how they might advance the participants' goals. Workshops took place in the spring and winter of 2019 with interview participants and other members of GeR in Andalucía ( $n = 11$  participants), Northwest Spain ( $n = 11$ ), Catalunya ( $n = 5$ ), Catalan ( $n = 16$ ), and Aragonés Pyrenees ( $n = 3$ ). The workshops served as regional gatherings for GeR and focused on analyzing the results jointly, but also strengthening women's relationships and confidence with researchers and among them; increasing the empowerment and visibility of pastoralist women in their families, communities, and the sector; improving rural services; and educating society about extensive livestock production. In the summer of 2020, we invited all research participants to two virtual meetings to engage participants in further discussions on the results and policy recommendations. In the Catalan Pyrenees, we engaged a visual artist to help with the facilitation. Additionally, three artists and illustrators—including a local photographer and a comic illustrator—were invited to follow the researcher and illustrate the process and some of the results from the life histories. The aim of the artistic process was to emotionally engage women through the arts in the research and strengthen the communication of results to a broader public.

### 3.3. Methods adopted to reflect on the research process

For this article, we adopted a reflective auto-ethnographic approach. First, we systematized and analyzed our field notes and notes from meetings among us. Additionally, each co-author completed a self-reflective questionnaire to individually analyze our feelings, experiences, and thoughts in relation to the different steps of our research with women pastoralists. We then identified common themes and individual variations among the three authors' experiences to extract lessons learned from applying a feminist perspective in the research process around (1) positionality and subjectivity, (2) embodiment and emotions, and (3) reciprocity and the ethic of care. For positionality and subjectivity, we reflected on our own life histories in relation to the research, capturing convergences and dissonances among us in terms of origins and identities, background in academic and activist arenas, as well as experiences that may have influenced our ways of doing research and our relationships with our participants and each other. For embodiment and emotions, we analyzed how we designed the research process with different activities that stimulated the engagement with and visibility of bodies, feelings,

and emotions. For reciprocity and an ethic of care, we analyzed our practices, relational responsibility, and emotional awareness, which overall built the foundations of an ethic of care applied to our research. Throughout the analysis process, we continued to reflect and discuss, and we incorporated these further discussions into the analysis presented here.

We acknowledge the limitations of our approach, which captures mainly our own reflections as researchers on our attempt to implement a feminist transdisciplinary co-production approach. We did not invite our participants to engage in the same level of reflection on the research co-production process for three main reasons. First, the onset of the COVID epidemic interrupted opportunities for face-to-face engagement and disrupted priorities for everyone involved. Second, the multiple existing demands on women pastoralists' time limited their ability to participate in further reflection. Third, such reflections and self-analysis were of greater interest to us as researchers and did not directly serve women pastoralists' agendas. Instead, we directed our efforts toward the participant's priorities, which included publishing the scientific results and using the findings to support their own public relations and policy campaigns. However, we did collect informal comments and analyzed the level of participation and engagement of women pastoralists throughout our projects. Also, in the summer of 2020, we invited all research participants to a virtual meeting to reflect together on the process. In this virtual meeting, participants addressed three main questions: What's your feeling and experience of collaboration in this research? How can this research serve women pastoralists? How should such research be designed in the future?"

## 4. Lessons learned from our experience

### 4.1. Recognizing our subjectivity and position as researchers

As feminist political ecologists, we acknowledge that our perspectives are filtered through our own positionality due to our backgrounds, origins, and experiences. EOR is Spanish, and she grew up in a big city; MFG and FR are foreign (US and Italian citizens, respectively), and they grew up in small towns. Both EOR and FR live in Spain and relocated from cities to small rural communities during the research. We shared common backgrounds in both ecological and social science, and currently, we are situated in universities or research institutions, but with different power conditions. MFG, who worked as a laborer on livestock ranches in the US West during her 20s, is currently an established senior researcher in her late 50s within the US academy. FR, in her 40s, is a senior postdoctoral researcher, with the possibility of her stabilization in the coming years. EOR, in her 30s, is also a senior researcher in the Spanish academic system, but still in a more precarious situation. Both FR and EOR identify not only as researchers but also as activists in the feminist and agroecology social movements, while MFG identifies as a feminist and researcher who advocates for extensive pastoralism.

