

*Co-creating Knowledge
for Action with
Transhumant Herders
in Spain*



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YOLDA



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*Co-creating Knowledge
for Action with
Transhumant Herders
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MARÍA E. FERNÁNDEZ-GIMÉNEZ

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Colorado State University

EXECUTIVE SUMMARY

Transhumance is a form of mobile livestock husbandry in which domestic livestock herds are regularly and repeatedly moved between defined seasonal pasture areas. In Spain, transhumance has a long history, potentially dating back to the Neolithic. A number of works have documented historic transhumance practices and the ecosystem services associated with 21st century transhumance. Several gaps in knowledge remain, however, including documentation of present-day transhumant pastoralists' traditional knowledge in use and ethnographic accounts of the current reality of transhumance in practice, grounded in the lived experiences and voices of transhumant herders. This study aims to address these gaps by conducting participant observation of transhumant movements and in-depth interviews with current and former transhumant herders. The findings challenge the dominant narrative of the demise of transhumance in rural Spain, showing that transhumance remains a relevant and profitable practice in some regions. The knowledge that transhumant herders create and maintain through active use continues to develop and adapt in response to a dynamic social-ecological context. Despite continued relevance and use, transhumance faces significant challenges to long-term continuity. Following a short introductory chapter to provide context, the results are divided into 4 chapters as follows: chapter 2 transhumant knowledge in

use: case studies of transhumance in Jaen and the central Pyrenees; chapter 3 benefits, costs and challenges of contemporary transhumance; chapter 4 abandonment and revitalization of transhumance in the western Aragonese Pyrenees; and chapter 5 a preliminary economic analysis of transhumance. Key findings from each chapter are summarized below, concluding with recommendations for policy, practice and future research.

CHAPTER 2

TRANSHUMANT KNOWLEDGE IN USE

Based on participant observation on two complete transhumant journeys, I identified the following types of traditional knowledge in use: geographic knowledge of the transhumant route; ethnoecological and climatological knowledge, including plant names and uses, knowledge of plant communities/habitats, their ecology and value for livestock, wildlife identification and natural history, and weather patterns and prediction and climate trends; knowledge of animal behavior and husbandry, including herding skills, animal training and handling, animal selection and breeding, and veterinary knowledge; practical outdoor skills such as camping, cooking, fire making, etc.; and social skills needed to negotiate passage and pasture

access along the route. Some types of traditional knowledge remain essential and relevant (e.g. route knowledge, herding knowledge, weather and ecological knowledge), while others may be less relevant and fall into disuse as technologies change (e.g. traditional food preparation, plant medicinal use, burro packing). Some key types of transhumant knowledge were not observed directly, including both new knowledge of how to work with regulations and subsidies, and traditional knowledge of communal pasture governance and processing of animal products (e.g. cheese-making, leather craft). The case studies highlighted the growing importance of social skills to the continuation of transhumance, and pointed to a number of practical and institutional challenges, further developed in chapter 3.

CHAPTER 3

BENEFITS, COSTS AND CHALLENGES OF CONTEMPORARY TRANSHUMANCE.

Based on 42 in-depth interviews with current and past transhumant herders, and some non-transhumants, this chapter draws on herders' lived experience and voices to identify the main benefits of transhumance as perceived by those who practice(d) it, as well as the costs and challenges. Interviewees saw the primary benefits of transhumance as its relative profitability (low cost) and lower work load compared to semi-extensive production, better animal health (and lower veterinary costs), benefits to the environment ("cleaning" the mountain, seed dispersal, fuel reduction, organic fertilizer and non-chemical weed control), and maintaining important cultural heritage that contributes to rural vitality. Interestingly, neither quality food production nor adaptation to a variable or changing climate were mentioned as specific benefits. Participants identified the major costs of transhumance as family separations and logistics, and potentially animal productivity (primarily in reference to historic rather than current transhumant practices). Interviewees cited many challenges,

including obstacles specific to transhumance and others more general to extensive livestock production. Living and working conditions were the key historic challenge of transhumance that interviewees mentioned. Participants viewed the major current challenges specific to transhumance as poor conditions and access to *vías pecuarias* (stock driveways), lack of labor for transhumant moves, securing seasonal pastures (especially winter and spring), herbicide poisoning in *vías pecuarias*, and conflicts with landowners, government and other users (recreationists, hunters). Challenges that affect extensive livestock producers more generally included increasing regulatory complexity, bureaucracy, and uncertainty regarding subsidies; predation or threat of predation by wolves and bears; public perceptions of livestock, herders and transhumance; and perceived neglect of rural areas and extensive producers by government and feelings of political disempowerment

CHAPTER 4

TRANSHUMANCE ABANDONMENT AND REVITALIZATION IN THE ARAGONESE PYRENEES

This chapter explores in greater depth producers' motivations for abandoning transhumance in the 1980s, and the reasons for a more recent revitalization of the practice in the 2010s. Data are drawn from 27 interviews with herders from the Valles Occidentales conducted in 2010, and 7 interviews from 2018 with current transhumants in the same area. Results show that the main drivers of abandonment were social—herders' desire to live year-round with their families, coupled with the construction of new barns outside the village that made confined feeding possible during the winter. A secondary driver was the increasing scarcity and cost of winter pastures in the Ribera. Primary drivers of revitalization are the continued availability of low-cost, high quality summer pastures, increased availability and low cost of winter pastures, and development of technologies

that help overcome the barriers to being transhumant while maintaining family life. This case study challenges the dominant narrative that transhumance is a practice of the past without present-day relevance and viability. As such, it illustrates that pastoral mobility in this region remains an important adaptation to take advantage of varying forage availability over space and time (high mountains in summer, crop aftermath in winter), using a production system that is more profitable than enclosed feeding for part of the year. Challenges to continuity of transhumance in the region include poor conditions of droveroads, family logistics and changing gender roles, challenges to new incorporations and learning transhumance, uncertainty about subsidies and regulations, potential for increased predation from carnivores that are reintroduced or expanding their ranges naturally, and perceived low public respect for the herding profession. The future availability and cost of winter pastures could also influence the persistence of transhumance in the region.

CHAPTER 5

AN ECONOMIC ANALYSIS OF TRANSHUMANCE IN THE WESTERN VALLEYS OF THE ARAGONESE PYRENEES

I used data from seven detailed budgets of sheep operations from the valleys of Ansó, Hecho and the village of Novés, outside of Jaca, to create a representative “typical” base budget for a sheep operation in this region. I then used the data to create three alternative budgets for a semi-extensive farm that stable-feeds the herd in winter, transhumance on foot, and transhumance by truck, and compared the relative profitability of the three operation types under 3 herd sizes : 500 sheep, 1000 sheep, and 2000 sheep. I then used partial budget analysis to compare the relative profitability (or loss) of semi-extensive production compared to transhumance with trucks or to transhumance on foot, at each herd size. This initial analysis of relative profitability of sheep operations in the Valles Occidentales supports herders’ perceptions that

transhumance, and especially transhumance on foot, is more profitable than semi-extensive production, especially at larger herd sizes (1000 sheep or more), and when feed costs are high. Under these scenarios transhumance is more profitable, even when lambing rates are lower (120%) than typical lambing rates for semi-extensive operations (150%). When feed prices are high (worst case), the margin of profitability for transhumance is even higher, but when feed prices are at their lowest, transhumance is relatively less profitable than semi-extensive production.

RECOMMENDATIONS FOR POLICY AND OUTREACH

Many of the findings in this report are new to science but not to those working on behalf of extensive and transhumant livestock producers. The research results in this report suggest areas where policy reform or improved implementation of existing laws and policies is needed if the aim is to support viable transhumance into the 21st century. The following are some of the key policy and outreach recommendations based on the findings.

- 1.** Improve maintenance of existing *vías pecuarias* and management compatible with livestock passage. This includes brush removal, enforcement of legal widths of the *cañada* (penalize landowners that cultivate or fence in parts of the *cañada*), removal of physical barriers that block passage, provision of alternate routes when the main route has been appropriated for a paved road, and enforcement of regulations that prohibit herbicide use in the *vías pecuarias*.
- 2.** Consider national and/or regional legislation to protect the rights of transhumants beyond the existing law for *vías pecuarias*.
- 3.** Provide additional infrastructure to support transhumant livestock and herders such as corrals, watering troughs, camping facilities or *refugios* (shepherds’ huts), bathing and sanitation facilities (e.g. pit toilet).

4. Sensitize public service providers such as schools and health clinics to the situation of transhumant families. Identify models of family work-life consilience that support transhumance, including situations where one spouse works outside of the livestock operation.

5. Maintain European Union Common Agricultural Policy (EU CAP) supports for extensive livestock production, such as payments for use of remote and high nature values areas and improve ways that eligible areas are calculated to account for forage value of woodlands and grazable shrublands. Advocate for specific payments for transhumance on foot at the EU, national and/or regional levels.

6. Improve implementation of EU CAP to control abuses that lead to poor grazing management or harm animal welfare.

7. Raise public awareness of the benefits of transhumance for the environment; animal welfare and production of high-quality animal products; and maintenance of rural life, cultural landscapes, and traditional knowledge.

8. Facilitate constructive multi-stakeholder dialog and collaborative problem solving among transhumant and extensive producers and other key stakeholders such as government, environmental and animal rights organizations.

9. Provide professional development and peer-to-peer knowledge exchange for transhumant pastoralists and families.

10. Develop opportunities for new and first-generation herders to learn and take up transhumance via apprenticeship programs or an “*escuela de pastores*” (shepherd’s school) that focuses specifically on transhumance.

RECOMMENDATIONS FOR FURTHER RESEARCH

1. Conduct a deeper and more systematic examination of transhumant herders’ traditional

knowledge related to soil, plants and wildlife, especially species of conservation concern or prone to conflict with humans; climate and weather; ethnoveterinary knowledge; applied animal behavior (herding practices); and traditional processing of animal products.

2. Carry out in-depth analysis of changes in transhumant knowledge and practices among herders who continue to practice transhumance.

3. Examine the role of social relationships and social skills (as a dimension of TEK) in the evolution and maintenance of transhumance.

4. Explore the roles of women and evolving gender roles and social norms more broadly in maintaining, abandoning and transforming transhumance. Document successful strategies for family consilience and schooling in transhumant families.

5. Investigate communal pasture governance, changes in governance institutions over time, and their relationship to or impacts on transhumance.

6. Study how transhumance is learned and how transhumant TEK is transmitted within and across generations.

7. Research the drivers and incentives/facilitating factors to abandon, continue, or take up transhumance, historically and in the current time.

8. Undertake more rigorous economic analysis of transhumance on foot and by truck relative to semi-extensive production systems.

9. Develop an interactive budgeting tool to allow current and prospective producers to evaluate relative profitability of different production scenarios.

10. Examine the role of herder and transhumant identity in maintenance, abandonment and transformation of transhumance in the 21st century.



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Introduction

Since pastoralism emerged as a lifeway and economic system in the Neolithic, herd mobility has been a hallmark of sustainability, supported by pastoralists' nuanced ecological knowledge and the institutions and social relations that maintained access to diverse pastoral resources over space and time (Geddes 1983, Honeychurch 2014). Science increasingly recognizes the compatibility of mobile pastoralism with biodiversity conservation (Reid et al. 2014) and its provision of other ecosystem benefits, such as carbon stores, water supplies (Havstad et al. 2007), pollinators (Hevia et al. 2016), and cultural services like place identity, sacred spaces and traditional knowledge (Oteros-Rozas et al. 2014). Yet rangelands and pastoral people face myriad interacting threats, including climate and land use change, land fragmentation, degradation, sedentarization, out-migration, poverty, and political marginalization (Galvin 2009, Reid et al. 2014, Coppock et al. 2017), calling into question the sustainability of both pastoral lifeways and the ecosystems pastoralists use and steward. Traditional ecological knowledge (TEK) is both a cultural ecosystem service provided by mobile pastoralists, and an important cultural resource

that herders and others may draw upon as a source for innovation and adaptation to future changes (Fernandez-Gimenez and Estaque 2012).

Traditional ecological knowledge is the dynamic and evolving body of knowledge, specific to a particular people and place, that includes observations of biological and physical ecosystem elements; management practices, technology and skills; and cultural institutions, values and beliefs (Berkes 1999). TEK develops through direct experience living and working in a particular ecosystem and is culturally transmitted within communities and across generations. TEK is one way humans detect and respond to environmental change (Berkes et al. 2003, Kassam 2013), and is therefore vital to maintaining balanced or self-regulating feedbacks between ecosystems and social systems. Because pastoralist TEK is created and maintained through active use (Fernandez-Gimenez and Fillat Estaque 2012), when mobile pastoralists are unable to access droveroads, dispossessed of their lands, forced to settle or choose to move to urban areas, TEK may be lost (Tang and Gavin 2010, Davis 2016).

The value of pastoralist traditional knowledge for rangeland management (Fernandez-Gimenez 2000, Ghorbani et al. 2013), climate adaptation (Kassam 2009, Marin 2010), and ecological monitoring (Reed et al. 2008, Roba and Oba 2009), is increasingly recognized and reflected in the growing number of knowledge documentation studies (Knapp and Fernandez-Gimenez 2009, Kgosikoma et al. 2012, Molnar 2017). Yet documentation studies often extract and isolate biophysical observations from their cultural context and meaning (Cruikshank 2012).

Transhumance is an important form of pastoral mobility that offers potential economic, ecological, and animal health benefits, and is associated with a specific body of traditional knowledge (Oteros-Rozas et al. 2013b). Transhumance is a domestic livestock management practice, production system, and life-way involving repeated seasonal movements of herds, usually along elevational (up and down-slope) or latitudinal (north-south) gradients. Transhumance has a long history in Spain, potentially dating back to the Neolithic (Geddes 1983). Spain's transhumance reached its apex in the middle ages, with formal protection of the stock driveways (*vías pecuarias*) and the organization of the Mesta, an institution that protected and advocated for transhumant livestock producers' rights (Klein 1920). Although the Mesta was dismantled in the 19th century and formal protections of drover's rights weakened, the practice remained common until the mid-20th century, before a decline beginning in the 1970s (Gomez-Ibanez 1977). In the 1990s, following growing recognition of the importance of stock driveways for both biodiversity and cultural heritage, a law was passed protecting the *vías pecuarias* (Martin Casas 2003). A number of works have documented historic transhumance practices (Rodriguez Pascual 2001, Berdusán 2004) and the ecosystem services, including TEK, associated with 21st century transhumance (Fernandez-Gimenez and Estaque 2012, Oteros-Rozas et al. 2012, Oteros-Rozas et al. 2013a, Oteros-Rozas et al. 2013b, Oteros-Rozas et al. 2014). Several gaps in knowledge remain, however, including documentation of present-day transhumant pastoralists' traditional

knowledge in use and detailed ethnographic accounts of the current reality of transhumance in practice, grounded in the lived experience and voices of transhumant herders.

This study aims to address these gaps by conducting participant observation of transhumant movements and in-depth interviews with current and former transhumant herders. It began by asking two primary research questions: 1) What does contemporary transhumance look like through the herders' experiences and voices? And 2) What types of knowledge do transhumants need and use on their journeys? The exploration of these questions through participant observation (Chapter 2), led to further questions that built upon one another and are examined in Chapters 3-5. These are: 3) How do current and former transhumants perceive the benefits, costs and challenges of transhumance? 4) Why did herders in the Valles Occidentales of the Aragonese Pyrenees abandon transhumance in the 1980s, and resume again in the 2010s? and 5) Does empirical evidence support herders' perception that transhumance is a more profitable production system than semi-extensive livestock production?

The methods and associated findings are reported in 4 chapters as follows: chapter 2 towards an ethnography of transhumance: traditional knowledge in use; chapter 3 benefits, costs and challenges of contemporary transhumance; chapter 4 abandonment and revitalization of transhumance in the western Aragonese Pyrenees; and chapter 5 a preliminary economic analysis of transhumance.

Towards an Ethnography of 21st Century Transhumance: Traditional Knowledge in Use

INTRODUCTION

In some parts of Spain, long distance transhumance on foot has greatly diminished, although some operations continue to walk their flocks on shorter routes or transport their livestock over long distances in trucks. This chapter is concerned with long distance transhumance on foot—where animals walk and the shepherds/cowherds who accompany them make the journey foot or horseback. The transhumance journeys that are the sources for this ethnography took from 7-10 days. In other regions of Spain, notably the Conquense Drove Road, a few herders continue to make journeys on foot of up to a month (Oteros-Rozas et al. 2013b). Sometimes these journeys are broken into several stages with a stay of several months in intermediate pastures. Here I describe two journeys from two different regions and seasons by presenting each as a case study of transhumance, distilling from these cases the key types of traditional knowledge in use and challenges encountered, and suggesting areas for further investigation.

METHODS

These case studies are based on participant observation of two transhumant journeys, and formal and informal interviews and conversations with herders that took place during these trips. In addition to the two primary journeys reported, I also took part for in four other transhumant treks with four different herders for 1-2 days each. The herders whom I accompanied on the two longer journeys were identified based on existing research networks. One was an individual who had participated in an earlier study in 2010 and the other was a contact of another research collaborator who was known to take “outsiders” along on his trips. Both transhumants were contacted in advance and provided informed consent for the research, which they understood would involve observation and both formal and informal interviews. The research was approved under Colorado State University human subjects protocol 350.18H. As a participant observer I took part in all aspects of the trip together with the other herders and helpers, provided herding labor, contributed to shared meals, and slept, ate and worked alongside the other transhumants.

Throughout the case studies the participants are referred to by pseudonyms.

During each transhumant journey I took detailed field notes, and recorded with a GPS each midday and overnight stopping place. On the second journey, I recorded the entire trip as a GPS track. In the notes, I recorded the landscape and vegetation types as we traversed them; wildlife occurrences; infrastructure important to transhumance, such as signage for *vías pecuarias*, corrals and water troughs; crossings, obstacles or hazards; social interactions between transhumants and landowners, villagers and government officials; social interactions with hired shepherds and helpers; notable events along the trail; and stories told by the transhumants about specific places or past events. When feasible I informally interviewed the herders along the trail, asking questions to elicit their knowledge of plant names and uses, grazing and disturbance ecology, weather and climate, and animal husbandry and behavior, among other topics. I also took photographs and short video clips throughout both journeys. I conducted 1-2 formal audio-recorded interviews with each herder during the journeys.

Data analysis took place in four phases. First, immediately after each trip, I wrote narrative summaries of each journey, my observations and reflections. Second, I organized field notes into tables to facilitate comparison within and across each case study. The rows in each table represented each stop on the journey and the associated stretch of trail prior to that stop. The columns represented the attributes and events associated with that stretch of the trail organized into the following categories: place names, coordinates and elevation; vegetation, plant community, and wildlife observations; land ownership and access rights; infrastructure and *vías pecuarias*; crossings (roads, rivers, towns); challenges or events; and social interactions. Third, I drew from the narratives and the table to develop a common case structure based on major themes common to both journeys, and described each case using the structure, focusing on operation ownership and labor, terrain and ecological zones, traditional knowledge in use,

infrastructure and access, daily routine, social interactions and stories. Fourth, I used the case descriptions to identify the key types of knowledge in use that I observed during each journey. The cases and descriptions of knowledge in use are presented in the following results. In the discussion, I highlight key findings and emergent themes that lay the groundwork for the analyses presented in the following chapters.

Case Studies of Transhumance

Case 1

*Linares (Sierra Morena) to Pontones
(Sierra del Segura), Jaen, Andalucía*

JUNE 6-18, 2018



I arrive by train in Linares on the evening of June 6 and am picked up by shepherd/stockman Pablo M. (pseudonym). We drive directly to the *cortijo* or farmhouse that serves as headquarters for Pablo's wintering grounds in the oak woodlands and grasslands (*dehesa*) of the Sierra Morena region of Jaen province in Andalucía. Pablo is a strong, stocky, balding man nearing 50, who dresses in neat jeans and a collared oxford-type shirt most days. His portly physique belies his fitness, which becomes apparent during long days trailing the sheep up steep mountain terrain.

OWNERSHIP AND LABOR

Pablo's home village is in the mountains of the Sierra de Segura, the destination of our transhumant journey, where his sheep will spend the remainder of June until the end of November. He rents the *dehesa*, including the pastures and *cortijo*, for winter grazing. A hired herder lives in the once grand but rundown farmhouse and Pablo lives in a more modern rented house on a different farm nearby, where he also keeps a herd of cattle year-round. Pablo and his brother Timoteo (pseudonym) co-own a flock of 1000 Segureña ewes, which they move between the winter *dehesa* and the alpine summer pastures each year, ascending in June and descending in late November or early December, when snow begins to fall in the high country. Pablo and Timoteo's father was also a transhumant herder, though he migrated from the mountain village to an area near the coast in the province of Murcia, the opposite direction from Pablo's current route. Pablo, Timoteo's senior by 8 years, has been herding since he left school at 13. At age 27, following his father's death, Pablo decided to resume the tradition of transhumance. For several years, he wintered at a point that is halfway to his current winter pastures, and later when he secured the lease near Linares, he began to make the longer move twice per year. Although Pablo comes from a livestock-rearing family, with transhumant roots, he learned his specific transhumant route and trail skills not from his father, but rather from an older family

friend from the mountain village, whom he accompanied on a journey before he took his own sheep.

Pablo's hired shepherd Aurelio (pseudonym) is a Spaniard with little formal education, who has worked in agriculture all his life. Aurelio is slim and long-legged with a ground-covering stride, fond of sheep, and very fond of wine. A kind and knowledgeable man, Aurelio prefers not to talk with me in front of his quick-tempered boss. At the end of the trip, Aurelio gives his notice and Pablo seeks another herder to take his place.

Although Pablo and Timoteo co-own the herd, Pablo is clearly the leader of the trip who gives orders to the rest of us. Pablo, Aurelio and I walk or ride horseback with the sheep all day every day while Timoteo drives the pick-up and trailer that carry our food, water, cooking gear, packs, sleeping bags, extra dogs and tired or lame sheep. In addition to the 1100 sheep, we bring 5-6 herding dogs, two mastifs (guard dogs), and three surefooted riding mares. Timoteo's main role is camp-tender, responsible for cooking and cleaning, loading and unloading gear, and feeding the dogs. He also waits for us at highway crossings, dressed in a fluorescent vest, to stop the traffic while we pass.

The nights of June 6 and 7 I sleep in my sleeping bag on an old mattress in the entry hall of the dimly lit and dusty *cortijo* together with three other visitors. June 7 and the morning of June 8 are dedicated to preparations for the trip: shopping for and loading the food, fixing truck and trailer, gathering the sheep from distant pastures, and strapping the traditional large bells (*cañones*) to the goats' necks. The *cortijo's* elderly owner comes to bid his tenant farewell for the season. After a last-minute delay due to a flat tire, we finally set out after lunch on June 8.

TERRAIN AND ECOLOGICAL ZONES

The 10-day route takes us first through rolling hills of *dehesas*, interspersed with native Mediterranean mountain shrub vegetation



Figure 1 Gathering sheep in dehesa landscape



Figure 2 Montes mediterraneos



Figure 3 Pine forest Sierra del Segura



Figure 4 Olive groves



Figure 5 Calar subalpine calcareous grasslands



Figure 6 Marker (*mojon*) for *via pecuaria* fenced into a farmer's field



Figure 7 *Vía pecuaria* replaced by a paved highway



Figure 8 Gully erosion on the trail

and occasional cultivated fields of grain (days 1-3) (Fig 2). The first night we camp between abandoned greenhouses owned by a local municipality and pen the sheep in one of the unused structures. Before we arrive at the campsite, we pass along the edge of a large field of grain, and a police car stops Pablo to inform him that he has been denounced by a neighboring landowner for letting his sheep stray into the field.

So begins the constant battle of our journey to keep the sheep out of cultivated fields and olive groves. Day 4 we reach Sierra Morena and briefly climb into pine forests (Fig 3) before descending back into the *dehesa*, mediterranean monte, and finally olive groves (Fig 4). We traverse olive groves for the better part of days 5 and 6, before reaching the Sierra del Segura and beginning our ascent through more pine forests (days 7 & 8)(Fig 3) until we reach the zone of calcareous alpine terrain ("*calar*") on day 9 and climb past the village of Pontones to our final destination of abundant subalpine grasslands (Fig 5) interspersed among pine forests with a rich herbaceous understory.

TRADITIONAL KNOWLEDGE IN USE

Both Pablo and Aurelio are knowledgeable about plant names, properties and traditional uses. They identify a variety of plants by name along the route including most of the dominant shrubs in the areas of *monte mediterraneo* (Mediterranean mountain vegetation type) and in the higher mountains later in the trip. Aurelio also identifies a number of grasses and herbs. The pace of the trip did not allow for a thorough or formal inventory of plant knowledge, but Table 1 lists the main species the herders identify, where they identify them, and the uses they mention.

In addition to knowledge of the food, forage and medicinal values and other properties of various plants and habitats, the transhumants demonstrate knowledge of both wild and domestic animals. Knowledge of wildlife includes

the ability to spot species visually or via sound (for certain bird species), and knowledge of their behavior. One day Pablo spends a good 30 minutes stalking and capturing several juvenile partridges, which he keeps in a bucket. He has someone pick them up from our next camping spot and take them to a warmer place. His idea is to raise and sell them, as they are apparently valuable. He acknowledges that capturing them is illegal. In addition to extensive knowledge of sheep breeding, husbandry and behavior, Pablo also has a strong interest in horses and is a skilled horseman and horse trainer. He appears less interested in, and is apparently less skilled, in working with herding dogs.

INFRASTRUCTURE AND ACCESS ALONG THE ROUTE

The route we follow coincides partially with the Real Conquense Cañada, and its tributaries. Portions of the trail are clearly marked with posts that delineate the officially designated width (which should be 90 *varas* or 75 meters for a *cañada*). Even where these posts are present, they have in places been fenced into farmers' fields (Fig 6), reducing the available area for the herd to graze and move along. In other places the *cañada* has been replaced by a paved road or highway, and in some stretches, we drive the sheep for several km along a highway, where it coincides the official *cañada* (Fig 7) and there is no viable off-highway alternative. The first time this occurs, I keep looking nervously behind me as the cars pile up. Pablo says, "*I don't care if it's the king in the car behind us: transhumants have the right of way along this cañada and everyone else can wait their turn.*" In contrast to the stretches where the *cañada* has been converted to a highway, along others it is so uncared for that a profusion of spiny shrubs render the historic official route unpassable and the transhumants have coopted a nearby firebreak or forest two-track into service as a drove road. Some of these makeshift trails are rough and dangerous with poor, loose footing on steep slopes, a peril to horses and people, on one hand, and an erosion hazard on the other. Accelerated

Table 1 Plants and their uses named by herders during transhumance from Linares to Pontones. Because plant specimens were not collected, scientific names have not been verified and are based on on-line searches using the vernacular names

Day	Day/Habitat	Common Name	Scientific name	Life form	Use mentioned
1	Monte mediterraneo	Jara negra	<i>Cistus monspeliensis</i>	Shrub	
1	Monte mediterraneo	Jaguarzo	<i>Cistus spp.</i> or <i>Halimium halimifolium</i>	Shrub	
1	Monte mediterraneo	Gamón	<i>Asphodelus spp.</i>	Herb	
1	Monte mediterraneo	Toro riesco Torobizco	<i>Phillyrea angustifolia ?</i>	Shrub	Used to treat diarrhea in baby goats
1	Monte mediterraneo	Lentisco	<i>Pistacia lentiscus</i>	Shrub	
1	Monte mediterraneo	Linterno		Shrub	
1	Monte mediterraneo	Retama	<i>Retama Sphaerocarpa</i>	Shrub	
1	Monte mediterraneo	Mejora	<i>Origanum majorana?</i>	Herb	
1	Monte mediterraneo	Tomillo	<i>Thymus spp.</i>	Herb	
1	Monte mediterraneo	Lavanda	<i>Lavandula spp.</i>	Herb	
1	Monte mediterraneo	Manzanilla	<i>Chamaemelum nobile? Santolina spp.?</i>	Herb	
3	Dehesa	Chupamiel	<i>Anchusa undulata</i>	Herb	
3	Dehesa	Barsanto		Grass	
3	Dehesa	Vallico	<i>Neoschischkinia elegans</i> or <i>N. nebulosa</i>	Grass	
3	Dehesa	Avena loca	<i>Avena sterilis</i> or <i>A. fatua</i>	Grass	
3	Dehesa	Triguera	<i>Piptatherum</i> or <i>Hyparrhenia spp.</i>	Grass	

Day	Day/Habitat	Common Name	Scientific name	Life form	Use mentioned
3	Dehesa	Espigilla		Grass	
3	Dehesa	Trébol	<i>Trifolium spp.</i>	Herb	
3	Dehesa	Carretón	<i>Medicago spp.</i>	Herb	
3	Dehesa	Adelfa o balberde	<i>Nerium oleander</i>	Shrub	Toxic
3	Dehesa	Cardus	<i>Asteraceae family</i>	Herb	(Thistle) down used as fire starter
3	Dehesa	Follo de lobo		Mushroom	Puff ball—dried spores cure wounds
3	Pine forest	Enebro	<i>Juniperus (communis?)</i>	Tree	
4	Pine forest	Asparaguare		Tree	
4	Pine forest	Ballestra		Tree	
4	Pine forest	Sabina	<i>Juniperus (sabina?)</i>	Tree	
4	Pine forest	Madroño	<i>Arbutus unedo</i>	Tree	Fruits are edible but psycho-active (make you drunk/high)
4	Pine forest	Romero	<i>Rosemarinus spp.</i>	Shrub	
4	Pine forest	Cardo setero	<i>Eryngium campestre</i>	Herb	Thistle. If you peel the stem and keep it in your pocket, prevents blisters.
10	High elevation meadows	Cojin de la monja	<i>Erinacea anthyllis</i>	Shrub	
10	Calar				Calar is a habitat type characterized by calcareous rocks and soils. AF describes the vegetation as "Sweet grass. Sparse but more nutritious. Goats eat shrubs and sheep eat the grass."

erosion is clearly evident on some stretches (Fig 8), although neither the danger nor the soil damage seem to concern Pablo.

Resting, grazing and sleeping places for both animals and people are essential drove road infrastructure, but are sorely lacking along this route. Of the 20 or so places we stop to eat or sleep, only three of them have rudimentary facilities to support transhumance: a fenced enclosure to pen the sheep for the night and a nearby water source for animals (though not for humans). No stopping place offers shelter or comfort facilities for people, and the herders sometimes sleep on the edge of the tarmac road (Fig 9). This makes me so nervous that I climb up steep terraces into an olive grove to avoid the possibility of being run over by a car as I sleep. Pablo does not believe in portable electric fences, so penning the sheep each night is an exercise in creativity. The greenhouses the first night are one example. Another night we use “found” wire to cordon off two ends of a stretch of dirt road between fenced fields. Other nights the sheep are let into private *dehesas* to graze, sometimes with the explicit or, more often, tacit consent of a foreman or manager, and other times on the sly. Once the sheep are put into the corral of an unoccupied private estate, which Pablo also breaks into to take a shower. We spend only one night indoors, when we pass through Pablo and Timoteo’s home village of Pontones on day 9. There we take a shower and eat a meal with their elderly mother, whose bedroom I share that night, sleeping in a spare single bed across from her “*cama matrimonio*,” (double bed) while Aurelio and another visitor sleep in the living/dining room and Pablo and Timoteo in their childhood bedrooms. Other bathing opportunities during the 11 days are a dip in a muddy river at midday on day 4, a shower in a warehouse on day 6, and a swim in a reservoir on day 8.

As alluded to above, forage for grazing the sheep along the trail is an essential resource if the sheep are to maintain their condition or gain weight along the trail. When the official *cañada* is maintained at its full width (no encroachment from adjacent fields) and properly “cleaned” of

brush, it provides sufficient grazing for the herd along the way. However, as these conditions often are not maintained, the herder must keep an eye out for opportunities to stop and let the sheep graze for 30-60 minutes at a time. Most days the midday stop provides forage as well as shady resting spots for the animals. Access to many of these spots is open if they are part of the official *cañada* or adjacent publically managed lands held by the local government (*ayuntamiento o municipio*) or managed as a natural park. However, some days the only stopping place is a roadside with little area between a fenced field and the pavement.

DAILY ROUTINE

The general rhythm of days on the trail is to rise at 6 am, eat a quick breakfast of packaged sweet rolls, fruit and coffee, pack up and saddle the horses, and hit the trail shortly after sunrise around 7 am. We walk 3-5 hours in the morning, and stop between 10:30 am - 12:00 pm for lunch. Timoteo, the camp tender, arrives at the lunch spot before the sheep, and prepares to cook a hot midday meal. The trailer carries a folding table and chairs, and we eat a hot meal every mid-day, followed by a lengthy siesta on the bare ground. While the people eat and sleep, the animals eat graze and rest. When the heat of the day is waning we start up again, between 4:30-7:00 pm, and walk for another 3-5 hours, arriving at our evening campsite at 9-10 pm just before or at sunset. Pablo estimates distances and times of arrival with remarkable precision. Arrival is followed by chores (feeding the dogs, staking out the horses, setting up camp) and by supper (usually a light cold meal). We usually go to bed around midnight (12:00 am). The herders all sleep in the open air (no tents), Pablo and Aurelio on regular mattresses under wool blankets and Timoteo on a camp cot in a sleeping bag. I sleep in a sleeping bag in a small tent on a lightweight inflatable backpacking mattress. On the one night of rain, Timoteo rigs a tarp under which he cooks and sleeps and we all eat.



Figure 9 Camping on a paved road due to lack of camping/resting areas along *vía pecuaria*.

SOCIAL INTERACTIONS

On seven of the ten days, Pablo interacts with people we meet along the trail. With the exception of the police stop on day 1, most interactions are with friends or acquaintances. The first three and last two days have the highest frequency and intensity of face-to-face social interactions, likely reflecting the longer time that Pablo spends at either end of the transhumance route, and the connections to family, neighbors and friends there. Interactions range from casual and short conversations with acquaintances and strangers, to much more lengthy and involved interactions with close friends, long-term acquaintances or allies. Most are overall positive interactions in which the contacts provide information, physical or logistical help (including access to pasture or resting places), or conversation and companionship. For example, Pablo's close friend Jaime (pseudonym) tends Pablo's cattle while he is away, and offers to lend me his saddle bags for use on the trip when he observes that I lack a proper way to carry my water, snacks and essentials on the trail. Another long-term acquaintance is the property manager of Finca del Corcho, where we spend the second night. Pablo reinforces this relationship by inviting the managers' three sons and grandson to join our evening meal, and sells a handsome filly to the grandson for 100 Euros. One of the sons joins us on horseback for the morning stretch of day 3.

A few interactions are more negative, including the interaction with local police when a landowner reports the sheep trespassing in their crops. The second slightly negative interaction occurs with a property manager for a large *dehesa* estate. We trail the sheep through part of the estate and leave them overnight in one fenced pasture, camping on the roadside next to the pasture. The manager concurs that the transhumant has a right to cross their land on the drove road but makes clear he prefers to be notified in advance of the plan to spend the night. Pablo dismisses the request saying, "How could I notify him if I don't have his phone number?"

An interesting interaction occurs when, on day 3, another prominent transhumant livestock owner stops by our lunch resting spot to negotiate with Pablo about where each of the herds will spend the night. This individual is a prominent stockwoman with a large transhumant herd of bullfighting cattle (*toros bravos*). She claims the camping spot that Pablo plans to use as it is more suitable for corralling the cattle, and wants to go first along the drove road in the morning. Pablo agrees to camp further along the road, but does not agree to let the cattle go first in the morning. We rise early on day 4 and move the sheep quickly for a few hours until we pass the turn-off where the cattle route diverges towards Teruel and we continue on towards Pontones. This interaction points to the competition and necessary coordination between transhumant herders using the same route.

Overall, Pablo's "outlaw" attitude affects his interactions with others; he doesn't believe in asking for permission or forgiveness. He jokingly refers to himself and his friends from the Sierra del Segura as the "*delinquentes de la sierra*" (the delinquents of the mountains). When we spend the night on one property managed by an acquaintance, his mare breaks a valve in a watering trough the next morning as we are leaving. Rather than fix it or notify them, he says, "*it's for them to fix,*" and moves on.

One final distinctive aspect of Pablo's social interactions is his publicity-seeking behavior. For example, shortly after I arrive at the *cortijo* near Linares a team of filmmakers arrives. The previous fall, they accompanied Pablo on his entire trek, and are making a documentary film about him. They come to record a few follow up interviews and the departure to summer pastures. In another example, on day 5, Pablo arranges for a TV news crew from Canal Sur to meet us at the midday stopping place, where they film an interview with Pablo. To Pablo, the purpose of these actions is not self-promotion but rather public education about the practice of transhumance. His openness to taking curious travelers and researchers along on his journeys stems from the same motivation.

STORIES

Pablo often recounts stories of past events that occurred at certain points along the route, or the significance of particular places that we pass. These stories often relate to Pablo's history, identity or challenges as a transhumant. For example, on day 1 Pablo points out the place where he suffered heat exhaustion and was transported to the hospital for rehydration. On day 8 he tells the story of when he first started herding on his own and spent the winter near the reservoir where we stop for lunch. The other major theme of the stories is loss of access to or encroachments on the *vía pecuaria*. On day 4 he recounts how other transhumants were persuaded to allow a large landowner to build a fence across the drove road with assurances that they would have continued access, but now access has been withdrawn and the route is no longer accessible. Similarly, on day 10 he points out illegal fences put up by "lazy herders" in the communal mountain pastures.