Our backgrounds thus positioned each of us in different ways in relation to our various study communities and participants,

which sometimes dissolved and sometimes reinforced traditional researcher-participant dynamics. On the one hand, we recognize our privilege as highly educated urban residents with greater economic security and information access than most of the research participants. But each of us also experienced limitations and initial unease associated with our urban origins and identities, as EOR remarks: *"In my case, I felt that not having a rural origin, being quite young, and coming from a university context were disadvantages in a certain sense. When I first started my research 15 years ago, I knew very little about pastoralists and their world, and I did all my interviews with men. Later on, sharing "everyday life" with women - even if only virtually, as co-facilitator in GeR, not as researcher, I still always felt that I unavoidably missed part of the picture because I have not experienced, in my own body, some of their difficulties. For instance, having a "stable" income, not dependent on markets or the weather, or not having to care for any dependent, are privileges which are also widely perceived. Instead, I felt that my public commitment advocating for pastoralism in several organizations - including conservationist, and my scientific expertise, conferred me a legitimacy that opened the doors - and hearts - to set up personal relationships, sometimes even friendships, with the women, which afterwards paved the road for research."*

On the other hand, our own life experiences, like parenting, losing a parent, or moving from a city to a village, created a bond of shared experience with different participants. MFG and FR both benefited to some extent from being "foreigners," which released us from some expectations and garnered appreciation for our skills in local languages. In this sense, MFG observes: *"My age, gender, family status, personal work experience as a shepherdess and Spanish heritage helped me to connect with the research participants on a personal level, as we often had common life experiences like caring for an ageing parent or child rearing, as well as a shared interest in livestock. My US citizenship/identity and accent, in addition to my professional identity as a researcher, were constant reminders of my outsider status and position of relative power and privilege."* Similarly, FR notices: *"My Italian citizenship, my class, my education, my appearance, and my accent, all conferred whiteness upon me. This privilege prompted feelings of curiosity among respondents, facilitating research in myriad ways. As Italian, researcher and woman, I was not classified as part of the intellectual urban Spanish establishment neither as a tourist nor as a conservationist, and an initial sympathy for my person easily opened the dialogue with women pastoralists. The fact that I spoke Catalan, the main language spoken in mountain areas and a trait of identity for local people, helped to increase such sympathy. Step by step I then increased a trustful relation."*

MFG previously lived for a year and carried out research at one study site, and FR conducts long-term fieldwork research in the Pyrenees, while EOR developed extensive fieldwork among transhumant pastoralists for 4 years and, between 2016 and 2021, helped facilitate Ganaderas en Red. EOR had thus close personal relationships with some participants, and FR had personal friendships with some Catalan women participants, which provided additional insight into our interpretations. Each of us, thus, navigated multiple and sometimes conflicting positions such as researcher, activist/advocate, facilitator, and/or friend, relative to our participants and the extensive livestock sector. Each of us faced personal situations during the research, which also required and

received sensitivity and adaptation from the team and participants. For instance, the initial idea was to share the fieldwork in some regions among the authors, but EOR faced some health issues that required physical and psychological recovery and thus was not able to participate in interviews to the extent originally planned. Balancing these different needs, roles, and positions required adapting our research objectives and rhythms and working to maintain trust and transparency with our participants and each other.