Case Studies of Transhumance

Case 2

Ansó to Uncastillo, Huesca, Aragón

OCTOBER 16-21, 2018



OWNERSHIP AND LABOR

At 44, Manolo (pseudonym) is in his prime as a transhumant shepherd. A slim, strong and extremely energetic man, he often starts his day at 3 am and doesn't quit until 10 or 11 at night. I have known Manolo since I first interviewed him in 2010 and took part in a single day of the fall transhumant journey. In 2018, I join for nearly the entire route (missing only the first day of descent from the alpine summer and early autumn pastures). He is the younger of two children and the only son of a well-known transhumant stockman from the famed sheep-raising village of Ansó, in the Aragonese Pyrenees, bordering the province of Navarra. Manolo has loved sheep since childhood, when he spent as much time as possible with his father in the mountains. His mother hoped he might become a priest, but a perceptive aunt, observing the small boy playing at building toy corrals, astutely surmised that he was bound to be a different sort of *pastor* (pastor means shepherd in Spanish). To please his parents and maintain all his options open, he completed his formal schooling (Bachiller) and additional vocational training. After his father's retirement, Manolo sold most of the family's sheep and began to work as a truck driver. But after 6 months he returned, bought back the flock and has dedicated himself to his sheep ever since. Since his father suffered a cardiac event that left him partially paralyzed and in a wheelchair, Manolo has managed the herd on his own. He has grown to the flock to its current size of roughly 2700 sheep and ~100 goats. He keeps several well-tended and obedient herding dogs (shepherds) and no mastiffs. He employs a hired Moroccan farmhand, Ahmed (pseudonym), who helps primarily with lambing, while Manolo prefers to do the day to day shepherding in the mountains and on the transhumant trail. Manolo leads the transhumant trek with help from an assortment of local and more distant friends, most of whom are not herders. When I join the trek in 2010, the other helpers include Manolo's cousin who works as a sheep shearer, a young woman who works at the mountain hostel near the summer pastures, and two researchers (including me) from the nearby scientific institute. In 2018, the helpers include a longtime



Figure 10 Transhumance route from Zuriza to Uncastillo. Total of 112 km, averaging 18.6 km per day.

friend and the same two researchers, one of whom became an informal apprentice to Manolo in 2016. Several other friends or acquaintances join the trek for a day.

The division of labor on Manolo's transhumance is more informal than in the case from Jaen. Manolo gives instructions to the volunteer helpers, who move the animals. Most are already very familiar with the route, having walked it many times before. Manolo, Ahmed or one of the helpers drives the truck and trailer behind the herd. All participants contribute food that they purchase and cook. One other helper and I sleep with the sheep all nights, and Manolo and the other helper join on the last 2 nights.

TERRAIN AND ECOLOGICAL ZONES

The trail from Zuriza to Uncastillo (Fig 10) begins in the lower alpine pastures, winds on narrow paved roads through pine and beech forest to the village of Ansó (day 1) and then past the village of Fago through oak forests (Fig 11) and up onto an open meadow called Forcála (Fig 12) (day 2). From Forcála the *cañada* descends through oak forests to cultivated plains, over a



Figure 11 Pine forest between Fago and Forcala



Figure 12 Meadow at Fórcala, overnight stop on Day 2. Signs indicate *cabañera*.



Figure 13 Traversing shale hills (*margas*) near Berdún



Figure 14 Shepherds' refugio provides shelter from rain during midday stop on day



Figure 15 Mixed dehesa and cropland landscape near Uncastillo where the flock will spend the winter.



Figure 16 Manolo rests while watching his flock in the high Pyrenees, June 2018.

steep and treacherous series of shale hills (Fig 13), through the village of Martés to a plateau of cultivated fields (day 3). On day 4 the herd leaves the paved road and winds up and down through shrub-invaded hillsides and pine savannah to the remote village of Longás, where we sleep the night on the floor of a barn, protected from the rain. From Longás we continue on up similar rugged, shrub-covered slopes without a clear path until we reach the midday resting spot with a small shepherd's refuge (Fig 14). In the afternoon we continue on through similar landscapes to our sleeping spot in another shepherd's refuge (day 5). The final day we transition from a shrub and pine dominated landscape, towards a more open oak savanna/*dehesa* landscape near Uncastillo (day 6) (Fig 15).

TRADITIONAL KNOWLEDGE IN USE

Manolo is less knowledgeable about individual plant species than Pablo, but he is extremely knowledgeable about terrain and pasture qualities, route finding, weather and climate, sheep behavior and herding skills, and dog handling. For example, during one day of participant observation on June 22, 2018, I observe Manolo's knowledge in use over the course of a long day of herding just after the summer solstice. The day is sunny, Manolo releases the sheep from the electric fence pen at 10:30 am, and we begin to follow them upward into a high valley. We continue to follow the sheep in a broad circuit until they return to the pen at about 7:30 pm. Throughout this time, Manolo never actively herds the sheep or sends out the dog. Rather, he predicts to me exactly where the flock will go, and then we follow them. The sheep behave exactly as he predicts. They periodically stop, spread out and graze in particular spots before moving on, and Manolo takes these opportunities to eat from his knapsack or nap in the grass (Fig 16).

We discuss the weather and Manolo describes the cold, wet spring that has delayed grass growth in the mountains; the typical summer weather patterns (e.g. wind from the north

brings the fog in from France); and how one day of rain per week is ideal for summer pasture growth.

The daily herding pattern varies depending on the weather. On fine, sunny days like the 22nd, the sheep wander into the high passes in their grazing circuits. When it is raining, they stay lower in the valley. It is best to let the sheep out of the pen after the dew/moisture on the plants has dried (mid-morning) according to Manolo. Sheep prefer the *hierba fina* (thin grass) and the leaves, not stems, of grasses.

On this day and another when I accompany him, June 30, Manolo keeps a running commentary on the terrain, place names, and historical and archeological sites. He points out every spring or water source with clean drinking water for human consumption, and notes the best trails for people and animals, commenting on the poor route choice for the official marked GR11 hiking trail. He discusses various hiking and grazing routes that we can observe from our vantage points, estimating the time it takes to walk from one point to another.

We observe various wildlife or wildlife signs, including both *quabrantahuesos* (*Gypaetus barbatus* or Bearded Vulture) and regular vultures. Manolo instructs me on how to distinguish the birds based on the shapes of their tails. We also see ravens, alimoche (*Neophron percnopterus* or Egyptian Vulture), marmots (*Marmota marmota*) and sign of *javalí* (*Sus scrofa* or Wild Boar). On June 30, when he is moving his sheep to the high summer grazing lands, Manolo spots 4 *sarrío* (*Rupicapra rupicapra* or Chamois), which his other helper mistook for sheep left behind.

INFRASTRUCTURE AND ACCESS

The *via pecuaria* that Manolo follows is the same that his father and grandfather used before him, although there are some stretches of the original via that have become too overgrown to follow and necessitate deviations. Some of the trail

follows paved roads, forest “*pistas*” (dirt roads), and firebreaks, and sometimes the trail is rough and barely distinguishable through shrubby hillsides. The official *cañada* is only marked in a few places and I cannot tell when we were on or off of it, except when Manolo tells me so. As in Jaen, the resting and sleeping places that Manolo uses are customary spots where he stops on each trip. In most cases, the rights to use the places that he stops to graze, rest or overnight the sheep are the “*derechos de cabañera*” or drover’s rights inherent in the right to use the road. Most of the grazing and overnight spots are communal or public, held by the administration of a particular town. Sometimes these areas are leased to other herders for seasonal grazing, but the transhumants have rights to graze as part of their passage on the *via pecuaria*. In one location (day 2, in Fago), Manolo owns private fields adjoining the village, where the sheep graze for an hour or so during a morning stop. Unlike Jaen, only a few stretches of this *cabañera* traverse private croplands, reducing the effort needed to keep sheep out of sown fields. In each overnight spot, Manolo uses portable electric fence to contain the flock overnight. Two of the five nights we sleep in shelters—one a privately-owned barn alongside the *cabañera*, where we stay at the invitation of the owner, the other a public shepherd’s refuge owned by the municipality of Louesia.

DAILY ROUTINE

Because this trip is in the fall, the days are shorter and the overall rhythm of the trail is different from that of the summer transhumance in Jaen. Most days we rise before sunrise, around 6:30 or 7:00 am and are on the trail by 7:45 or 8:00 as the sun is rising. The first 3 days, one helper and I sleep with the sheep and the others arrive at 7:30. Manolo has a reputation of arriving 20 minutes before the time he says he will. The daily routine depends in part on where during the day there is good grazing for the sheep. Typically, we walk for 3-4 hours before the first stop. This also gives the grass a chance to dry before the sheep graze. Around mid-day we stop for 1-2

hours, or occasionally longer, to eat and let the sheep graze. Often we have a shorter mid-morning stop of 20-30 minutes for a snack. The mid-day meals are informal and eaten cold. All the shepherds and helpers contribute something to share—cheese, ham, bread, chocolate. On the first day one helper offers some cold left-overs like breaded cutlets. On some days Manolo’s girlfriend packs a tortilla *española* (hearty Spanish omelet made of eggs and potatoes). We usually eat sitting on the side of the trail in the grass, but on one day there is a small shepherd’s refuge with a bench and a table. After the mid-day rest we walk again for another 3-5 hours until 6 or 7 pm. We arrive and pen the sheep before sunset. The evening meal is usually another picnic. One day, we are invited to eat at the local bar (in Longás) and another evening we are hosted for dinner in a hunter’s cabin.

SOCIAL INTERACTIONS

Manolo has a different approach to social interactions along the trail than Pablo in Jaen. He is a sociable man, despite the long hours he spends alone with his sheep in the mountains. He recognizes the importance of keeping good relationships with landowners, villagers and government officials along the trail, and enjoys these interactions. Manolo goes out of his way to cultivate relationships with people, stopping to talk and accept hospitality. In two of the villages we traversed, we are met by a welcoming committee bearing baskets of snacks and beverages. At noon on day 2 we stop in the hamlet of Fago, while the sheep graze Manolo’s private pastures, and two elderly women meet us at the town picnic table with coffee, cake and many questions. The evening we arrive in the village of Longás, a group of villagers greets us with a *tortilla española* (Spanish omelet), a freshly baked pie, beer and wine. One of the older men in the village later invites us all to supper in the town bar. In the morning, before we leave, Susana (pseudonym), the widow who owns the barn where we sleep, brings us breakfast and Manolo gives two goat kids to a young couple, of new rurals or “*neo-rurales*,” who

have recently moved to the village and baked the pie from the previous evening's welcome party. Manolo explains that the gift is a gesture of good will to the village in general. Susana says she has known Manolo since he was a child and his father before him camped in the same spot. Later along the trail, near the town of Louesia, we are greeted by another friend, Fidel (pseudonym), who owns a hunting cabin, and invites us to dinner at the lodge with his wife and the hunters who are staying there.

In addition to these types of interactions, Manolo also talks to recreationists and other stockmen we meet along the way. One day at lunch a group of ATVs roars by our resting spot and Manolo flags them down to ask the riders to go slowly and more quietly past the sheep. Another day we cross paths with a horse herder from Navarra who has leased the grazing in the mountains we are traversing and is moving his horses up the trail we are coming down. The men politely discuss how to orchestrate the passage without disturbing the sheep too much.

In June, when I accompany Manolo in moving the sheep to summer pastures, I observe him negotiating with several other herders as they each vie to turn out their sheep at the earliest possible time without violating local rules that set the opening date of the high mountain grazing. Although privately he complains about other herders cheating, publically he treats them with friendly respect.

STORIES

Manolo's stories often take the form of warnings. In June he takes care to point out a particular place where rain rapidly concentrates during summer storms, creating an impassable torrent in the creek. He recounts how one year a flock was carried away by the deluge. He ends by advising that if clouds are gathering it is best to cross the creek soon or people and stock may be trapped on the wrong side, and never to try to cross the creek when it is running high. On the fall transhumance, he notes a place where the

heavy rains of spring 2018 caused a mudslide that obliterated the drove road for several days. He says it was the most frightening event he has ever witnessed on the trail and that they are lucky not to have been hit directly by it. Other stories recount human interactions among his helpers or even with strangers. One year he was moving the sheep shorthanded and asked a group of skinny-dipping hippies for help navigating a tricky spot in the trail.

SYNTHESIS OF KNOWLEDGE TYPES

Participant observation on these two transhumant journeys, and four other one- or two-day observations with four other transhumants on their seasonal treks, revealed 8 primary types of traditional knowledge that transhumants use during their journeys on foot.

The most basic and critical knowledge for a transhumant is detailed **geographic knowledge of the transhumant route**. Some transhumants, like Manolo, learn the route from their parents (mainly fathers) and follow the same *vías pecuarias* that their families have used for generations. Others, like Pablo, learn from other herders, and some find their way alone. It is not unusual for transhumants to change their routes over time due to changes in where they can access winter or summer pastures, or due to new obstacles (e.g. brush invasion) or encroachment on traditional routes (e.g. conversion to a highway). New transhumants often accompany another herder on several journeys to learn the route. Knowledge of the route includes the obvious—where it goes. Route knowledge also includes the locations of the best resting, grazing and overnight spots, waterpoints along the way, hazards and how to negotiate them, and transit times from point to point. Route knowledge includes knowing alternative paths when the primary or usual route is obstructed. Transhumant herders demonstrated very precise knowledge of the walking time from one point to another and ability to time their departures from the midday resting place so that the evening arrival was exactly at sunset. Route knowledge

also includes the lived or inherited knowledge of the route history, including historical and cultural artifacts, and events that have taken place along the route that shape its current path and how transhumants navigate it. Although both transhumants have cell phones that they use frequently for communication via what's app and voice, neither use the map/GPS functions on their phones.

Transhumant traditional ecological **knowledge also includes knowledge of individual plant species, plant communities and vegetation types**, and the food and medicinal uses and forage values of various plants. This type of knowledge seems to vary more between the two transhumant cases reported here, with Pablo and Aurelio, from Andalucía, demonstrating more detailed knowledge of plant species, than Manolo. This type of knowledge encompasses the ecological dynamics of these plant communities and vegetation types, including response to climatic conditions and disturbance regimes, and indicators and causes of good and poor pasture quality and condition. For example, both transhumants mention how the unusual spring weather affected plant growth in 2018. Pablo perceives his sheep as a tool for vegetation management, creating "*cortafuegos*" or fire-breaks. He also seems unconcerned by what appeared to be obvious evidence of moderate to severe erosion along parts of the *cañada*. These types of ethnobotanical and ethno-ecological knowledge deserve more systematic and detailed attention in a separate study.

A third type of transhumant TEK is knowledge related to **the identification, distribution, behavior and natural history of various wildlife species**. Both transhumant herders in this study demonstrate a keen eye for spotting wildlife as well as knowledge of distinguishing characteristics of similar species, and wildlife behavior. Other transhumants (as well as non-transhumant extensive livestock producers) also shared knowledge about predator behavior, which has historically helped them to live in proximity to larger carnivores and to mitigate predator losses. As with plant knowledge, wildlife knowledge deserves more systematic

and detailed research attention, especially as it relates to species of conservation concern (e.g. vultures) or prone to conflicts with humans (e.g. wild boar, wolf, bear).

Knowledge of local weather patterns, long-term climate trends and the ability to predict and respond to weather cues is fourth key area of transhumant knowledge. These case studies took place in a year with an unusually long, cold and wet spring and both herders combined their knowledge of plant ecology with their knowledge of weather and climate to interpret how the weather in spring and early summer 2018 affected plant growth and production. Both herders delayed their annual spring migration by a week or more to adapt to the weather conditions and because they predicted that the forage had not had sufficient time to germinate and grow due to the cool, wet spring.

One could argue that the essence of transhumant herder TEK is the combination of the above types of knowledge about the environment and geographic context of transhumance with **knowledge of animal behavior and husbandry**. To make efficient and effective use of diverse plant resources over space and time, safely move herds long distances across the landscape mosaic of different land covers and vegetation types, avoid hazards, and adapt to variable weather and forage production, herders must respond to their understanding of dynamic environmental conditions with their knowledge of animal nutrition, reproduction, health and behavior, across multiple spatial and temporal scales. Taking animals on transhumance requires a herder to strike a balance between maintaining animal body condition through sufficient grazing opportunities, water and rest, and covering sufficient distances to make progress towards the next seasonal grazing area. Herders use their knowledge of the route and forage availability and quality to ensure adequate intake and minimize animal weight loss and stress during the trip.

Over longer time periods, the herders in this study choose locally adapted breeds, such as the Segureña (Andalucía) or Ansotana

(Pyrenees), and select replacement ewes based on their knowledge of animal conformation and performance under transhumant conditions. On an annual cycle, these transhumants plan lambing, lactation and rapid weight gain periods when they can best take advantage of forage quality and quantity. A main concern is enabling ewes to regain conditions rapidly after lambing so that they will breed back within the year. Most producers strive for a production system in which each ewe has 3 pregnancies every 2 years, producing 2-3 lambs every 2 years. Interestingly, neither of these transhumant herders selected replacement ewes based on twinning.

During the transhumant journey, herders pay close attention to animal health and are constantly “curing” animals with lameness or other symptoms. Due to cold, wet conditions spring of 2018 was a particularly bad year for hoof problems and associated lameness. Weak or tired animals are placed in a trailer and allowed to rest for part of the journey.

Understanding and manipulating individual and herd behavior is the most obvious application of animal knowledge during transhumance. Herders apply this knowledge constantly to keep the herd moving, navigate hazards such as steep slopes and narrow crossings. A transhumant herder from a different region revealed that the ability to navigate such hazards can be a matter of life and death for animals and people alike. Another common problem encountered on the trail is an individual animal that gets trapped on the wrong side of a fence or wall. Extracting a lone animal demonstrates another application of animal behavior knowledge.

Another essential applied animal behavior skill is **training and handling work animals**, including horses and herd dogs. During the transhumant trek in Andalucía, Pablo was training a young mare and also constantly instructed me on how to handle my own horse, who was often reluctant to part from her companions. Transhumance also requires **practical outdoor living skills, such as slaughtering and butchering livestock, food preparation, cooking and camping**. In older times, these skills would have included

knowledge such as building shelters, baking bread on a hearth, and other skills that are seldom used today.

Finally, one of the most important and unrecognized aspects of transhumant traditional knowledge are **social skills**. In particular, transhumants must be skilled at managing relationships with landowners, government officials, villagers, and other transhumant and non-transhumant livestock producers. Increasingly these relationships extend to other groups with shared or conflicting interests such as conservation organizations, recreationists, hunters, animal rights advocates, media outlets and researchers. Social relationships are essential to securing pastures or grazing lands in wintering areas, accessing grazing and resting areas along the transhumant route, knowledge and information exchange and learning, and obtaining low-cost or free labor and assistance for transhumant migrations. The two case studies highlighted here illustrate the respective transhumants’ strengths and weaknesses in these areas. For example, Pablo from Andalucía focuses his attentions on advocacy for transhumance via publicity on TV and taking adventure tourists along on his transhumant treks. Although he no longer does the latter on a large scale (he once took as many as 30 people on these trips), he continues to work with the media, and will soon be the subject of a feature-length documentary. However, Pablo is less skilled (or less interested) in fostering positive reciprocal relationships with landowners and villagers along his route. In addition, he reported and I verified from other sources, that he has conflicts with other pastoralists who share the same summer communal pastures.

In contrast, Manolo appears to be exceptionally skilled in and to enjoy maintaining positive reciprocal relationships with landowners and villagers along his route. He is often lavishly greeted by villagers in the towns he stays near overnight. He expresses his appreciation by socializing with local hosts, and offering gifts such as a lamb or baby goat. This type of exchange was also common among the other transhumants from Manolo’s region with whom

I spent shorter periods of observation. Manolo also invests in maintaining positive or cordial relationships with other herders in his home town. He also relies on a small group of long-time mostly non-local friends to provide free labor for his seasonal moves.

Several other types of knowledge were not observed in use on the trail, but form important aspects of traditional and/or contemporary transhumant knowledge. These include traditional processing of animal produces (e.g. making cheese, meat products, leather, etc.), customary and evolving pasture governance institutions, marketing and business acumen, and knowledge to navigate bureaucracy including increasing regulations and paperwork to obtain subsidies. Rather than elaborate, I simply note that there are additional areas of knowledge important to transhumants and other extensive livestock producers.

DISCUSSION

This work builds upon and updates prior research on historic transhumance practices from the middle ages to the mid-20th century (Ruiz and Ruiz 1986, Rodriguez Pascual 2001). It highlights both commonalities with historic traditions and differences, especially the social context and challenges faced by contemporary transhumants as they strive to continue a practice that provides benefits to pastoralists, livestock and the environment, while maintaining a historic cultural practice and the associated knowledge in use. While other recent work has conducted inventories and quantitative assessments of transhumant ecological knowledge (Oteros-Rozas et al. 2013b), this study takes a qualitative, participant observation approach. As such, in place of a comprehensive and systematic analysis of knowledge, it observed knowledge in use within the context of specific transhumance journeys. In this way it is both less and more complete.

Traditional knowledge is created and maintained through active use (Tang and Gavin 2010,

Fernandez-Gimenez and Estaque 2012, Oteros-Rozas et al. 2013b), as well as through social and cultural transmission among herders and generations (Gómez-Baggethun et al. 2010). As transhumance evolves and adapts to modern social, cultural, economic, political and technological conditions, it follows that transhumant herders' knowledge will change as well. Certain types of knowledge are likely to remain highly relevant and constant across generations, such as knowledge of animal and herd behavior applied to moving animals through the landscape. I speculate that knowledge of plants, plant communities, wildlife and livestock-habitat interactions will also retain relevance and be slower to change, except as wildlife and plant populations change in response to other drivers such as habitat loss or recovery (e.g. shrub encroachment) and climate change. Other types of knowledge such as ethnoveterinary knowledge, practical knowledge related to building shelters, making fire and harvesting wild foods, may be less relevant as herders more often use modern medicines, camping equipment and food from grocery stores. Although direct experience, intergenerational and social transmission of knowledge will likely remain important mechanisms of knowledge transmission, technologies such as smart phones play an increasing role in facilitating knowledge transmission via social networks of herders, as well as news articles and videos.

One of the most critical forms of knowledge for the future of transhumance are social skills. As rights and access to *vías pecuarias* become more difficult to maintain and defend, social relationships with landowners, villagers and local government officials become increasingly important to the viability of transhumance. As later sections of this report highlight, many herders express concerns about how extensive livestock production and transhumant herders specifically are viewed by the general public, especially urban residents, animal rights and environmental activists. Thus, relevant social skills for transhumants include both the ability to maintain positive relationships and public perceptions at the local level (with landowners, villagers, administrative jurisdictions through



which their routes pass) and the ability to publicize and advocate for transhumance as a cultural and conservation practice. The two transhumance case studies reported here depict transhumant herders with different strengths in social skills. Pablo uses his media networks to secure television coverage for his movements, and will appear in a feature length documentary film on transhumance. In the past he has actively advocated for policies to support transhumance at the level of the Autonomous Region, and also invited (paying) visitors to accompany him on movements. However, Pablo also cultivates an “outlaw” persona and, with a few key exceptions, does not visibly invest in building or maintaining positive relationships with landowners, residents or local governments along his route, rather the opposite. In contrast, Manolo enjoys and emphasizes cultivating relationships with villagers, landowners and to some extent, local government. Although he reported conflicts with landowners and public land administrators, he appears to try hard to maintain positive perceptions and relationships along his route. He does this by taking time to talk with people, appreciate their offerings (coffee, meals), and offer gifts in return. The importance of social relationships along the route to transhumance is fertile terrain for further research.

Participant observation raised issues regarding knowledge transmission. Although herders like Pablo claim that transhumance “has to run through the blood in your veins,” a closer inspection indicates that some of transhumants, including Pablo, actually learned the transhumant route, not from their fathers, but from other herders. Even Manolo, who accompanied his father on many transhumant journeys, has had to adapt his route over time because of shifting access to the *vías pecuarias* caused by shrub encroachment. Future work could explore in greater detail how transhumants learn their routes and knowledge necessary to implement this practice. As other parts of this report show, herders without direct experience and recent family history of transhumance have nevertheless taken up the practice successfully, suggesting that transhumance is not exclusively the purview of herders who inherit the tradition

and associated knowledge from their parents or close family. This finding has implications for supporting herders to start a practice such as transhumance, that may not be part of their family history.

Finally, participant observation provided an opportunity to observe and document first hand the challenges that face contemporary transhumants. Major challenges common to both case studies include the condition of or access to *vías pecuarias*, which are overgrown by brush, encroached upon by cultivated fields and olive groves, or converted to paved roads. All of these forms of encroachment or conversion hinder the ability to move across the landscape and diminish the grazing resources available to livestock as they transit. Many of the *vías pecuarias*, especially in the Pyrenees route, are not well marked. Some stretches of the *vías pecuarias* are also in dangerous condition due to steepness, poor footing and erosion. These conditions bothered the transhumants and sheep less than the visitors. A second common challenge is the scarcity of infrastructure to support transhumants, such as pens and watering places for sheep and camping places or shelters for shepherds. A third challenge is securing the necessary help or labor for transhumance, including hired shepherds or volunteer assistants. Both transhumants had ample help during the journeys I observed, but it was clear that it is difficult to hire shepherds with the ability and willingness to do transhumance, and that transhumants often rely on volunteer labor of other family members, friends and associates. Fourth, a constant challenge, especially where croplands encroach on *vías pecuarias*, is keeping sheep out of cultivated fields. This challenge sometimes leads to confrontations with landowners or the police, which both transhumants reported and which I observed on the case study in Jaen. Fifth, a potential challenge can be competition or coordination with other transhumants using the same route, and transhumants who leave campsites or resting spots in poor condition for those that follow. Competition was observed in the Jaen case study and to a lesser extent in the Pyrenees. Finally, transhumance requires

substantial physical strength and endurance to complete the trip and avoid injury. I witnessed or personally experienced several near accidents along the trail and both transhumants reported incidents that had befallen them or other herders. In the chapters that follow, I interview a wider range of transhumants and other herders, who further elaborate on the challenges and well as benefits of transhumance.

continue transhumance and those that lead them to abandon it, or prevent them from adopting it. The following chapters will explore these factors in greater detail, based on semi-structured interviews with a larger sample of current and former transhumant herders.

CONCLUSIONS AND IMPLICATIONS

This ethnographic account of contemporary transhumance highlights the kinds of knowledge that modern transhumants use daily to navigate their trails, as well as the challenges they face. Some types of transhumant knowledge, like ecological knowledge and knowledge of animal breeding and behavior applied to herding, have long historical importance and likely historical continuity. Other types of practical knowledge may be falling into disuse, while new types of knowledge become increasingly important. One knowledge type that I did not directly observe, but which is clearly important to extensive livestock producers, is knowledge about subsidies, regulations and how to navigate effectively the bureaucracy associated with extensive livestock production. A type of traditional knowledge I did not directly observe, but which is essential to the continuation of transhumance, are the communal governance institutions for common pastures. Of the observed types of knowledge, social skills strike me as the most underappreciated form of traditional or practical knowledge that is increasingly essential to maintaining transhumance.

These qualitative ethnographic findings point to several areas for further research including more systematic ethnoecological, ethnobotanical and ethnoveterinary knowledge studies of Spanish transhumant herders. Several studies have documented knowledge transmission, but this is an area for continued future research. Finally, further study is needed to understand the factors that facilitate or incentivize herders to take up or

Benefits, Costs and Challenges of Contemporary Transhumance

INTRODUCTION

Recent research has argued the benefits of transhumance, especially benefits in terms of ecosystem services (Manzano and Malo 2006, Manzano Baena and Casas 2010, Azcarate et al. 2013, Oteros-Rozas et al. 2014, Hevia et al. 2016). Some of this work includes surveys that quantify different stakeholders' perceptions of the ecosystem services provided by transhumance. However, qualitative studies that explore the benefits, costs and challenges of transhumance from herders' perspectives and in their own voices are lacking from the scholarly literature. Understanding herders' perceptions of these benefits and costs and their lived experience of the daily challenges they face may help us to understand both why this practice persists, why it is perceived to be in decline, and to identify potential measures to support herders in continuing a practice with multiple environmental and cultural benefits.

METHODS

This qualitative, descriptive study aims to document and report on herders' experiences, observations and perceptions of the benefits, costs and challenges of transhumance, both as it was practiced in the mid-20th century and today, in the early 21st century. Data are drawn from two sets of interviews, one carried out in 2010 with both transhumant and semi-extensive herders in the Valles Occidentales (western valleys) of the Aragonese Pyrenees in Huesca (n=27), and one carried out in 2018 in the same location (n=10), with additional interviews of current or former transhumant herders in the eastern Pyrenees of Huesca (n=1); Jaen, Andalucia (n=1); León (n=2); Zamora (n=1). The sample is thus skewed towards the experiences of herders in the Pyrenees and encompasses perspectives of current and former transhumants, and semi-extensive herders who are not transhumant. However, the interviews suggest many commonalities as well as some differences across the regions. Interviews were transcribed, imported into NVIVO qualitative software and coded for references to the

benefits, costs and challenges to transhumance. The results focus on describing the variety of benefits and challenges that herders report, in their own words, and reflecting the variation in perceptions. For example, if the majority of interviewees reported one type of benefit but a few interviewees contradicted these observations, both the positive and negative perceptions are reported.

RESULTS

BENEFITS OF TRANSHUMANCE: HERDER PERCEPTIONS AND EXPERIENCES

Economic benefits and costs

The most frequently mentioned benefit of and reason for taking up or continuing to practice transhumance is its profitability. The profitability of transhumance stems primarily from access to low-cost communal pastures for summer grazing and reduced winter and spring feeding costs from rented pastures or crop aftermath compared to the cost of purchasing commercial feed. Infrastructure costs are also lower because the size and quality of barn required for a transhumant is smaller as not all animals need to be sheltered at once, but rather only those that are lambing/calving. Transhumant herders also cited the ability to increase their total herd size, number of lambing seasons and overall herd productivity as contributing to the economic rationale.

As the wife and mother of transhumant herders explained, *“Well because it was simply more profitable for us. It was more profitable to do transhumance because feeding [...] it is a lot of work. It’s not the same 600 ewes as 2000 and some, and then you have to invest to build barns adequate for this number of livestock—watch out! And if you made the investment [in the barns] you have to think about, in my opinion, how to make them work for 2000 sheep and two men, because with three men and three social securities to pay you would have no profits.”*

Another explained, *“It’s that here, to leave the livestock here [in the mountain village] is much more expensive than descending below [to winter pastures].”*

A retired herder explained why some stockman have returned to transhumance for economic reasons. *“Oh, here it’s very expensive. You have to buy a lot [of feed] and it is very expensive. Transhumance is cheaper, always cheaper. Those people who go now they go because if not, one with 200 cattle, another with 150, they would have had to buy so much, it’s anti-economic, and because of this they are transhumant.”*

Animal health and well-being

Many transhumant and semi-extensive herders believe that the more time animals spend outside grazing on natural pasture, the more healthy they are. In the words of one transhumant from the Pyrenees, *“The animals, like we were talking about before, have to be in the mountains as much time as possible. Cattle, horses, sheep... all the animals need to make use of the resources, and when the bad weather comes and there are none, it is necessary to help them with feed. But the more time they spend outside, the better it is for all creatures. It’s fundamental, yes.”*

A cattle herder referenced the herd dynamics that make cattle less happy in an enclosed space, *“They are much better off free (outside). Because enclosed the cows are, how can I say it? Let’s say there is a line and the leader doesn’t want another at it’s side and they have to wait to eat because they don’t want to be close to one another. Then, at liberty (outside) of course each one goes where she wants and they don’t bother each other. And the barns here, they are not set up for so many animals. They are better free outside.”*

A transhumant herder from the north of Spain (León) referenced the nutritional and health benefits of the summer mountain pastures. *“That grass is the best. It has no herbicides, nothing. The livestock notice it a lot. There are people who go up for only a single month and it is worth it because the sheep come even with different wool. It’s completely different.”*

A transhumant cattle herder from the valley of Aisa in the Pyrenees, felt that the benefits of transhumance using trucks outweighed the costs, with the overall benefit being animal health. When asked if the cost of trucks and renting pastures in the Ribera outweigh the cost of buying feed, she responded, that economically, *"It's about the same because below of course you don't need to buy feed. If you also take the calves, yes you have to take some feed but it is only a few of them. There is a person there to care for the animals. So, well, this feed you avoid it here and later you avoid a lot of expenses in veterinary costs because that is the problem, the veterinarians every time that a calf has diarrhea or any little thing, they have to come up, give it a drip. So you avoid all that."*

Among transhumant herders, those who walk their herds feel the same way compared to those who use trucks. One transhumant herder related the animals' experience to human experiences, *"Livestock will always be most comfortable, walking, going at their pace. Imagine when people walk freely in the countryside and when they are packed in a train or trolley. I think that the animals feel the same way. People we feel the same. We are free, we are in nature, we go walking, taking in the air, and we feel good. And with animals it's the same thing."* Another transhumant herder referenced the increase risk of transporting animals in trucks, *"Look, I like it, I like to do transhumance, and to me it is less risky than grabbing the herd and putting them in a truck."*

A transhumant cattle herder from the Pyrenees agreed, *"In our case, we do transhumance [on foot]. We still do it because one year we tried with trucks, it stressed [the cows] a lot, it's expensive and took the same amount of time."*

Environmental benefits

Although economics are a primary motivation for transhumance, many interviewees recognized environmental benefits of transhumance on foot. Environmental benefits cited by herders in order of frequency included "cleaning the mountains," seed dispersal, chemical-free fertilization, fuel and wildfire risk reduction, and chemical-

free weed control. One transhumant herder expressed the potential negative environmental impacts of the future disappearance of transhumant sheep. *"The day that the sheep disappear, which is not far from now, well all the fields will be overgrown with brush. What happens is that people don't realize this, they think it won't happen. And apart from this, the animals, the seeds they carry from here they distribute all the places they go. As a result there are plants that will be lost if the livestock don't carry them. So many, millions, millions of seeds that these animals, they say there are millions that they are distributing from one place to another. In the town where we go in the spring, a lady said that there are grasses there that they have never seen before."*

Another transhumant (from Andalucía) also mentioned seed transport, as well as a range of other environmental benefits. *"They also transport seeds. The animals with their excrement, they go eating and pooping and fertilizing the mountains and at the same time they are making firebreaks as they go. Where they pass there is a pretty big firebreak because they eat, they trample, and the fire, if there were one and we hope to god there never is, in the zones where there are animals there tend not to be fires because the animals take care of the environment. And the herders as well. There tend not to be fires. So, the reality is that there are good advantages of going by walking."*

Another benefit of transhumance on foot is maintaining the stock driveways (*vías pecuarias*). The *vías pecuarias* of course benefit the transhumants, but they also have been shown to provide other ecological and social benefits.

Less work during the winter

Several herders referenced that although transhumance has many inconveniences, it is actually less work in the winter, when animals in semi-extensive operations are stabled and fed indoors. *"Well for the stockgrower who doesn't have to be so, who is freerer, maybe, who doesn't have so much work every day having to be there every day, go to the barn, clean the barn. Well you have more freedom as a stockgrower, and since you are pretty tied down most of the year, well you*

have a little more freedom. Because of course, to have 130 cows in a barn and their calves as well. You have to clean the barn, you have to feed every day. It's a different way of feeding. In the end it is grass, they eat grass [down below] and in the barn they eat grass too, because we harvested it in the summer. In the end the feed is practically the same, but the main benefit apart from this, from the health and welfare of the animals, is that the stockgrower always has a bit more freedom."

Maintain identity, tradition and rural towns

Several transhumant herders referenced the importance of maintaining transhumance as a cultural tradition, discussed it as part of their identity, or drew connections between the continuation (or loss) of transhumance and the survival of rural villages. One young man who identifies as a transhumant explained the significance of the tradition to him as follows. *"My father is a transhumant and my two grandfathers, on my father's side and my mother's side, both were transhumants. Whether you like it or not, knowing that 40 or 50 or 60 years ago on the trails where I go with my sheep, they passed before me, well it pulls you. Not like a prize for feeling super proud but it is something that's there, these occupations are tradition, apart from being a business or an enterprise. But we are businessmen, we have to manage our business so it functions and is profitable economically. But apart from all that, it is a family thing and a tradition that passes from generation to generation and there are generations that continue it and generations that leave it and later generations that come after and recover it, because they feel that it is a family tradition of their family."*

Another young transhumant, who inherited the herd and the practice from her father, felt a responsibility to keep the tradition going, in addition to liking it. *"And apart from that, I don't know, I think it's because I have always seen it, because in the end transhumance is ending, that is, it is ending here because the cabañeras are disappearing. I don't know, I like it, It is to say, [gosh], it's if I leave it, one other will pass, and if that person leaves it in a while, that's it, it's over, it's over for real."* Later the same herder went

on to say, *"I always think that we have to keep it alive, if we don't it will end and it is a very old thing."*

An older transhumant shared the desire and sense of obligation to maintain a cultural tradition. *"What do I know. It's like when we are little they teach us that something is a tradition and we follow this tradition and we teach it to our children. Our parents taught it to us, we teach it to our children, our neighbors, our friends. They are cultural traditions that I think must be respected and must be maintained and must be cared for."*

COSTS AND CHALLENGES OF TRANSHUMANCE: HERDER PERCEPTIONS AND EXPERIENCES

Living conditions on the trail and seasonal pastures

Current and former transhumant herders mentioned a large number of factors that challenge the continuity of transhumance, especially transhumance on foot. Those who practiced transhumance in the "old days" recounted the difficult conditions on the trail and in winter and summer pastures. Prior to the late 20th century, provisions were carried on a burro, not in a pick-up, sheep required constant presence of a shepherd, and herders were separated from their families for months at a time, often in dismal and isolated living conditions. The often brutal living and working conditions of shepherds both on the trail and in their winter pastures can hardly be exaggerated. Many older shepherds equated it with the conditions in a less developed country.

One older herder who continued to transhume all his life, and whose son continues the tradition today, recounted the challenging conditions along the trail: *"That life was very bad. I walked with burros and now there are cars. Days of cañadas and rain, now it never rains like that, nonstop until we arrived at Escatrón. Fifteen days to descend to the province of Teruel and look, and you left here in the rain, but ceaseless rains, and you continue and continue, raining, without provisions, without anything, only a sad umbrella and nothing, and sleeping where[ever]..."*

A middle-aged man who accompanied his father as a youth, recalled the living conditions in the winter pastures. *"It's that I'm talking about a time when we didn't stay in any village, in any house. My father when he descended and me in that era when I went those years, we stayed in a hut, a shanty, without light or water, nothing more than a fireplace. I can show you pictures of myself as a kid in a jumpsuit like a gypsy, with all respect to gypsies, but I mean without having washed. When I went in spring I was there for three months fixed. Three months without breathing."* The same herder continued. *"Anyway, you can't compare those times with these, eh, people say huy, those times, you can believe it or not, I don't know if it is poorer or richer; I wasn't the poorest, but that level of life was very sad. You had no television, no radio, no light, no water. It was very hard, very hard. Probably, you see now, like the life in those less developed countries. But we lived it here, and it wasn't so long ago. I am 47 years old and I'm talking about 30 years ago."*

Another older shepherd recalled the isolation of herding in the summer mountain pastures. *"Being up there for a month without coming down. In those days few people passed through the mountains. Not like now. Now when you're in the mountains you talk with one person and another. Then, no. You were in the puerto and you herded for a month, and you probably saw no one. And of course, when you went down to the village, you felt it."*

Even for present day transhumants, life on the trail or continuously out with the livestock is wearing at times. One younger female transhumant recounted the internal conflict she sometimes feels: *"Those days are horrible, those days are horrible. Some days for example my girlfriends say to me, 'you are in the fog with the sheep and I will be with the heating, in summer you will be hot and I will be in the air conditioning,' and I think ok, yes, there are bad days because there are days that are bad. Eh? Fifteen days ago it snowed on me and I was all day, I had never turned out in the snow and I had a terrible time, because in addition to snow, there was fog, snow, fog. It was horrible. But well, you get home and you think, another day and I got them out, there*

were OK, and in the end you think, they were good. Within the bad they were good. Then there are days when everything goes wrong and you despair, there are days that I even cry with despair. I despair because there are things, or because some animal that I can't help. But I don't know, I think later it compensates, later the animals come to you, and they say they don't have feelings but for me when they come to me and like kiss me well, it makes me happy. I don't know, I like it."