Building upon our awareness of our positionalities, we practiced reflexivity by examining how such positions, beliefs, and practices affected the research and the power dynamics therein, especially in the context of a particular political and social moment (we refer here to the dimension of caring about, i.e., asking ourselves and being attentive to capture key questions, after Moriggi et al., 2020). FR reflected on how she is rewarded for research publications and grants in which the “local communities are the protagonists” but for which they receive little credit. She counteracted this imbalance by engaging women in her study site through art activities through which they communicate key findings and messages from the research to a wider audience. She remarks: “My efforts were oriented to not only returning and discussing results in workshops, but also to bring women pastoralists into participating in writing a comic and working with local artists to transform their life histories into illustrations. I then invited them to expose their own thoughts in the local festival of the sector.” EOR leveraged her facilitator and activist roles to bring research participants to scientific conferences and international policy forums where their voices directly reached a broad audience (e.g., COP-25 side events where some women pastoralists participated together with scientists). MFG recognized her own developing understanding of feminist theory and practice through the project, and in light of terrible racial injustices in her own country, she critically reflected on the limitations of our research: “As I continue to read and learn more feminist theory, my understanding of gender relations and identities in rural spaces continues to evolve, reshaping interpretation of the data and of their socio-political contexts and needed changes. At the same time, my readings of intersectional feminist work, and work by Black and Chicana feminist scholars, pushes me to further challenge our assumptions and sampling frame within this study, and to ask whether we are rendering invisible women and men of other races/ethnicities (e.g., mestizo/a, Moroccan) in the same way I previously made assumptions about and contributed to the erasure of women from Spanish pastoralism. I am not always comfortable with the claims we are making about intersectionality in our analyses because they do not address race or ethnicity, which true intersectionality requires. My US Black/Latina/Chicana/Indígena feminist colleagues would be highly critical of our use of intersectionality. Similarly, I would not characterize our work as decolonial because this research has no direct impact on returning land to or supporting the sovereignty of Indigenous nations.” Such debate allowed the other authors to ask themselves if the absence of race and ethnicity in the study reflected its invisibility in the livestock sector, causing us to overlook specific intersecting oppressions: “In our Spanish context we focused on simultaneity of oppressions and privileges that we can clearly observe in our data, such as gender, age, and rural/urban

origins. However, are there no ethnically and racially marginalized groups, such as Romanian or Moroccan shepherds or Black workers? Why and how are Romanian, Moroccan or Black women absent or invisible?” (FR). Privileging some subjects (e.g., white Spanish women) silences others (e.g., women of color and immigrant women). Thus, our research, embedded in the European academic arena, aspires to be decolonial but falls short of promoting full social and environmental justice. The debate among us remained open during the research and writing process, prompting ongoing reflexivity about where and how we talk about the inclusion of other knowledge systems.

Our different ages, experiences, and political perspectives also shaped what we focused on in our data interpretation. For example, FR and EOR emphasized the importance of newcomer women in transforming agrifood systems, while MFG was deeply interested in the contributions of older “traditional” rural women to both conservation and innovation in extensive pastoral systems. FR focused much more on differential perceptions, impacts, and responses to global change among newcomers and women in the area of study and the structural reasons for differential inequities. Ongoing reflexivity through individual and collective critical examination supports rigorous qualitative analysis and challenges us to continually redress power differentials in pastoral/rangeland research.

## 4.2. Engaging with bodies and emotions

In our research process, we frequently expressed our emotions of anger, frustration, despair, and grief when we heard about the problems and challenges facing women pastoralists. In our opinion, taking the emotional into account enhances our empathy and connection with the other participants in the research, amplifying the impact of affective actions. Moreover, we also tried to create a safe space for sharing feelings among us, thus cultivating a careful academic relationship that respects different times, objectives, stages of life, and priorities. We met constantly virtually and physically and spent time talking and, in some cases, sharing feelings in critical moments (such as the fire in Colorado and the COVID crisis).

Additionally, we explored new embodied methodologies for gathering, sharing, or co-producing information. To explore feelings and address embodiments of identities, experiences, and knowledge, we incorporated the arts into our work (Figure 1). During the workshops, we introduced image theater, a tool within social theater and theater of the oppressed (Heras and Tàbara, 2014), using movement and creating body statues with one’s and others’ bodies. We also invited each participant to bring and share an object that represented their identity as a woman and livestock farmer. Workshops took place over 1–2 days and, in some instances, involved preparing and sharing one or more meals together, often with the women participants bringing contributions from their farms. The physical and tactile activities, sharing of meals, and informal exchanges, as well as stories and humor shared during the structured workshop time, created space for both participants and researchers to share our life histories,



fears, vulnerabilities, anxieties, and angers and learn about others' feelings. This sharing and learning occurred, not only through words but also through rational and cognitive experiences, as well as physical and emotional experiences. The use of artistic actions also shifted attention from acknowledging toward empowering through acting about the constructed collective consciousness. However, we also observed some limitations due to the short duration of the interaction. For researchers, facilitating these kinds of processes requires skill and familiarity, which are only achieved with time, sensitivity, and care.