Another older transhumant herder expressed a similar tension between the discomforts and pleasures of the trail. *"Like last night, well I told you all that today would be a hard morning, and it has been. I think you all with your own eyes have confirmed it, that it was pretty hard. It has been the worst morning. Between mosquitoes, heat. There's a zone with a lot of water that they are putting on the olive groves, and so a lot of mosquitos gather there. So we have to rise early to get to our destination as we have, and now we are here in the shade, resting peacefully."*

Lack of infrastructure and conditions of *vías pecuarias*

Herders often lamented the lack of infrastructure along the *vías pecuarias*, such as resting and watering places, corrals for the animals, and shelter for shepherds. As one seasoned transhumant stated, *"The ideal would be that in every resting spot there were a watering trough, a refuge for people and a corral for the animals. That would be the ideal."* In actuality, along the 10-day *cañada* that this transhumant followed, there was not a single shelter for people, no public watering troughs, and only 3 locations with a publically provided corral.

However, the more urgent concern of most transhumant herders are the conditions of and encroachments upon the actual *vías pecuarias*. This was a theme mentioned by all interviewed transhumants, and often a source of conflict with local landowners and government. The problems with the conditions of the trails include inadequate markings (*majones*) to indicate the route and the statutory width of the trails, and the overgrowth of trails with brush. In some

places shrub encroachment has rendered *vías pecuarias* completely impassable. The following two passages from interviews with two generations of transhumants from Ansó illustrate how the overgrowth of *vías pecuarias* foments conflicts between transhumants, landowners and local government.

The wife and mother of transhumants recounts, *"The really narrow piece that you passed yesterday, once you have descended to Berdún, and it's all slate, loose slate, and later they go through a narrows? Well there they have eaten, but there there aren't 60 varas castellanas and this year, I don't know, but two years ago there was no way (to get through). So then I had to get in there, and R. as well, I had to crawl in there calling two little goats that he had well prepared to guide, but the animals with their horns got tangled (in the brush) and turned back. Well two years ago when we went with J. to bring the car, the same thing happened. I had to get in there in front and go and go until they could get through. But of course the sheep went into one of the fields alongside, which in fact had not been sown yet. And well the owner yelled and everything and so I had to put my feet down with the Comarca government and the foresters and all, and that is when they cleaned it last year for us to go up in the spring. Because there was no way, no way."*

In another interview 8 years later, the son recounts a different episode along a different part of the same *cañada*. *"Everything from above to where we arrived is the trail of always. Yes, the same, the same. Well, some things already when I was small. I have never passed by there, eh, I never have passed there, my father yes, but not me, eh, no, no. He already told me, you can't get through there. He told the foresters too, bah! There was a move, they denounced us one year. You didn't ask for a variance? Yes, of course we asked. The engineer came, everyone came, and they denounced us for going on the dirt road because they said we couldn't go on the dirt forest road. We told them to clear the trail, that until the trail was cleared we had to use the road, and the trail is still not cleared. Clearing it isn't worth it, it might cost 100,000 Euros or more to clear. So if it's just two*

times a year, and not every day, on the dirt road, only two times a year."

In addition to shrub encroachment, many herders complained about other forms of encroachment on and appropriation of the *vías pecuarias*. Such encroachments include farmers incrementally expanding their cultivated fields into the *vía pecuaria*, fencing parts of or placing barriers across the *vía pecuaria*, or wholesale conversion of the *vía pecuaria* into a paved road or highway.

A retired transhumant couple from the Pyrenees discussed these challenges: *"Husband: Of course before everything was clean, there was a cabañera, the "general cabañera" is 70 varas wide. But that has disappeared now. Now there are nothing but highways and dirt roads. Nothing else. Wife: And the crop fields, the farmers take pieces of the cabañeras. Now it's not like before. Well maybe if a lot of people keep going down there would be a bigger effort to keep the terrain open, but because there are only a few, well..."* The couple went on to discuss the impacts on forage for sheep along the trail. *"Husband: Now where we go, we go on dirt roads and arrive there on the highway. In other words the sheep don't go out and they don't eat. Wife: Before there were many cañadas, they went on the cañadas and there was much more feed. Husband: Now that has disappeared."*

Another transhumant from the north of Spain had similar observations about his region, *"Here, the respect for the cañadas, no. It's that they don't respect you. They leave you, they made some new irrigated [lands] between Zamora and León, and those irrigated [lands] took the cañadas, and where the cañada was they put a road, and the land, if the cañada was for example 2 hectares, 4, 6 or 8, whatever they had of hectares, they put them into a farm and the Environment Department took them, the government of Castilla y León, and they planted trees and don't let the sheep in."*

One Pyrenees transhumant described encountering a locked fence blocking the *vía pecuaria*. *"Last year I encountered a blocked cabañera; a fence with chains that I could not*

pass. So then, for the animals the same as for you, you say, eh you can't go here, and you have to go around."

Another transhumant from the north recounted, *"Then too I will find cabañeras that have disappeared, there is a piece that has disappeared, the croplands have eaten it. ... Here closing off [the cabañera] with fences as in other places, no. But the roads have eaten the cabañeras."*

Animal health and productivity

Although most herders believed the animals are better off outside grazing natural pastures, they also concede that livestock may not gain as much weight outside as they do being fed on grains in a stable, and in the old days, without supplemental feeding, reproductive rates were much lower as a result. As one transhumant cattle herder explained, *"In the pardinias, what happened? In that era since there wasn't any, they didn't give any other feed and well what happened is that the cow that came down fat and was pregnant, she gave birth. But in that era if you didn't give extra feed, well the animals lost weight and became skinny because when they gave birth the calf sucked all the strength and substance from the mother until they arrived back at the summer pastures above. And what happened of course when that cow arrived in those pastures, she didn't recover because of all she had done, she was very thin and didn't come into heat, and what often happened is there was a percentage of the animals that didn't get pregnant. A cow that gave birth one year, went empty the next."*

Another transhumant herder pointed out that although the animals are better off outside, the irrigated pastures, alfalfa and crop aftermath in Monegros where his flock grazes in the wintertime are often treated with herbicides (*sulfatos*) and synthetic fertilizers, which accumulate in the animals' livers. This may make these pastures much less healthy than the natural vegetation they graze in the mountains during summer and fall.

- **MFG:** *Are there advantages for the health and well-being of the animals from doing transhumance and not being stabled?*

- **Herder:** *Because of bringing them down here? Let's see, yes and no. Here they put a lot of herbicides and fertilizer on the fields, and there are few places for the sheep to drink except from the irrigation canals in the fields, where the fertilizer ends up. So, yes and no. They eat food, natural pasture, and sometimes pastures that have a lot of fertilizer and sulfates and so sometimes instead of getting fat, they stay thin, because their livers are damaged, or their lungs, or everything. Up above, in the stables, they harvest hay from the fields and it is less nutritious, depending on where it is cut, but more natural, and the granulado that they give the sheep to eat, it might also be a bit more natural. Or not. Is it better? We don't really know. If I told you it was healthier here, I might be lying.*

Herbicide poisoning

Several transhumants mentioned livestock losses to herbicide ("*sulfata*") poisoning along the *vías pecuarias*. Here one transhumant recounts her challenges with herbicide losses and her efforts to communicate with the government administration.

"I have a lot of losses from herbicides, poisoning from herbicides, because people use "sulfata." They don't tell you anything, and they "sulfated" right up to the gate of my corral without saying anything. Then the sheep go out, they eat and they die. One year, three years ago, the day that we were leaving [on transhumance] they "sulfated" one piece, there is a piece of the cabañera that is highway and along that highway they "sulfated" everything. And I had to risk, I had to risk my whole herd because it was a 12 kilometer stretch, and some sheep in some moment or other will go to the roadside and eat a bite of grass. I called the forester and he told me there was no reason for him to know [about the herbicide application]. I called Public Works, Public Works told me that they had the right of the road. I called Seprona, Seprona told me that Public Works had priority over my herd. The solution: get another job. So I contacted the Asociación Trashumancia y Naturaleza.

Desperate, I sent them a Facebook message and they told me another highway route I could go on. I haven't succeeded in stopping the herbicide, but that year I succeeded in finding another route. Later, on other roads, I have had to go, risking [my sheep]. Because they [the government] didn't want them and it's all the same to them if they [my sheep] die. I have killed many animals on the road due to this, due to herbicides, and another thing, too, because they don't follow the law."

Two transhumant herders from the León recounted similar experiences. "Here for example in the cañada when we are coming down with the sheep in this cañada, the administration was spraying ('sulfatando') the cañada, eh." "Here in theory you cannot spray herbicide ('sulfatar') in a via pecuaria, you are prohibited, in the trail or for a certain number of meters, but people ignore the laws."

Conflicts with recreationists, hunters, environmentalists

As the struggles to keep *cañadas* cleared of brush, free of herbicides, and prevent their appropriation as croplands or roads illustrates, transhumants often feel embattled by the need to constantly assert their legal rights of passage. In addition to the fight to maintain the *cabañeras*, transhumant (and other extensive livestock producers) also sometimes come into conflict with other resource users, such as recreationists and hunters.

For example, one semi-extensive sheep herder described how hunting in the communal pastures they use during fall and winter, made it difficult to graze outside during certain times of year. *"Now the snow will come and the bad weather and we will have to put them in the barn and feed them there. But while the weather is good, they are always in the "monte." Sometimes it's problematic because it is hunting season and [people] go to hunt in those mountains and sometimes there are problems with the [hunting] dogs. You have to pay attention a bit. For example, when there is hunting in Fórcala, of course it's necessary to gather [the sheep]. If they come to hunt on a weekend, it's necessary to gather them because some dog could be left behind, some dog that a hunter doesn't*

take with them, and of course the dogs are hungry and the sheep are easy to catch. So you have to be careful here in the low mountains during hunting season, which is just starting now, when we bring the sheep down from the puertos."

A transhumant herder recounted conflicts with urban visitors and recreationists, including one incident in which a recreationist killed a sheep, apparently intentionally. *"Yes and there are many urban people who come for four days and think they are God, that then have power over everything and everyone. They make it theirs, ah, 'let's go to the mountains, the mountains belong to everyone.' Yes, but who takes care of the mountains? You who come to walk for two days with your dog or those who are here every day? ... Last year a tourist came to me, parked their camper in the river. The sheep when they went there surrounded the camper, and that woman started to accelerate and hit them. I went running, saying, 'What are you doing, you animal?' Because she was running over my sheep. She said 'Why are you yelling at me, this place belongs to everyone. Excuse me, your sheep have invaded my space.' No, no this field is for my sheep, this field is mine. You entered here, wait a bit until they leave and then you can go. She killed one of my ewes. Yes, and telling me that she, that she was from the countryside, that she likes the mountains and that she cares for the mountains, that she was from the country all her life. Sure, I can see that. They think they have rights... No. That day demoralized me a lot."*

Hazards

Less common today than conflicts with other people are natural hazards along the route. One transhumant recounted the most frightening episode he has witnessed in 30 years of transhumance, which happened in the spring of 2018. *"Well last spring in May, when we were about to leave (on transhumance) there were some very strong storms. Now you can't see it because it's been repaired. The water as it flowed took the whole road. If it had caught us there, it would have taken the whole flock and all of us. That's the hardest thing that has happened to me so far. ... Now I am much more scared of big storms. For*

me last year was the worst. We were already on the road, later we saw what happened when we passed. The sheep had to pass single file, the whole road was gone, the car could not pass—I had to turn back. It was bad, really bad."

Securing winter and spring pastures

A financial and logistical burden that transhumant herders bear that semi-extensive herders do not, is locating and renting grazing lands for the winter and spring. None of the herders interviewed for this study owned private lands in their wintering places. Rather, they had to negotiate access through leases or informal exchanges. In the Ebro River plains and Monegros areas where the Pyrenees transhumants winter, this is often complicated because the crop rotations change every year. Grazing lands get especially scarce in the late spring, after farmers have planted new crops. Often transhumants must split their sheep into several smaller herds to make use of available grazing in small patches and then spend their days shuttling between one field and another, moving sheep and electric fences.

"But the problem is to be here, in May and June it is more difficult to find food [grazing land]. And now that those ones have come, to make dehydrated hay, the dehydrators pay a ton, that a stockgrower can't pay, and then they harvest, they harvest and four days later they plow it and then you can't go there with your herd."

Family separation and complications

A persistent challenge for transhumants is family separation or the complex arrangements of keeping families together over the course of a year, moving between two, and sometimes three, different villages (summer, fall/spring and winter). The long separations from family historically contributed to many herders abandoning transhumance in the 20th century, in order to live year-round with their wives and children. Today, married transhumant couples often move households seasonally, so that they can stay together throughout most of the year. Indeed, couples who adapted in this way appear

more likely to continue a family tradition of transhumance. This adaptation is challenged by the increasing frequency of two-career families, where the woman often works as a professional outside the home and cannot relocate seasonally. In addition to the social costs associated with these complex family arrangements, there may be an added financial burden of owning or renting houses in multiple locations.

In the following quote a multi-generational transhumant herder from Ansó discusses how family considerations delay the spring departure for the mountains, which costs them money. This herder's wife is a school teacher and she and the children finish out the school year in the Monegros region where they live during the winter, before spending the summer in the mountain village of Ansó, where the herder's parents continue to reside. *"Yes, of course. We could all go up to Ansó in May with the sheep, and that would be less costly, speaking of money. But we always try to stay as close as possible to the family, or to try to combine ["compaginar"] as much as possible, because if not, if you don't see each other, as they say, it's like you almost never see each other."*

The wife and mother of another multi-generational transhumant family from Ansó described how she broke with community traditions and accompanied her husband on transhumance in order to keep her family together. She insisted on renting an apartment near the winter grazing lands in the Ebro River valley, where the children went to school, and then the whole family moved in summer to the husband's home village in the mountains. Here she describes how she felt when she first realized what it meant to be married to a transhumant. *"Well, it's that there before here, the women never went with them [transhumant shepherds]. I came from a different way of thinking and.... and to me it didn't seem right to see them in a cabin, there, in a stable, with everything, everything. And so when you marry to form a family it's not a question of being 6 months in one place, 6 months with the children. If you have children you have to think what level of family they will have and respect for their father and a level that*

I could enjoy them, and it appealed to me that he should be able to enjoy his children day to day. And then the shepherds when they arrived there without conditions, all sleeping on mattresses in a heap and one cauldron to cook in. ... Imagine we were married the 17 of September, we went and came back, and I will remember all my life that on the 28th of November, the shepherd came with the burro to the door to load up and leave "de cabañera." The food, the blankets, and I said but really with this rain how will they keep the food and the clothing dry and all?"

This same woman went on to describe how she decided to migrate with her husband and they became a transhumant family, despite the social repudiation she suffered from her husband's family and village. *"I came one day [to the wintering place in the Ribera], when I was already pregnant with [first child], and I look [at the conditions in which her transhumant husband was living] and say, 'you are here?' This no, in this way, no, no. Me in my house, stupendously, but of course the work is the work, and no one was stopping, and I say no, no, no. Like this, no. So then, with the assistance of some friends here [in the Ribera] I told them, 'Listen, please look for an apartment for me, a house, whatever.' But during that time here there was nothing to rent because they were building the canal and the reservoir and Portuguese [workers] were living here and everything you can imagine. Much worse than today with the Algerians and the Moroccans. Much worse. They were living in warehouses, in stables. So I said, then, no, no, ok, ok, and finally, two years later was when they found it for me. Not in good conditions but I closed my eyes and I came with them [her husband and sheep]. My mother-in-law, let her rest in heaven. Eh? And when I went up above [to husband's village in the mountains] and so forth and then with the Four L [car] that they had, I started to bring them [herders] food in the mountain pastures. Out there helping them, I went with them. And, fffff, there began the attack and the confrontation in our own house, with my mother-in-law and my sister-in-law, and a bit the whole environment of women [in the mountain village]. [They treated me] like I was a know-it-all, and I have never acted like I know it all, nowhere, never, never. Like that, 'There she goes that*

Riberana,' which is a pejorative name that they call you. They don't call you Riberana because you are a young woman from the Ribera. It's like this [in a disparaging tone], 'There goes that Riberana!'"

A transhumant couple from the north of Spain (León) each described the challenges in separate interviews. The husband and father reflected on how transhumance worked when he started as a transhumant shepherd employed by another stock owner. *"It's very hard. And we are here in June and 8 days in the mountains, 8 days at home, 8 days in the mountains, 8 days at home. But of course November, December, January, February, March, April, May, seven months away from home without wife or children. The woman here with the kids, the children."*

His wife recounted her feelings about the arrangement they developed, where the family stayed together all winter and then during the summer she herded the sheep in the mountains, while her husband took care of the children and the remaining flocks below. *"For me the worst was when our daughters were little and I was not able to be with them when they needed me. Think of it, I was away from them the entire summer. That was when they were out of school, they had more time, and there they were alone. Adolescence was hard and I wasn't there to be able to... I don't know, for example when my parents died, my mother was in the hospital and I couldn't be with her as I wanted to. For me, this has been the worst part."*

A woman who is now a semi-extensive cattle herder in northern Spain explained why her family switched from sheep to cattle and stopped transhuming after she married. *"What happened is that when we married in 2 or 3 years, we got rid of [the sheep] because he had to be above in the mountains for 4 or 5 months and I was alone at home. So, it wasn't... I had my little girl and it wasn't the plan to, you know, have my husband 5 months in the mountains, 4 or 5 months, and me alone with the little one. That's not a family, and well you have to look out for the family, too."*

Labor shortages

Today's transhumance on foot generally requires a minimum of 3 people—one to guide the herd from the front, one to follow behind, and one to drive the vehicle with provisions, overnight supplies and a trailer to carry lame or tired animals. Few enterprises have enough paid staff or family to fill these roles, and often rely on help from friends or neighbors. This labor shortage is one reason that some transhumants resort to trucking their sheep instead of walking. In the words of one transhumant, *"It's that now there are only a few of us. Before, when my father and my brother were there we were more and then we could [go on foot]. But now, I am the only one, me alone. And half have already lambed and the other half no, and so it's impossible. So we put them in a truck because where I go, they go, and vice versa. That's it."*

Another experienced transhumant who continues to do the route on foot with a substantial herd of 2700 sheep stated, *"You need a minimum of three, with three you go well. Of course, you could go without a car, but if anything happens... You could take your food for the day in your backpack, ok. But you have to go somewhere to sleep, and so you have to bring your sleeping things, of course, and if you don't have a car, it's bad. The dogs, for example now, if you don't need a dog you're fine here, but there are places where there are crops and you have to work with dogs, and even more, the food, the raingear, umbrella, everything is in the car. Minimum three, you need three: one in front, one behind, and one with the car."*

A transhumant from a different region of the Pyrenees gave a similar explanation of the labor requirements for moving on foot. *"Yes, normally we go two walking and one driving because in that way for the stretches where the car can't go you always have one person to go behind in case something happens, because you never know what could happen. When you go on the trail you never know, and there are always a lot of complications. Everything happens to us, but well, we go."*

This same transhumant recounted a time when he was caught shorthanded in a tricky part of the trail and had to recruit some nearby picnickers to help him. *"One time I didn't have people to help me, because my shepherd was down with the ewes that were lambing, and I was alone. And when I passed by the Yesa reservoir there were a bunch of hippies swimming. I waved and yelled at them, 'Hey, do you have work?' And they said, 'No!' And I said, 'Could you come help me move these sheep?' and they said 'Yes' and I said, 'Ok, I'll give you dinner.' And they brought them to me. They didn't know [what to do]. I put one in front and one behind and bit by bit they went... Later I ran into one of them in Arnedillo. One was Oscar and the other Goika I think."*

Although several of the transhumants had hired shepherds, they explained that it is difficult to find people come on the trail. In the words of one from Andalucía, *"Yes, it's my brother and me and we have one employee. But if you look for people, it's very difficult. It is very, very difficult to find people, even paying a good salary it is complicated because it's 10 days and not one wants to come."* He went on to explain the rhythm of the work year, reiterating that few people want to do this work. *"It's complicated. Nowadays no one wants to be in livestock. It's complicated. It's not a job that kills you. You have, practically speaking, four months of really hard work each year. You have three lambing seasons, and another month, 10 days of transhumance, 10 days going down, that's 20. Another four or five days of shearing, because we do the shearing. Together [with transhumance] the shearing makes another month. It's four months a year of hard work. The other months, it's just watching them. It's not hard work. It's not a job that kills you. It's a job of being in the country. It's a solitary job. It's a job that, well, you have to be alone many hours and the truth is it's hard to find people."*

Predation

Many herders expressed concerns about predation by bears in the Pyrenees and wolves in the north of Spain (Zamora, León, Asturias, Cantabria) and in the Monegros area of Aragón. Predation is an issue for both transhumants and

semi-extensive herders in these regions. Some interviewed herders have suffered significant mortality and others occasional losses directly attributable to wolves or bears. Many more complain about the indirect effects of predators on livestock productivity due to stress, weight loss, spontaneous abortions, and frightened animals falling from cliffs. One of the primary impacts on producers is the uncertainty associated with predators, and the anxiety this causes. Many herders also complained about the ways in which government managers predators and communication with herders, especially in areas frequented by reintroduced brown bears.

A young transhumant herder who summers in the Pyrenees in a region frequented by bears, and spends the winter in Monegros, where the wolf population is expanding, explained his concerns for the future. He sees the return of the wolf and bears as a threat to his ability to have the home life he aspires to.

"And the most important of all regarding the future is the presence in this zone where we are now, the zone of Monegros, of wolves, and in the Pyrenees of wolves and bears. In France, they are reintroducing bears, female bears, and there is also talk of the wolves. And we, in the times we are in, seeing what we've seen that the people, well, our herds are not abandoned. For example, in the mountains I go every day to take a look. Many days I sleep at home, but almost every day I go up and take a look, and feed the mastiff that is protecting the flock, and look after them a while. But if these mountains become full of bears and wolves we would have to be living right with [the sheep]. And it's what I was saying, about planning for the future, of making a family. How do you explain to your wife or your partner and your children, 'No, no, I have to stay in the mountains this week watching over the sheep because the bear and the wolf are coming.' They would say, 'Not possible.'"

Another, middle aged, transhumant responded as follows when asked "How do you see the future of transhumance or extensive livestock husbandry?"

"Me? Very bad! I don't know what others have told you but I see it very bad. I already told you that up here above they put more bears, or the bears come more habitually, it's practically impossible. In our area, if you have been up there, it's not like in Cataluña, where you can take a herd of 4000 sheep and go up the forest road [in a vehicle] until you reach a corral in the middle of the mountain. Here, no. Here when you go up, you have at least 3 hours on foot, walking, to get to your sheep, no less. Three hours going up and 3 hours going down. For us up there it is difficult, between the bear, the mountains getting covered with shrubs, ... each time more complicated and the Natural Park that doesn't let us touch anything and the PAC..."

One young transhumant shared, "What worries me most of all, what worries me most of all are the wildlife that are here. Because where we are is a bear zone. A few days ago I saw a wolf print here. To me this is worrying because I am not a person that wants to be paid [compensated for predator losses]. No, what I don't want is that they kill my animals." This herder went on to explain that their herds had not yet suffered, but their neighbors' had. "We haven't had any problems. No problems and there has been a female bear and two cubs two years in the mountain where we are. In the mountain next to us this year 110 sheep went missing. Last year in another area that touches ours, an avalanche of bears. 250 [sheep] dead. ... [The bear] made them fall from a cliff. They fell from a cliff because when they see the bears. They explained to me afterwards that when the female bears have young ones, to teach them to attack, they put themselves in a place to make a massacre of animals. They explained this to me; I don't know if it's true or not. So they teach [the cubs] to scare them and kill them. Then the young go to the carrion. I don't know if it's true."

In answer to the question about major challenges, another young transhumant responded similarly. "Challenges, well truly I don't know. Now the problem that we tend to have is when, see yesterday they saw a bear in the valley next to ours, in Aisa. So, when you go up here, you have the bear, when we go down to Monegros, there is the wolf. ... The wolf attacked 50 km from where we are. ... We have mastiff dogs. Three of

them. I don't know, it's that the wolf. You never know when it might happen to you, you live with uncertainty."

Regulations

Most transhumants and other extensive and semi-extensive herders complain bitterly about regulation and bureaucratic paperwork, although a several interviewees discussed regulations that were not enforced as a problem. Some of the latter instances were revealed above, when government does not enforce laws related to protecting the *vías pecuarias* or prohibiting herbicide use.

Regulations that disproportionately affect transhumant herders are those related to the movement of livestock between provinces or autonomous regions, and related animal health certifications. One transhumant herder described their frustration as follows. *"Well the quantity of obstacles there are. There are big requirements, a lot of paperwork, a lot of bureaucracy. There are many laws that don't make much sense because when they are said from an office they sound good, but later when you put them into practice they don't make sense. For example, they come to me and do animal well-being inspections, to see that the animals are well, that the area around the barn is clean, and later they don't worry about whether the roof of the barn is falling in and they don't look for that. So it doesn't make sense that they look for animal well-being when the infrastructure doesn't conform with the requirements it needs to meet."*

The same herder went on to talk more specifically about the bureaucracy for moving animals. *"It's that, for example, they want to now, when I go with this year and I go to the veterinary office and I make a guía [official record book]. We have joint title, ..., and I put in the guía '1200 ewes from San Pelayo to the lake of Omaña and for example 50 rams, period.' Well now they want, the coming year, they want me in this guía to identify each animal individually. I have 1200 but I have friends with 2500. Do you know what it takes to look at each sheep individually, and record the code on it's ear tag, and write it down in a book--it*

would be 7 or 8 pages--and take it to the veterinary unit. What sense does that make?" VA

Another transhumant from the same region expressed concern about insufficient regulation when it comes to governing the grazing of summer communal pastures.

"The problem we have in the summer pastures (puertos) is when we arrive a lot of people have problems because the cattle and horses have eaten the forage. This is the problem there is, when we arrive this has happened. That is, the laws that exist, they haven't followed and you have to put up with it. Reserve a pasture where no other animal enters, that doesn't exist. Today in the mountains of León, in the puertos of our zone. Because the rules that exist you have the pasture rented for 5 years for July, August, September, October. Two months before, the rules that are written [say], the forage must be reserved so that it regenerates. That is, in April and May there can't be livestock there. In January, February, March no livestock can enter because it is covered in snow. So in April and May, it was to be reserved, everything that grows there, it would be like a vergel [place of diverse and abundant plants]. On the other hand, in May they turn out the cattle there, everywhere, and they get in your summer pasture area and since no one is looking after them, they leave them there, so in almost all the puertos there are problems, in almost all of them. ... Simply, the puerto that they lease to you and it's yours, what can't be, because these leases are for sheep, not for cattle or for horses. But the permissiveness that there is in Spain now, in León..."

The same herder went on to elaborate on the need for a rangeland law (*ley de pastos*) in Spain. *"In Spain there is no rangeland law. In Spain they need to propose [sacar] a rangeland law because, they need to propose and pass a rangeland law, but they don't want to. Why don't they want to? Because here the only thing that has power [se potencia] is the abandonment. A gentleman who makes [una cada] in Chima or in Cordel, in the town hall, the mayor and the town hall well they put a sports complex, or a picnic area or whatever, 50,000 things. But to preserve the Cañadas as they should be, here in Spain, well I am speaking*

of Castilla y Leon, no. I'm sick of going to the Junta of Castilla y León, and nothing. ... In the rural world one must live as if you live in a rural area, the way you live. The stockgrower must respect their neighbors, [pero jobar], for example if you have to pass through this pasture or this village, there are people that will bother and people who probably say you don't control this land or they plant 4 pines and 4 houses.. And there are other people who [te cota] the farms, and they're not worth anything. It's that there needs to be a law, a management such that the pastures are used, but used appropriately, not like they are being used now. Not a free for all [libre albedrío]. Have a 100 cows and go. Regulate. We need regeneration of pastures in all the places, all of them. So that, for example, it is required to reserve all pastures for 2 months. You go here on this side. When the 2 months are over, you can go there and it will be regenerated. Because today, the way the extensive livestock are, the equines and the bovines, well there is no regeneration. The cattle and the mares the same below as above, there is no control. There is no control."

Subsidies

A theme related to regulations and bureaucracy are agricultural subsidies for extensive livestock production and for young herders. Herders see these subsidies as a double-edged sword, which they depend upon even if they would much prefer not to. Some complain that other producers "game the system" in order to benefit from the subsidies, but they do not actually care for their animals. Other interviewed herders admit to "gaming the system" to collect additional subsidies, for example by leasing pastures that they do not actually graze, in order to collect per hectare subsidies for extensive livestock production.

Here one transhumant herder explains the difference between a true *ganadero's* (stockgrower's) motivations and those of a "*gana-duros*" ("win-coins" or person who exploits the financial gains from subsidies). "*The stockgrower who is a stockgrower loves their livestock and wants to make their livestock as productive as possible. So, improve genetics,*

improve wool, I'm going to speak of sheep, keep your livestock healthy, everything. But there are many stockgrowers that we call "ganaduros" [win-coins] that are only here to get their subsidy and they don't care if they have 5 animals or 50. It's not that it's all the same to them, it's that they don't worry about their animals. Before, in the mountain villages, each person, your harvested your hay for the winter, kept your stables for the sheep, for the cattle, for the goats, and when the bad weather came, they gathered up [the animals] and kept them there, and gave them grain and hay, whatever there was that had been harvested in summer. Now, well, it's very pretty in the mountains, but when a big snow comes the animals die because no one gathers them. That has happened. Not that it happens every year, but it has happened."

The same herder went on to elaborate further. "*In the mountains, the sheep yes, but the cattle and the horses, no. If you walk in these mountains you will see that the cattle and horses are loose, poor things. If it rains, it rains, if it snows, it snows. One who is a true ganadero, brings them down and gathers them. But there are few of these and many more people who keep livestock poorly than keep them well. There are good ganaderos, eh, who gather [their stock], and care for them, and give them hay and everything. But the problem for many years with the issue of the subsidies is that the money doesn't go to a legitimate ganadero, the money goes to anyone who can demonstrate that they own livestock and puts it in the name of their child or in the name of their wife, puts it in the name of a third person."*

Another young transhumant herder complained that the process of incorporating robbed them of some of the subsidies they should be entitled to for being based in the mountains. "*I get the PAC like everyone else, but about up here [in the mountains], that I could get, no, because I have always requested it and they always tell me no, because my operation is not registered here [in the mountains], it is there [in the wintering area]. And it makes me mad because I practically spend more time in the mountains than I do below. ... It was due to poor advice, because in the end I had to do some repairs to legalize my corral there*

[below] and I could have done those here [in the mountains], but they told me that I couldn't do it here. And later yes they told me that yes, I could have done them here, but by then it was too late because once you are in [the system] you can't change."

Finally, others complain that the PAC is poorly designed and does not account for grazable lands that are beneath tree canopy, like much of Spain's *dehesa* (oak woodland) landscape.

Government neglect of rural communities and public misunderstanding of extensive livestock production

A final theme that resonated throughout many interviews with transhumant and other extensive and semi-extensive herders is a sense of being neglected or abandoned by government administration and being misunderstood by the broader (mostly urban) public. This perspective and a keen understanding of the politics behind this neglect are evident in the thoughts of a young transhumant from the Pyrenees.

"If you compare this study with other years before, it will demoralize you, I think, because if you count the number of cabañeras and the number of transhumants, it demoralizes you because you think, wow, in a few years, I have seen, my father always said, 50,000 sheep pass on this cabañera and now 1000 pass. But also, if people come and they realize, and I think they are realizing, that the rural world and all that it brings is going, because in the end they don't take care of it. They don't take care of the people in the small villages. Well, in the end, I am in a village of 1000 inhabitants, which is not a small village, but they don't take care of people in the small villages or stockgrowers in the small villages. They [politicians, government] could realize and they could serve. But do they want to realize and to serve? ... Would they want to do anything to fix this? That is the question. It's that in those [tiny] villages there isn't the number of votes, and now that's what the politicians count, the number of votes. In the city you will win votes; you won't win votes in a tiny village."

DISCUSSION

Interviews revealed four main benefits of transhumance, one significant social cost and one potential financial cost, and 11 challenges (Table 2). Some of these challenges are specific to transhumance while others apply more generally to extensive livestock husbandry. Although herders pointed out various public or social benefits of transhumance, such as its benefits to the environment and contribution to maintaining an important cultural tradition and the viability of rural villages and village life, the most commonly mentioned benefits were those that directly affect the herder's business and assets: profitability and animal health.

BENEFITS

A majority of those asked about the advantages of transhumance referred to the reduced costs of transhumant production in comparison to semi-extensive confined-feeding of animals during the winter. In chapter 5, I present a preliminary economic analysis that attempts to assess this perception using data from typical operations in the Aragonese Pyrenees. The second main advantage was seen to be benefits for animal health—keeping animals out in the open rather than confined in a barn was perceived to reduce disease incidence and transmission and be beneficial to animal health and well-being overall. Although mentioned by only a few transhumants, the relatively lighter workload compared to caring for confined animals is interesting. In one interview, a transhumant mentioned that transhumance involved four months of intense work—three lambing periods and a month of transhumance. The rest of the time, he claimed, is more relaxed.

Transhumants recognized a number of environmental benefits of transhumance, such as keeping the mountains cleared of shrubs, reducing fuel loads and thus preventing wildfires, distributing seeds and contribution to plant biodiversity, and providing free, organic fertilizer. Many of these benefits have been previously documented in the ecological literature

Table 2 Summary of the main costs, benefits and challenges of transhumance according to current and former transhumant herders

↑ Benefits	Costs ↓
Profitability (reduced costs)	Family separations and complicated logistics
Animal health (reduced disease, overall wellness)	Animal productivity and health
Environmental benefits ("limpiar el monte" clean the mountains, seed dispersal, organic fertilizer, fuel reduction)	
Less work	
Maintains tradition, culture and rural village life	
Challenges to Continuity	
(Historic) living conditions	Securing seasonal pastures access (primarily winter)
Condition and access to <i>vías pecuarias</i>	Conflicts with other interests (hunters, recreation, animal rights, environmentalists)
Labor shortages for transhumant moves	Regulations, subsidies and bureaucracy
Herbicide poisoning	Predation
Navigating subsidies; uncertainty re future subsidies	Government neglect of rural communities
Public perceptions of livestock and herding	

(Manzano and Malo 2006, Azcarate et al. 2013, Hevia et al. 2013).

Finally, several transhumants expressed a sense of responsibility to maintain a cultural tradition that they perceive is in danger of disappearing. Some of them feel a strong family identity with the tradition. Interestingly, neither production of high-quality food products nor adaptation to a variable or changing climate were mentioned explicitly as benefits of transhumance.

COSTS

The major cost of transhumance is the social cost of family separation. As we see in chapter 4, this is a main reason that many families abandoned transhumance in the 1980s in the Valles Occidentales of the Pyrenees. Even in the contemporary context, where whole families more often move between the summer and winter grazing lands, and mobile phones and cars facilitate staying in touch or together, family separations continue to challenge transhumants. Several of the long-time transhumants interviewed were couples, each of whom had family, and often a house or property in different seasonal grazing lands. Having family at either end of the trajectory facilitated logistics such as finding winter (or summer) living quarters for the family, or securing access to seasonal pastures. The proximity of grandparents or other close family also helped with childcare, in cases where the woman also actively took part in the herding aspects of transhumance. Whereas earlier in the 20th century the women in transhumant families generally did not work outside of the home as professionals, today women who are not livestock producers themselves often have a professional life and income of their own outside of the family livestock business. This greatly complicates logistics of transhumance. One transhumant who is married to a schoolteacher described how her schedule has altered the timing of their transhumant movements, decreased the amount of time they graze on low-cost communal summer pastures and increased the time and funds expended on rented winter pastures. In addition to accommodating spousal schedules, children's schooling is a consideration.

The transhumant families that I interviewed who had children generally enrolled them in one school for the entire year, rather than moving them from one school to another. Women transhumants who are sole or primary operators and heavily involved in the animal husbandry, including seasonal movements, reported that the most difficult aspect of their livelihood choice was not fulfilling their care-giving roles for children or elderly parents in the way they wished, or (for younger women who do not yet have children), the concern that having a family will be incompatible with continuing transhumance. Among transhumant men, one recently divorced transhumant implied that his long absences contributed to the end of his marriage, while another man has a long-time girlfriend but no plans to marry or have children. Two other men decided to take up transhumance with their young adult sons only after the young men had completed their schooling.

The other potential cost is the impact on animal productivity and potentially income. The herder who mentioned this cost was referring to past practices of transhumance in which the animals received no supplemental feed in the winter during calving or lactation, so cows often did not breed back in the same year that they calved. It is unlikely that this cost is incurred under contemporary conditions where the cows and ewes who are lactating are usually given extra feed. However, transhumance certainly does impose additional energy expenditure and potentially decreased energy intake during the journey, especially if it is a drought year, or the herd passes after other herds have already grazed and trampled the forage in the *vías pecuarias*. Interviews with transhumants and the economic analysis in chapter 5 indicate that transhumant ewes have lower lambing rates, and that transhumant shepherds deliberately do not select for twinning. A study of the energetics of transhumance and its implications for animal body condition and reproductive health could be a valuable addition to understanding the benefits and costs of this practice.

One transhumant herder also challenged the notion that outdoor grazing in the wintering

areas is always better for animal health than barn feeding. Specifically he pointed out the extensive fertilizer and herbicide use on the fields transhumants' sheep graze during the winter, suggesting that the toxin load can be sufficient to harm or even kill sheep.