In addition to using art and embodied methodologies in the workshops as a means of deepening relationships and data, we also used art to co-produce and share our findings. In the Pyrenean case in Catalonia, FR collaborated with a visual artist to share and discuss results with shepherdesses, resulting in the publication of a comic book, which resumes the process of the research and the main results, and the presentation of an exhibition of paintings of women's oral histories and photographs at local festivals. During the exhibitions, circles of women were organized to give local women the chance to meet and hear each other's voices explaining their own daily lives and their challenges. FR remembered: "All of them created a circle in the middle of the room to speak. Some of them just stood up around us. We spoke, we laughed, we cried together and then we danced and we ate the local cheese." Local women appreciated these co-production experiences as a space for telling

their stories through artistic means, as this quote shows: "She (FR) asked us if we agreed to communicate our experiences and reflections through humor and an easy readable comic format, and I doubted this was feasible, it seemed to me a big challenge but...look at it... it's here and it's so nice piece of art and we are the protagonists!" (Natàlia, Pyrenees).

Gatherings took place in different settings (Figure 2). While we tried to hold them in comfortable places that allowed for conviviality (see Section 4.3), this was not always possible. However, this allowed us to notice and reflect on the differences in the process between the case where the gathering was held over a weekend of coexistence in a leased vacation home, with women preparing and sharing home-made food and relaxed and intimate moments, or when the gathering was held in a conventional meeting room in a city center over a day with a lunch in a restaurant. Choosing, arranging, and observing the use of the physical spaces where interviews and gatherings took place and their influence on participants' and researchers' moods, attitudes, and comfort also influenced the outcomes of the process as a lived and embodied experience. We observed that food always played a very central and special role in the shared spaces, whether it was a lunch together with an interviewee at her home or a restaurant, mutual gifts exchanged as a form of gratitude, a shepherdess and cheese maker bringing her cheese to a public event, an incredibly diverse lunch with 10 women serving their





FIGURE 2

Images of workshops and meetings: meeting around food in Ronda (A); women circle during the exhibition in December 2019 in the Catalan Pyrenees (B). All women gave their informed consent for publishing their image.

own products and home-made food and displaying their pride in their gastronomic identities, or the relaxed atmosphere of sitting around a table in a restaurant and enjoying a special day being served the food without needing to prepare it themselves. Food, due to its sensual, visceral nature, has been considered a strategic place from which to begin to understand identity, difference, and power, but also a very central element in the process of self-care. Feminist geographers have called for a “visceral approach to food,” through which observing how the body offers a domain that makes room for the construction of political claims, i.e., the defense of a right to nutritious and healthy food access for all (Hayes-Conroy and Hayes-Conroy, 2008). Women farmers are ultimately food producers, so we argue that consciously incorporating a space for food in feminist research approaches opens up a significantly different space for the expression and exploration of identities, political messages, and overall embodiment.

### 4.3. Approaching different dimensions of an ethics of care

In our work, caring for the entire process and the relationships with participants along the dimensions of a care ethic, identified by Moriggi et al. (2020), inspired our research: caring about, caring for, care giving, care receiving, and caring with.