CHALLENGES

Some challenges mentioned by interviewees were specific to transhumants and others apply to extensive livestock husbandry more generally. Those specific to transhumance include living and working conditions, securing seasonal pastures in multiple locations, the condition of and access to *vías pecuarias*, conflicts with landowners and government along the route, labor shortages for movements, and natural (landslides) and human-caused hazards (herbicide poisoning). Life along the transhumant trail can be challenging, especially when there is little infrastructure for shepherds. However, the conditions that most interviewees referenced were those they lived in during the winter in the mid-late 20th century, when many shepherds still spent months at a time living in unheated stone huts or other marginal housing. Those herders who continue transhumance today usually own or rent a house or apartment in a town or village, so the challenge of living conditions apart from the actual journey has largely disappeared.

More urgent are the conditions of and access to the *vías pecuarias*. This challenge was mentioned by nearly every interviewee that continues to practice transhumance. Because active use of the droveways helps to maintain them clear of brush, and to assert a *de facto* claim to the legal right-of-way, there is a positive feedback loop between the decline in the number of sheep and shepherds transhuming on foot, and the condition of the *vías pecuarias*. As fewer herds pass, more and larger shrubs grow and block the trail, and neighboring landowners are emboldened to appropriate land from the official drove-road to expand their fields. The denser shrubs and reduced width of the droveway, and accompanying reduction in forage, combine to make the *vía pecuaria* less usable for its intended purpose, further discouraging use

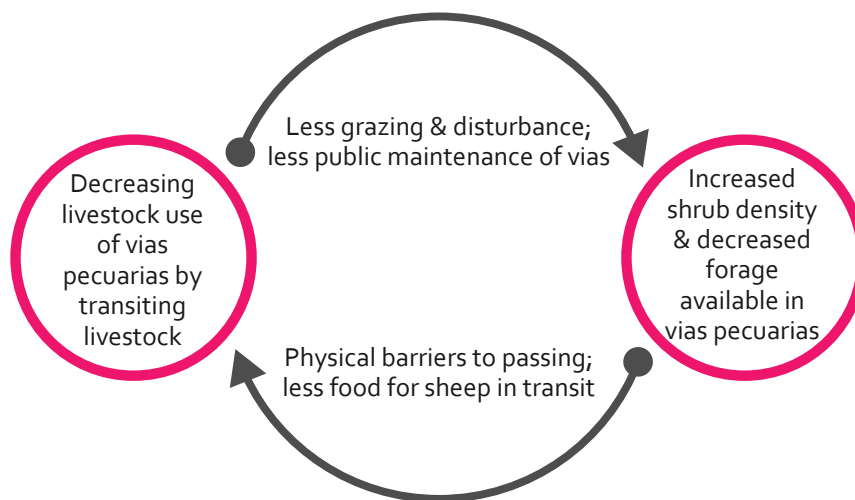


Figure 17 Positive feedback between decreasing use of *vías pecuarias* and increasing shrub cover and decreasing forage availability

by transhumants (Fig 17). With fewer herds passing and fewer active transhumants, there is insufficient political or public pressure on government administrations to invest in the maintenance needed to keep the drove roads open, hence they fall into disrepair. Similarly, when government itself appropriates droveroads and converts them to paved roads, it is able to do so because of the lack of public awareness and political pressure.

Other aspects of the *vías pecuarias* that herders referenced are the need for more infrastructure along the droveroads to support active use. Such infrastructure would include corrals to enclose sheep at night, watering troughs or other water sources at regular intervals, adequate signage to mark the legal extent of the *via pecuaria*, and more developed camping spots or refuges where herders can overnight or seek shelter from the elements. Periodic drinking water, toilet, bathing and washing facilities for herders would be greatly appreciated.

Some herders encountered natural hazards, such as flooding rivers or landslides, along the route. Such natural catastrophes cannot be blamed directly on policies or lack of maintenance, but they do present dangers to both people and animals. Herbicide poisoning was also mentioned by a number of transhumants as a human-caused and preventable hazard and cause of

animal mortality. Specifically, laws that prohibit use of poisonous herbicides within the legally defined *vías pecuarias* are apparently disregarded by landowners and local administrations, with serious impacts on flocks and livestock enterprises. One transhumant reported another type of hazard that killed several dozen sheep and nearly took the life of a youth assisting in the transhumance: the piling up of sheep along a mountain roadway that occurred when motorists refused to stop and wait for the sheep to calmly pass. In this instance the sheep were so crowded that they began to fall over the cliff on one side of the road and the child was almost lost along with them, but was rescued by an older herder who managed to save them by hooking his shepherd's hook on their pants and lifting the child to safety.

Access to labor and seasonal grazing year-round are two other key challenges that specific to transhumants. Many herders recounted making long-distance moves shorthanded and the difficulties of doing this, but few can afford a paid shepherd. Even those with a hired shepherd rely on additional help from family members or friends to complete the journey.

Transhumant producers must also secure grazing for their flocks during each season. Most of the shepherds I interviewed have rights to graze communal summer pastures based in residency



Sheep in Dehesa © Concha Salguero,
Trashumancia y Naturaleza

in a mountain village. Most have historic family ties to their summer village, although one transhumant interviewed in 2010 was based in the Ribera and purchased a house in the mountain village in order to establish residency and gain access to the summer grazing. However, access to winter and spring grazing often poses a challenge. Most Pyrenees and northern Spanish herders interviewed rely on grazing privately owned croplands or pastures during winter. Because farmers often rotate their fields annually, the availability of specific grazing lands varies year to year, making it a continual moving puzzle. The social skills referenced in chapter 1 are important in securing winter/spring grazing access in these regions. The transhumant from Andalucía, in contrast, was able to secure a long-term lease on a single large *dehesa* for his winter grazing, which was much less complex.

Regulations, subsidies and bureaucracy are challenges to all extensive livestock herders, not transhumants exclusively. However, transhumants often must deal with a greater regulatory burden in terms of record keeping and health inspections if they transit between autonomous regions, for example between Castilla y La Mancha and Cantabria, or between Aragón and Andalucía. Subsidies are a mixed blessing for many transhumants, as well as other extensive livestock producers. Virtually all extensive producers rely on subsidies for a significant portion of their incomes, yet many feel the programs are unfairly designed and do not reflect the true social and environmental benefits that their herds provide. Many complain about other livestock owners who are not genuine producers but rather own a few livestock in order to be able to claim subsidies, "*ganaduros*" (money-winners) rather than "*ganaderos*" (stock-growers), according to one informant. One genuine herder admitted to renting more inexpensive "*puertos de subasta*" (summer pastures at auction) than they could actually use, in order to receive a larger subsidy. This herder reported that they ensured the pastures were grazed, meeting the intent of the subsidy, but they were not grazed by their livestock, but someone else's. Older herders, who began their careers during the Franco era, wish that

they would be rewarded by the market for the excellence of their product rather than receiving pay-outs from the government for providing an environmental service.

Finally, many herders reported specific or general conflicts with other resource users or interest groups, issues of predation or threat of predators, and expressed feelings of being misunderstood by the public and neglected by the government. Conflicts with other resource users tended to focus primarily on hunters and recreationists, while those with interest groups focused on animal rights activists and environmentalists. Conflicts with other resource users were more specific and personal interactions, such as particular instances in which hunters' dogs threatened sheep, or when recreationists insulted shepherds or harmed their animals. Conflicts with animal rights activists and environmentalists tended to be more generalized and unspecific, but rather to refer to broad categories of people based largely on stereotypes or dominant narratives in the media.

One particular theme that many interviewees mentioned, and which intersects with the theme of conflicts with environmental and animal welfare activists, is the theme of predation by large carnivores, specifically wolves and bears. Although few current transhumants had been directly affected by predation, many were very concerned about the potential impact of recently reintroduced bears in the Aragonese Pyrenees, or the potential expansion of wolf ranges into the Monegros. In the North of Spain, I interviewed semi-extensive herders, including one former transhumant, who suffered significant losses to wolves, but the transhumant herders in León managed to avoid problems, in part due to the large number of mastiffs they keep to protect their herds, and in part due to their specific geographic context. One repeated theme in conversations about bears was the wish that government officials would communicate to herders the known locations and movement patterns of the bears, to enable them to better avoid potential direct or indirect losses due to predators.

The final and perhaps most crucial issue that many herders mentioned is their feelings of being disrespected and misunderstood by the public at large and of being neglected by the government. Several expressed the sentiment that rural residents and extensive livestock producers have little political power because there are so few people left in the small rural villages. Why should politicians provide services to them or respond to their requests when their voting power is minimal? This sentiment is hardly unique to rural Spain, and is a common complaint of ranchers and pastoralists in the US and Mongolia as well. A challenge highlighted in other work that did not emerge here are the poor market conditions generally and lack of market differentiation for high-quality animal products produced through transhumance and extensive production generally.

CONCLUSION AND IMPLICATIONS

Many of the findings in this chapter are not new to those working at the nexus of research, policy and practice related to transhumance, extensive livestock production, biodiversity conservation and rural development. The discourses about transhumance and extensive livestock production more generally, are broadly familiar. Some of the claims made by pastoralists in this study, particularly those about the environmental benefits of transhumance, have been empirically tested (Manzano and Malo 2006, Azcarate et al. 2013, Hevia et al. 2016). It is even possible that transhumants' beliefs about certain benefits, such as seed dispersal, are grounded in the existing science as much as their traditional knowledge. Other work has used quantitative social science approaches to estimate ecosystem services associated with transhumance (Oteros-Rozas et al. 2013b, Oteros-Rozas et al. 2014), and scenario planning to integrate different stakeholder groups' views of the future of transhumance (Oteros-Rozas et al. 2013a). However, no prior studies have collected these discourses directly from herders and presented them in herders' own voices. As such, this study lends scientific support to policy briefs and

advocacy documents that make the case for maintaining transhumance. Such qualitative and descriptive work lays the groundwork for theory and policy development, as well as setting the stage for further empirical research, is lacking from the scientific record. Finally, the act of doing qualitative research with/on transhumant herders itself had a potentially important impact of making herders feel valued and heard. As one transhumant remarked in his interview, *"For me, the medals of honor are the people that I get to know on the trail. Like you, for example, who come from the USA here to accompany me, to do transhumance. For me this is an honor that makes me proud. ... You change people's opinions and that is the biggest satisfaction that you can have."*

This work suggests many future avenues of research. For example, transhumants' claims about the economic benefits of the practice have not received the same research attention as its ecological benefits, even though profitability appears to be a significant motivator for many herders. These claims could be empirically evaluated. Transhumants' discourses about cultural heritage and identity; their feelings of being misunderstood, undervalued and ignored by society and government; and their reported conflicts with environmental and animal rights interests suggest that a deeper qualitative analysis of transhumant and pastoralist identities might offer insights into the dynamics of these conflicts and potentially pathways to reconciliation. Finally, the interviews point to the need for further understanding of evolving governance of grazing commons and *vías pecuarias* in Spain, as well as an assessment of the impacts of subsidies on the initiation, maintenance and abandonment of pastoral enterprises, and the social, economic and ecological outcomes of these policies. This is not an exhaustive list of possible research, but rather some of the most obvious next steps.

The costs and challenges of transhumance reported by herders point to a number of potential areas for rural development, land management and governance policy, and public education and outreach. The most critical challenge to current transhumance may be

the condition of *vías pecuarias*. Though legally protected, these protections are not enforced, allowing neighboring landowners to expand crops into rights-of-way and fence parts of the official droveways into private lands. Few governments make efforts to maintain droveways by controlling encroaching shrubs. Further, government is sometimes complicit in converting *vías* to paved roads without providing alternatives, and in actions such as spraying toxic herbicides in droveways. Thus enforcement of the letter and the spirit of existing legislation on *vías pecuarias* is an important step.

A major social cost to transhumance is the strain it places on families. There are no simple answers to this complex challenge, which affects mobile pastoralists globally (Galvin 2009). Some possible measures include sensitizing affected schools, teachers and health care systems to the issue, promoting more opportunities for spouses to work remotely (telecommute), and simply documenting and sharing the successful strategies used by transhumant families to maintain their enterprises, their cultural practices, healthy family relationships, and employment and schooling opportunities for family members that need or want them.

The future of transhumance is likely tied to the future of EU CAP subsidies and domestic programs (“*ayudas*”). The uncertainty around these programs places the future of transhumance, and extensive livestock production generally, in question. A specific subsidy for those who practice transhumance on foot could be an important incentive and support for the continuity of transhumance, but the likelihood of this occurring seems slim. Probably the most we can hope for is a continuation or extension of existing payments for use of remote and high nature value areas, improved implementation of the ways in which eligible areas are calculated to better account for the forage value of woodlands (e.g. *dehesas*) and open shrublands, and better control over abuses of the system that lead to poor grazing management or harm animal welfare.

Finally, there is a need for more education and public outreach efforts focused on three broad areas. 1) Raise awareness of the broader public of the benefits of transhumance for the environment; animal welfare and production of high-quality animal products; and maintenance of rural life, cultural landscapes, and traditional knowledge. 2) Provide more professional development, continuing education and peer-to-peer learning and knowledge exchange opportunities for transhumants. 3) Create opportunities for and facilitate constructive dialog and collaborative problem solving among different interest groups, especially herders, environmental advocates and animal rights advocates.

Transhumance Abandonment & Revitalization in the Aragonese Pyrenees

INTRODUCTION

The dominant narrative about transhumance in Spain, and mobile pastoralism globally, is that it is in decline and will soon disappear completely. This narrative is repeated by transhumants themselves, as well as by observers and scholars. However, the predictions of this global narrative of the demise of mobile pastoralism, which date back to the early 20th century (Herskovits 1926), have yet to be realized (Reid et al. 2014). Certainly mobile pastoralism has ended or been severely curtailed in some regions, especially where pastoralists' access to seasonal pastures has been completely denied via land conversion or appropriation for other uses. The Middle Atlas of Morocco (Bencherifa and Johnson 1991) are an excellent example of this pattern. However, a broader analyses of pastoral systems over both archeological (Honeychurch 2010, 2014) and decadal (Fernandez-Gimenez and LeFebre 2006) time frames suggest that what is sometimes interpreted as a one-way decline, is often a cyclical ebb in a longer term dynamic ebb and flow pattern of livelihood strategies in response

to changing climatic, social or institutional conditions.

Here I present a short case study of one example of this dynamic pattern of abandonment and later revitalization of transhumance within two neighboring valleys of the western Aragonese Pyrenees in Spain. Focusing on herders' own accounts of the reasons for their own abandonment, continuity or adoption/renewal of transhumance, I ask the following questions. 1) Why did many herders abandon transhumance in Ansó and Hecho in the late 20th century (1970s and 1980s)? And, 2) why have some herders, including both younger/newer herders and more senior herders recently decided to resume transhumance? Finally, I consider this case study to ask 3) what can we learn from this case and the wider set of interviews about the conditions that support or deter the continued practice of transhumance, especially transhumance on foot?

METHODS

This qualitative case study is based primarily on semi-structured interviews with current and former herders, both transhumant and non-transhumant, in the Valles Occidentales of Ansó and Hecho, Huesca in the autonomous region of Aragón, Spain. An initial set of 27 interviews was conducted in 2010. Among other topics, the 2010 interviews asked herders to describe their seasonal grazing patterns, including transhumance movements when applicable. The interviews also included questions related to the adoption of new practices in the region, specifically building barns for confined feeding of livestock, and the abandonment of a traditional practice, specifically transhumance. In these questions, I asked why the new practice was taken up, who was first to adopt it, how it spread through the community, and how long this diffusion took. Similarly, I asked why many herders had abandoned transhumance, and when and how that process took place. I also asked who continued to transhume and why. Upon returning the study site in 2018, I discovered that several herders interviewed in 2010, who were then semi-extensive, had become transhumant in the intervening years. I re-interviewed two of these herders to learn what had motivated this change, and also spent a day with each of them as a participant observer on their transhumant migration. In addition, I learned that several of the new livestock incorporations had established transhumant operations from their inception, and I interviewed each of these three younger herders. Finally, I also re-interviewed two transhumant herders who were transhumant in 2010 and continued the practice in 2018. I also accompanied one of these herders as a participant observer on his entire transhumant journey in the fall of 2018.

Interviews were conducted in Spanish, audio-recorded, transcribed verbatim, and imported into QSR NVIVO for qualitative analysis. I analyzed interview data by coding the interviews for reasons for abandonment and revitalization of transhumance, and for the perceived benefits, costs and challenges of transhumance. I used

the interview data, participant observation and other primary and secondary sources to construct a case study narrative of the process of transhumance abandonment and revitalization. In the results that follow, I first present this overview, and then present a more detailed explanation of the reasons for abandonment and revitalization drawing heavily on passages from herder interviews in both 2010 and 2018. These qualitative interview results are highlighted in order to give voice to herders' experiences and motivations in their own words. All coding was done in Spanish and the selected illustrative quotations were translated into English during the article writing process.

RESULTS

OVERVIEW OF THE PROCESS OF DECLINE AND REVITALIZATION

The pattern of decline in transhumant livestock husbandry in the Valles Occidentales of Ansó and Hecho follows the pattern throughout the Pyrenees and other parts of Spain. During the post-civil war era, and increasingly in the 1960s-1980s, many men and women left the mountain villages to seek work in other sectors. In the region of Ansó, a number of men took herding contracts in the western United States (Tarazona Grasa 2017). Some immigrated permanently to the US and others returned to marry and settle back in their villages. During this era of the mid-20th century, transhumance continued much as it had been practices for centuries, with most of the herding work done by hired shepherds or the younger sons of powerful livestock-owning families (*casas*). The conditions of transhumant life were difficult. Herders spent much of their summers with flocks in the high mountain pastures, coming down to the village to visit their families once per week. Flocks spent the fall (Oct) and spring (May, June) near the villages, when herders could live at home with their families. Then in late October or November, they would depart for the wintering grounds in the Ebro River valley, where they would spend 6-7 months. The journey was difficult, made on

foot using burros to carry food and supplies, and sleeping without shelter. However, the most difficult season in most transhumants' recollections were the months in the Ribera, which were cold, foggy and damp during winter. Herders often lived in rudimentary huts, distant from populated towns.

The shift away from transhumance in this region came about through a combination of "push" and "pull" factors. The primary "pull" factor was the men's desire for a more comfortable and family-oriented life. They wanted to be able to go home every night to their wives and families and to participate actively in their childrens' lives. Women's desires also played a role in these decisions. The major "push" factor was the increasing scarcity and cost of winter grazing lands in the Ribera. Transhumance no longer made economic sense for many producers and the hassle of finding forage for the entire winter and spring, as well as the financial cost, made it a less attractive management system. A third major factor was the declining access to labor to make the transhumant moves. In Hecho several cattlegrowers recounted how they stopped transhuming after their fathers and uncles retired because it was too much work for one man alone.

In Ansó, one pair of brothers were the first to decide that they would buy land and build barns near the village where they would keep their sheep and feed them on grain during the winter. Others soon followed their example and within 4-5 years the majority of sheep operators had transitioned from transhumance to semi-extensive herding in the late 1980s. However, there was one family of transhumants who never stopped making the trip on foot, and another family that paused briefly for a few years before resuming the practice.

By 2010, when I conducted my first round of interviews with herders in Ansó and Hecho, several cattlegrowers had resumed transhuming, albeit a somewhat shorter distance. Instead of going all the way to the Ribera, they moved their cows to natural pastures in the intermediate mountains. These pastures, which they referred to as "*pardinas*," are either privately owned by

estates or public lands and are leased to herders for grazing. In the Valley of Ansó there was another family who had purchased property in the village of Fago nearby Ansó and whose pastures are adjoined. Local regulations allow residents rights to graze the communal summer pastures after two years of residency, which enabled the family to establish a transhumant enterprise. Unlike the others, their primary base is in the Ebro valley and they move their stock up to the mountains for spring, summer and fall, to take advantage of the abundant and cheap forage that comes with their rights.