As mentioned before, all of us were engaged in long-term collaborative relationships with women pastoralists across our different study areas, especially via GeR or ramaderes.cat, and with women from the Pyrenees and Andalucía. The team aspires to support extensive livestock production overall and specifically women pastoralists in advancing their self-defined goals/agenda and increasing their visibility and empowerment (*caring about*, after Moriggi et al., 2020). We clarified upfront our explicit commitment to such advocacy in our initial visits and phone calls and our dual roles in science and activism (especially EOR and FR). As EOR remarks: “As a co-facilitator of GeR and having a

*personal relationship with several of the women, I frequently support them emotionally, with information they require, in advancing their objectives, in technicalities with social networks and communication, in organizing gathering and meetings, etc. However, I had not framed my support within a reciprocity relationship related to my research. The support started already beforehand. Research has been another way (from my position as academic) to support the common goals I share, as an activist, with women in pastoralism, agroecology and food sovereignty.”* Women pastoralists expressed their goals in the collaboration: “What we do (in extensive livestock management) is cardinal for the sustainability of life, but if there are no researchers like you that investigate, implement and communicate, the society will not be conscious of the value of our work.” (Sandra, Andalucía)

Paying attention to the needs and values at stake and the responsibility to meet them implies genuinely addressing co-production and knowledge pluralism at each step (*caring for*, after Moriggi et al., 2020). For us, it implied documenting and valuing women’s knowledge through their own life histories, valorizing their daily practices, engaging them as co-researchers to the extent possible by discussing with Ganaderas en Red and Ramaderes de Catalunya in initial contacts the aims and research questions, sharing interview transcripts, and involving them in discussions and interpretation of the preliminary results at the regional workshops (*care giving*, after Moriggi et al., 2020). We also ensured that the results were returned to the community in a form they could understand and use via workshops, webinars, and a report published in Spanish. We invited participants to be part of the artistic communication; for instance, during the campaign of dissemination of the comic book, women pastoralists from the Pyrenees presented it. Participants’ ability to engage deeply in co-authoring conventional research products like journal articles has been hindered by our geographical dispersion, language barriers (navigating between Spanish and English), and constraints on the women’s time as well as the time of the research team. However, to date, one participant has authored her own reflective section in a book chapter we wrote together (Cobo, 2022).

Women pastoralists reported that they often receive requests to participate in research studies, but the interaction with researchers and scientific knowledge is not always as respectful, horizontal, non-extractive, and two-way as it was in our projects: *“You take care of the power relations. In other research, we were contacted to be interviewed without transparency, without knowing clearly the goals and without receiving back the results. The last week we received a questionnaire of a sociologist on-line. She didn’t even call for explaining us. We didn’t answer, of course”* (Esther, Pyrenees).

When international travel resumed in 2022, MFG visited women in the Pyrenees study site, shared hard copies of the Spanish language report, listened to their updates and experiences, helped with farmwork, and explored how she could provide continued support for local initiatives and individual women (*care giving*). In different workshops, women recognized that they felt empowered by the research process in itself (*care receiving*), as we find in these quotes: *“I participated in this project and it was the first time that I opened my house, my farm, my daily life story (...). I felt very important”* (Pamela, Northeast). *“When she (FR) asked us about our story, I didn’t mind, but now I have realized the importance to collect our mundane everyday to emerge from the silence and to show the contributions we have in conserving and innovating”* (Sara, Pyrenees).

This activist commitment with pastoralist communities, and specifically with women, also extended beyond the locality and time of the study. Specifically, during the pandemic, FR and EOR were involved with women pastoralists as part of a feminist agroecological network to discuss problems, launch campaigns, participate in analyzing solutions for post-COVID measures, and create a space of mutual support among women researchers and farmers. Recently, FR and EOR challenged the uncomfortable public discussion among some academic antispeciesist feminists and agroecological feminists. We perceive that this conflict reflects the ongoing undervaluation of the rural world by an urban culture. Through an asymmetric power relationship, the urban elite normatively reproduces a public narrative that defines which experiences have value and who has the legitimate technical and scientific knowledge to make decisions. Specifically, in this instance, an urban, highly educated, and academically supported anti-speciesist and vegan feminist movement critiques and opposes women pastoralists, some of whom also self-identify as feminists. A new campaign in defense of rural feminism is currently supported by the active engagement of two of us (FR and EOR) (*care giving and receiving*, after Moriggi et al., 2020). To avoid speaking for the marginalized voices of women pastoralists, we invited them to be part of a community of ecofeminists in agroecology, and we participated in writing together some articles for dissemination.

Caring also included paying attention to researchers’ and partners’ physical needs, including health (*caring for and with*, after Moriggi et al., 2020). One aspect of this was the choice of locations for interviews and workshops. Interviews were often held over many hours (usually spending at least a day with each participant), combining formal and informal conversations, in the field accompanying herding or other farming tasks, or at their homes. The workshops were organized as collective spaces of fun, and several complementary activities (e.g., organization of artistic exhibitions and participation with common talks during local *ferias*

or specific congresses) became spaces for sharing life experiences, needs, opinions, or simply enjoying, dancing, and singing. All the spaces were facilitated to give legitimacy to all the voices, and we observed that giving such space and legitimacy to the “personal” is also a way to deconstruct the power relations of research, seen as the extraction of information. We observed that participants perceived the spaces of the research as self-care spaces, both in the case of interviews (e.g., for self-empowerment and acknowledgment as knowledge holders) and the workshops (e.g., as a “women space” where they are willing to share experiences with other women). However, we also discussed with participants the latent tension observed in our experiences as researchers between creating a caring space and time together with women participants and consuming energy and time that may add to their workload. In addition, we acknowledged the difficulties of maintaining the care process over long distances and times, especially during the pandemic, when the lockdown only permitted virtual calls. Virtual communications (especially Zoom) were a daily practice of researchers but demanded extra time from women farmers. However, some women participants appreciated staying in touch via asynchronous digital communication like WhatsApp, where they could respond or initiate chats on their own timeframe.

Additionally, on several occasions, researchers reflected with women on the risks and impacts assumed by some women to participate in the research. They left home to attend the workshops, being away from care duties and farm work for several days with “unknown” people. In patriarchal Spanish society, such absences can foment suspicion of partners, leading to family tensions and the possibility of domestic violence. Finally, women sometimes shared extremely sensitive information regarding their emotional and physical well-being and security during the interviews and workshops, including experiences of violence or disrespect from family or community members. On several occasions, we prioritized listening and empathizing over pursuing research objectives. However, as MFG remarks, *“we probably lacked tools and experience to handle such situations and outcomes, other than empathizing and supporting in the moment as facilitators.”* When in the final virtual meeting we asked women pastoralists how we can design our research for a genuine committed feminist approach, Sandra answered, *“We have to be mutually responsible and responsive, as you did, with sorority”* (Sandra, Andalucía).

Over the course of the process, we have also observed that the space of exchange and research has transformed into a space of trust, listening, and friendship with women (*caring with*, after Moriggi et al., 2020). As Moriggi et al. (2020) call this process of co-becoming, mutual learning, and change reciprocity. MFG says, *“many participants hosted me overnight, invited me to meals in their homes or a restaurant and contributed hours or days of their time to the research. I remain in touch with several of them via social media or whatsapp, and visit them when I am in the area, helping out with herding tasks when possible. With one such participant we discussed co-writing her own autoethnography of her experiences as a newcomer pastoralist and single woman in a very small traditional community. I also formed a special friendship with one of the older women, and make a point to visit her whenever I can. She seems to really appreciate these visits, which offer a respite from caring for her disabled spouse, and often talks non-stop for several hours.”*

*I appreciate her courage and intelligence, her generosity of time and spirit, and her candor.”*

Similarly, in her experience, FR remarks, *“I spent almost four years with local communities in the Pyrenees. I’ve shared with women pastoralists most of the time, accompanying and helping them in the activities, sharing spaces of socialization and collective meetings, such as Saturdays’ or Sundays’ meetings in the summer grasslands, when they climb to bring things at the summer shepherd/shepherdess, and to salt and take care of the sick animals. With some of the women I started a friendship, especially when we were linked with common interests and networks, such as meeting for trekking, artistic festival and local “ferias” participation or being part of social or civic movements. They probably changed their mind on the role and distance of a researcher and I changed my mind on how to do careful social research.”*

## 5. Final insights: does a feminist perspective reinforce transformation and emancipation in knowledge co-production processes, and how?

In this article, we refer to transformation as the attempt to create the conditions for a problem-solving partnership between social-ecological scientists and livestock managers focused on responding to the current challenges of environmental changes and systemic crises. Our experience has shown that co-production processes may be reinforced by feminist principles and practices, which support a paradigm shift in dominant systems, build equitable relationships, and deconstruct/reconstruct power relations and mental models of problems’ and possible solutions’ within an activist agenda. Despite the recognition of context-specific processes, we identify key spaces for pushing forward transformation and emancipation in co-production and some limitations.

The first key space for transformation is the practice of reflexivity to “become aware of, and to challenge underlined paradigms and hierarchies” (Staffa et al., 2022, p. 58). Throughout the research process, we maintained a continuous dialogue and reflection among the three of us, balancing intuition, previous experiences in participatory (action) research in practice, and struggles and learning with feminist theoretical frameworks. As a result of our reflective process, we first critically opened an intense theoretical debate (e.g., about our use of intersectionality and decolonial/postcolonial frameworks), especially focused on our choices of research (e.g., the universe of participants) and on how other voices might be silenced by this choice (e.g., immigrant women, racialized women, and disabled women). We shed light on our epistemic biases to understand how systems of domination such as racism, classism, and sexism may influence our research. Such awareness may be transformative within the same oppressions within the arena of Academia and beyond. Indeed, we also recognized our privileges as researchers in receiving academic and social acknowledgment and credit for the knowledge we produce, attention, and rewards that the participating communities barely receive. This reflexivity disrupts the authority and legitimacy

of science and seeks to counterbalance power disparities among researchers and participants. It also redefines relations and roles through the recognition that different knowledge systems and processes of knowledge production and circulation operate at the same time to analyze and respond to environmental changes. Moreover, following decolonial feminist claims for countering epistemic violence in research processes, we also recognized we should speak to and with, but not for our co-researchers, assuring their implication during and beyond the knowledge co-production process (Osinski, 2021).

The second key to transformation has been specially identified in committing to a feminist ethic of care. It implies both taking care of non-academic research partners and cultivating caring environments in academia through mutual support and effective collaboration (Mountz et al., 2015; Iniesta-Arandia et al., 2016). As suggested by other authors, care entails three scales: everyday practice during the research process, affective engagement, and ethical-political obligation (Staffa et al., 2022). The networks bring together women from different backgrounds, ages, origins, education, motivations, and aspirations (Fernández-Giménez et al., 2021). Listening to each other, eating together, sharing intimate experiences, and becoming colleagues of challenges helped to create among and with women pastoralists such collaborative partnership, and we reflected on that as researchers. Ethically informed practices include paying attention to the spaces, time, needs, and agendas of non-academic research partners, returning research results to participants, engaging them in the interpretation and dissemination of findings, and inviting them to co-author. Moreover, the current two-way commitment and support for activist research with women pastoralists may also signal an advance in transformative and emancipatory science.

Moreover, opening spaces for the expression of emotions and feelings increased the affective engagement for action. Empathy and compassion among researchers and partners’ concerns include how to connect with the experience of others and look after ourselves (Bondi, 2003; Jax et al., 2018). Learning from the daily barriers of women pastoralists within the livestock sector and society and their cooperation and self-care through physical and virtual spaces helped us reflect on our own barriers within neoliberal Academia. Indeed, if, as feminist political ecologists, we are committed to transforming the hierarchical power dynamics of knowledge production, we should, first of all, rethink our ethics within our scientific labs and collaborations. Committing time, developing a care ethics, and looking for space for relationship-building among us and with participants should be fundamental tenets of feminist research and slow scholarship that profoundly challenge the neoliberal academy’s demands for accountability, speediness, efficiency, and measurable and rankable outputs (Mountz et al., 2015; Caretta and Faria, 2019).

Introducing an ethics of care in transformative scholarship and empowerment processes also requires us to rethink research methods (e.g., visual tools, literary arts, and oral histories) to facilitate communication and include alternative voices and representations (e.g., Nightingale, 2003; Mollett and Faria, 2013; Coddington, 2015; Harris, 2015; Carey et al., 2016). Indeed, during the research process, we specifically reflected on storytelling, enabling partners to talk for themselves, and the power of feeling

with bodies and emotions. We worked with the arts as experiences and tools for filling the gaps between acknowledging the need for change and acting for change. Through embodied and arts-based processes and methods, we explored the intimate, mundane, and everyday lives of women pastoralists facing climate challenges, for instance (Ravera et al., 2022). These embodied and arts-based methodologies also opened a space of mutual trust for discussing identities, discrimination, sexism, conflicts, and, in some cases, violence (see also Foster, 2016).

Therefore, throughout our collaboration with women pastoralists, we recognize that there has been mutual empowerment and emancipation in the control of the knowledge production process. As researchers, we learned about the theories and practice of feminist research. However, interacting daily with women pastoralists confronts our theories and expands our reflections, and we feel now more empowered in planning and implementing feminist research and in defending, justifying, and explaining the need for and value of it, especially when sharing our work in conferences and scientific publications. For the women pastoralists, by participating in this research process, they gained deeper insights into research and academia, including learning about their rights as participants. In the case of *Ganaderas en Red* (GeR), our project contributed to increasing members' self-esteem, reinforcing the network, and clarifying the group's action plan. Moreover, recently, a research group with an animalist focus invited GeR members to participate in interviews. After several discussions between our team and GeR members, GeR participants looked for information about these researchers, their objectives, and the expected research outputs and decided not to participate due to their disagreement with the research focus. We also observed that now women from GeR are more often invited as presenters in applied research conferences, alongside academic researchers. For example, in a recent (October 2022) conference on extensive livestock production and climate change in Spain, MFG was invited as a keynote speaker along with a GeR member, and several other GeR members had prominent roles in various panels throughout the conference. When the five GeR members in attendance organized a group photo at the event, they asked MFG to join them, saying "you are one of us." In such small, everyday gestures of solidarity and belonging in historically academic research processes and spaces lies the groundwork for more equitable, inclusive, careful, and meaningful research and action partnerships.

Nevertheless, as suggested by Turnhout et al. (2020), we must ask whether the co-production process catalyzes transformations broader than the specific process, limited in time, and the number of individuals involved. Indeed, we experienced limitations in achieving broader transformative impacts. For example, we found that to be transformative, co-production processes must reach beyond the boundaries of specific funded research projects to engage with the wider political context. The academic spaces and time (e.g., the universities as spaces of knowledge and the deadlines of projects as temporal frames of processes), as well as the target of the messages/language (e.g., the use of English and the peer community as reviewers of research processes), remain dominated by a hierarchical dynamic of power. We observed that the ability to more deeply engage participants

was hindered by our geographical dispersion, constraints on women's time, the time of the research team, and the COVID-19 pandemic, which precluded almost all in-person encounters for several years and forced us to rely entirely on virtual interactions. Moreover, we realized that we have limitations in our ability to support ongoing collaborations with our participants and conflictive situations. For instance, women pastoralists' requests for support from interdisciplinary applied research in approaching the environmental challenges they currently face remain unanswered. Our findings have yet to be translated into policy. In particular, in Catalonia, women pastoralists perceived their increasing vulnerability in the face of wildfires and prolonged droughts, and they requested support to learn how to prevent, cope with, and adapt to such events, which we have not entirely yet managed to provide.

Finally, similarly to other authors (Staffa et al., 2022), we would also remark that the future challenges of transdisciplinary research and political ecology are not only to reflect on our own scientific identity and relations but also to push forward a fundamental organizational and institutional change in academia that may catalyze novel perspectives and emancipatory pathways and may enable changes for sustainable and equitable futures.

## Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

## Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

## Author contributions

FR coordinated the work and refined this final version. All authors performed the entire work, proposed the analysis, and wrote some parts of the manuscript.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships

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