When I returned in 2018 for a second round of interviews, two of the Hecho sheepherders whom I had interviewed in 2010 when they were semi-extensive herders, had become committed transhumants. These men took their sheep to the Ribera and Monegros, respectively. In addition, both of these men had sons who have established their own transhumant operations. One has two sons and the other one. Although each man (2 fathers and 3 sons) has an operation in his own name, for practical purposes each family manages all of their sheep together. In addition, the transhumant from Ansó who briefly stopped transhuming, had resumed as the family business was taken over by one of his sons, who continued the tradition using trucks to transport his flocks. The next generation of herders in the Fago family has also continued the transhumant tradition.

The primary factor driving the revitalization of transhumance in this region is economic, but personal situations sometimes also play a role. Changing technologies, family dynamics, and resulting improved conditions for moving livestock and living in multiple locations facilitated the renaissance of transhumance. The main economic driver is the greater availability of low-cost grazing lands in the Monegros and Ebro River valley areas, which significantly reduce production costs compared to stall feeding. One Hecho shepherd began transhuming after he lost his wife to cancer. He explained that he and his teenage son needed a change of scene and to get away, temporarily, from the village and the house that reminded them of their loss. They have

continued the practice for the past 9 years, and now identify as transhumants. For others, taking up transhumance became more feasible as their children grew older and were able to help. Additionally, the advent of cell phones, electric fences and cars make transhumance more comfortable and enables some herders to move their sheep on foot without actually spending the night away from home. In the following sections of the results, these and additional reasons for both the initial disappearance of transhumance and its renaissance are explained in herders' own words, drawn from interviews in these two valleys in 2010 and 2018.

REASONS FOR ABANDONING TRANSHUMANCE

The main reasons that herders from Ansó and Hecho abandoned transhumance in the 1980s were the difficult living and working conditions in the Ribera. Herders referenced simply not wanting to make the long walks anymore, not wanting to spend day after day all day long watching sheep in the Ribera, and the difficult living conditions. One Hecho herder recalled the work in the grazing lands of the Ribera. *"Because it's fields, you have to be there all day with the dog and the staff, and eating every day away from home. Here [in Hecho], even when it's winter, even when it's the time to keep the animals inside, to lunch at home to eat at home and to be at home by 6 pm, and there [in the Ribera] it's from morning until night."*

When another herder was asked why people in Ansó began to build barns and stopped transhuming, he responded, *"Because this practice arrived here and because, because we didn't want to go down to the Ribera any more. We didn't want to be transhumants. So to stay here there had to be a place [to put the animals] and this is what we did. Here, in order to be here, one has to have a corral to enclose [the sheep], if not, you can't be here. And we saw this and did this, and ever since then we live better."*

An important dimension of the difficult living conditions was the separation of families. Typically, the shepherds, all of whom were men, spent months alone in the Ribera during the

winter, away from wives and children, and then in summer they often tended their sheep in the high mountains for a week at a time, again away from the family. As one of the first herders to abandon transhumance explained, *"Because of course, I married thinking of living here. We built the barn the year after I married."* Another former transhumant echoed the same sentiment. *"Well we married because of being alone out there, out there. But we could be here at home, with our families. That's it simply."*

Another contributing factor was the increasing scarcity and cost of renting winter grazing lands in the Ribera as cultivation expanded. *"In the villages below with so many livestock that people began to have, well then the pastures were all taken, there was no place to go and so they [transhumants from Ansó] started to think of something else. Another thing is that there had never been barns here. There were small stables and corrals, but no place adequate for livestock until they built the barns. So people began to buy small fields and ask for loans and build themselves [barns]."*

Other reasons for stopping transhumance included insufficient labor and support after their fathers retired. A cattle herder from Hecho who was a transhumant for many years, explained as follows. *"Four or five of us were the last, and we all left it almost 30 years ago, we left transhumance. My father was getting old, I was alone, and the same happened to 3 or 4 others, 3 or 4 others were left alone and decided to leave, to stop doing transhumance."*

In sum, family issues and harsh living conditions appear to be major drivers for the abandonment of transhumance in the Valles Occidentales in the 1980s, but this timing also coincided with rising costs for winter pastures and declining labor availability.

REASONS FOR CONTINUING OR ADOPTING/ RESUMING TRANSHUMANCE

A main motivation for continuing or resuming transhumance in the Valles Occidentales is the availability of high quality inexpensive summer

pastures. One man who became a transhumant explained, *"Of course, I was motivated by the puertos, by the pasture. That was the story; that was the change. ... You know what happens, it's the classic story, the winter in the Ribera and the summer in the high passes. Of course the question is, if it's so bad, why do you go? Because they are the pastures of your village, yours, and as a villager you belong to these pastures and we have a right to these pastures, of course."*

The counterpoint to the availability of summer pastures, is the increasing availability and low cost of winter grazing opportunities in the Ebro Plains and Monegros, especially when compared with the high cost of feeding confined animals in the mountain villages all winter. One Ansó herder explained how the high costs motivated a return to transhumance. *"Well for 6 or 8 years we stayed here all year because the situation below was bad. But here the time is long and one spends a lot."* His wife chimed in, *"One spends a lot! The cost obliges you to go down."* The herder went on, *"Of course it depends on each family. For us, if our son wasn't here we wouldn't go down, because he lives down there."*

The son, who has taken over the family enterprise, married a woman from a town near their wintering place in Monegros, and their family spends the school year there. He brings the sheep up to the mountains of Ansó in the summer. His children spend the summer with their grandparents in the mountain village and the fall, winter and spring below in school, where their mother also works as a teacher. In a separate interview, the son explained that he had always liked working with sheep, but had trained and worked as an electrician for many years. When his wife secured a teaching position near her hometown in Monegros, and he was unable to find work as an electrician, he took up herding again. *"I wanted [to be a herder], but what happened is one thing and another and you are out there, and you have no security. When we came back here, well the truth is that there were no work opportunities either, and there wasn't much time to think about the possibilities because we arrived in October, with the beginning of school in September, and my father retired, well he was*

retired for 3 or 4 years, but he has bad knees and so he said, 'Hey, do you want them [the sheep] or not? Because I can't continue.'"

Like these more experienced transhumants, one interviewee, in the process of incorporating a new enterprise in a valley east of Ansó and Hecho, spoke to their main reason for planning their operation as transhumant as best use of available summer pastures in the high Pyrenees, but that logically it is impossible to stay there year-round, necessitating transit to the lowlands for winter. Interviewer: *"Why transhumance?"* Interviewee: *"That comes from taking advantage of the pastures. See, it's clear that in the Pyrenees if you are up high in the winter you will have a bad time. ... For me the most important is the beneficial use of the pastures. I think more importance should be given to transhumance."*

The main driver of the revitalization of transhumance appears to be its relative profitability compared to semi-extensive production, due to the cost reduction in feed. One Hecho herder explained as follows. *"Well if there is an upturn in returning to transhumance it's because of the same thing: wintering here costs a lot of money, feeding here. If you spend a lot of money and the income doesn't compensate for the expenses, well you lose, and what happens? It turns out cheaper to go on transhumance, because in the Ribera the livestock eat every day in pastures, the cattle in the pardinás are on pasture every day. ... It's because of this that transhumance has increased, not to improve the livestock, it has been for convenience and to eliminate the stockgrower's costs."*

Several cattle herders from Hecho explained that their return to transhumance was motivated by the desire to expand their herd sizes beyond what they could legally keep in their barns near the village or that could be supported on the fall and spring communal pastures. One of these men explained as follows. *"I started again about 5 or 6 years ago. We went, probably, 10 years without doing it. When my father and my grandfather were old, they stopped doing it and I, as I increased the number of livestock, we thought it was convenient to go back to doing it. ... When*

you increase the livestock, well you don't have enough room in the barns for all the animals. Or if you put them all in, the animals are stressed because they are very crowded, so then we decided to try it again." The same herder went on to explain that the work as well as the space were motivating factors. "The work but also the space and the work. It's not the same to keep 50 cows here, more or less you organize yourself in the morning or the afternoon, but 150 is a lot more space. You would need a much greater quantity of food. And every day you would have to be there. I can take care of mine in a morning. I go out at 10:30 and come back at 4:00 pm. If I had all these cows gathered [in a barn], I would need all day to take care of them."

Another Hecho cattlegrower echoed this same sentiment when asked why some herders were returning to transhumance. *"Well, maybe for comfort, to not be in the stable feeding. Here, you have to buy almost everything [feed]. If the cattle are loose in the mountains well you don't have to be taking care of them. You have to take care of them, but it's not the same as having to feed them every day."*

One other herder provided additional details on the workload of a transhumant vs a semi-extensive herder and his own reasons for becoming transhumant. *"When I started seriously, there were 30 head, 30, 35 or 28, I don't recall. But you decide to increase. And of course, if you increase, if you have a good barn, you have to build another. If you decide to go back [to transhumance] the strong livestock can be outside, at least. You avoid having to clean the barns, you avoid having to feed. It's less work, in a word. Less work and more health."*

The same Ansó herder who abandoned transhumance to marry 30 years ago, in 2010 admitted that technology and infrastructure have significantly changed conditions for transhumance, making it a more attractive option again. *"I don't say no to transhumance, if I were 40 years old now and they say there are [pastures available]. I would go down to look. Go down and take a good look. If there is abundant pasture below. If it is cheap. This could be good. Yes, yes. I don't say no. It could be good....Now*

there are cars. When I went down, there were no cars. With cars you can come and go. Every day. That is a different thing. What I talked about before was when you went down to the Ribera for 7 months and stayed in a hut there."

Together with changing infrastructure (improved roads) and technology (cars, cell phones, electric fences and GPS collars to track herds in the mountains), another factor that favors continuing transhumance is the flexibility of families, especially women--the wives and mothers of transhumant herders—to move their families seasonally, and spend time in the mountains with their partners and children, in order to help with the work but more importantly, to keep the family together during the annual cycle of movements. In Ansó the two main families (*casas*) of long-distance sheep transhumants that have maintained the transhumant tradition both included a supportive spouse who was willing at some point to move entire the family down to the Ribera during winter and to return to the mountains in the summer. In these Ansó transhumant families, this type of arrangement is facilitated by marriages or other connections between a spouse from the mountains and a spouse from the Ribera, which means that each partner in the family has connections, and often land, a house or an apartment in each seasonal terminus.

Finally, for a few herders, the transhumant heritage and identity, together with a deep personal affinity for the transhumant life, are important motivators. The mother of one Ansó transhumant who continues to follow the trails of his father and grandfather, recounts how she saw this hereditary affinity in her son from an early age.

"Well it's that he caught it because he is the fourth generation, from my house, my uncle's, his other uncle, his father, his grandfather, his great-grandfather. It's that he carries this in his genes because when M. was little and he saw a truck full of sheep go by the playground of the school, he would say, 'I wouldn't sell them because in Zuriza there is a lot of pasture and room for many [sheep].' You understand, no? And he always

looked for an opening or organized himself to be with the animals, to go with his father to the animals, to go up to the mountain pastures, to... He was a kid who got up at dawn and went with his father, with the shepherd, with whoever it was. And probably his friends said, come on down to the Pozo Mancho [teen-age hangout], it was called, because the swimming pool wasn't there yet, and he went up on a bicycle [to the mountain pastures] and came down for a while [to his friends] at the hour, and then [went up] again. In other words, this came from inside him."

When I interviewed the son in 2010 and asked if he agreed that the end of transhumance and extensive livestock production was imminent, he responded passionately. *"But why the end? The end, why? I don't understand the end. People are living in the villages. The thing is if you like it or you don't like it. Today, with the subsidies and how we are. Well we are staying. ... It's not the end. It can't be the end, because you have seen it. In Ansó livestock production has weakened, and people from outside came. There will always be people who come. And we will eat everything and sell it."* When I asked if he had ever tried a different career, he responded, *"I tried it and I couldn't do it. I got my truck driver's license to drive trucks out there. One year I left just 200 sheep and in 6 months I had to buy [more back] because I couldn't do it. I was raised for this, I'm sorry."*

Eight years later, I interviewed the same herder again, this time during the fall transhumant trek. I asked what he liked about his sheep and herding, and he responded with the following, speaking to both his love of his animals and of the life of the transhumant. *"To be with them, hours and hours with them, to be with them, to take care of them and at the end of the day you gather them and all is well, and it's been a good day. And to see if a ewe is sick, if they eat, if the dogs are well, if they have good pastures, good health. One has to do one thing and the other, talk to the people from the slaughterhouse, talk to people about the feed, the veterinarians. For example, yesterday night, I was very happy, with all the people [transhumant helpers and villagers who invited them] there in Longás in the bar eating their dinner peacefully. The other day in Berdún*

also, it was good there. The day ends, all has gone well, everyone is happy. Good, me too, every day. The bad thing is that it ends quickly, this walking. We want more."

Thus, the major driver of the return to transhumance appears to be its profitability, and secondarily the reduced workload during winter, coupled with changing technological advances that make the journey and the winter season less arduous and minimize family separations. Transhumant identity and enjoyment of the lifestyle are less important overall, but may be very significant for a few multi-generational transhumant herders.

DISCUSSION

This qualitative case study of abandonment and revitalization of transhumance in two adjacent valleys of the western Aragonese Pyrenees suggests that prevailing narratives of the demise of transhumance do not fully match the reality in specific locales on the ground. While we cannot generalize from this case to the whole Pyrenees or to other traditionally transhumant regions of Spain, this case study illustrates that transhumance remains a relevant and appealing practice to some extensive livestock producers today, for a suite of economic, quality of life, animal welfare, and other reasons. Further, it highlights how the evolution of both technology and social norms, including gender norms, makes transhumance more compatible with a desirable standard of living and family life than it was when many herders in the Valles Occidentales abandoned transhumance in the 1980s.

According to interviews, the primary factors that drove abandonment of transhumance in the 1980s were social and economic. Social factors included the desire to live as a unified family, the desire to live specifically in the mountain village, and the brutally isolated and uncomfortable living conditions for shepherds in the wintering areas of the Ribera. The major economic factors were increasing crowding and resulting rising cost of and difficulty securing winter grazing

in the lowlands, and the shortage of labor for transhumance moves as the older generation passed on.

Economic factors appear to dominate reasons for resuming or starting transhumance, namely the high financial and labor costs of feeding stabled animals, the cost of infrastructure investment in barns that precludes increasing herd size for semi-extensive herders, and the increased availability and decreased cost of winter grazing lands in the Ribera and Monegros. The development and increased availability and affordability of technology including cars, mobile phones and electric fences has helped overcome the issues of isolation, family separation, and harsh working conditions in both winter and summer pastures, rebalancing the equation of relative economic gains and social costs of transhumance compared to semi-extensive production.

Changing gender norms in Spanish rural society could have both positive and negative impacts on the viability of transhumance in the future. In the case study sites, although a number of enterprises are registered in women's names, these are usually wives or mothers of the men who are the primary decision-makers and who work directly with the livestock. One exception is a woman sheep producer who immigrated from eastern Europe and runs a small flock in Ansó. Two older women I interviewed were married to transhumants and played larger supporting roles than was typical, helping their families during transhumant moves, usually by driving a car or truck, and in some cases spending time as a family living in a *refugio* (shepherd's refuge) in the summer pastures. One of these women also introduced production innovations to make the business more profitable. Although she played a key role in her family's enterprise, she reported being socially ostracized by other village women for violating the conservative gender norms in the town. Today, shifting gender norms in Spanish society, as well as new legal provisions that allow joint ownership by spouses, increase the potential for women to play visible and primary roles in livestock enterprises, including transhumance production systems. Although

none of the recently incorporated operations in Ansó or Hecho is woman-owned, several middle-aged male herders said that they would support their daughters if they wanted to enter the business. In other nearby valleys, a few woman-led enterprises exist or are in the process of incorporation, including one that has recently taken up transhumance and another that intends to.

Other aspects of evolving gender roles create potential barriers to transhumance, especially the increasing number of women who work outside the home and/or hold professional positions. Most jobs do not allow the flexibility to move the household from a summer village to a different winter town to follow a transhumant spouse, yet the off-farm income may be vital to the family budget. As more women become primary operators married to partners who hold off-farm jobs, the same challenges apply. Among the interviewees, one example of conciliation between spousal work and transhumance was reported by a transhumant married to a schoolteacher. Her occupation allows her the summer off, which enables her to move with the family to the summer village. However, keeping the family together during the school year also represents an economic trade-off because this transhumant moves his sheep to summer pastures later and down to winter pastures earlier, which represents a financial cost relative to other transhumant producers who arrive at the low-cost summer pastures earlier and stay longer in the fall. An important avenue for further research is the historical and evolving role of women and gender roles more broadly in transhumance. Learning from very long distance transhumants, like those on the Conquense drove road, how they manage family life and gender roles within a transhumant enterprise could provide a resource for other transhumant women, men and families throughout the country, as well as making more visible the roles of women in transhumance historically and in the present day.

Although the current trend towards revitalization of transhumance in the Valles is a promising sign, a number of threats to continuity remain.

In addition to the family and gender issues mentioned above, the deteriorating conditions of drove roads discourage transhumance on foot (see chapter 3). Aspiring producers who are not from a transhumant family face multiple challenges to establishing a transhumant operation, including securing rights to summer pasture, access to a barn (needed to legalize a new enterprise) and to winter grazing lands, and the opportunity to learn the transhumant route and herding practices. According to interviews at this study site, transhumance knowledge is passed on primarily via family relationships. However, a recent study suggests (Oteros-Rozas et al. 2013b) that learning from experience is as important as family ties for gaining transhumant traditional knowledge. Thus, a practical apprenticeship with an experienced transhumant may help starting transhumants gain essential practical knowledge. A further potential threat to continuity is the uncertainty about future subsidies and regulations. Subsidies that support extensive livestock production generally serve as a positive incentive for transhumance, but some regulations discourage it. Other circumstances that create uncertainty include the reintroduction of bears by the French government, which prey on sheep in the Valles Occidentales, and the perceived threat of wolf range expansion into the winter grazing lands of Monegros. Finally, public perceptions of herders generally and transhumance specifically sometimes generate direct conflicts (between recreationists, hunters or farmers and transiting herders, for example), but also play to herders' feelings of being disrespected, misunderstood and undervalued by society. Many interviews spoke to this malaise, the resulting loss of occupational pride, and its consequences for young people's interest in maintaining the tradition of transhumance.

It is important to recognize several limitations of this study. First, it does not include a complete census of producers in each valley of each type and thus does not provide a quantitative assessment of the precise number of transhumant and semi-extensive herders in each village over time. Second, the villages of Ansó and Hecho, especially the former, have several characteristics that may limit their

representativeness, even with regard to other villages in the Pyrenees. Ansó in particular has a historic reputation as being a village of livestock producers and transhumants. A local indigenous sheep breed named the Ansotana, is famed for its fine wool. The identity of the community is thus historically associated with livestock and transhumance, and this may remain an important aspect of herders' and the village's identity. In addition, both villages and their surroundings are highly scenic and provide a high quality of life for those who live there. Young people raised in the village often prefer to return to live there, and livestock production is one of the few livelihood options. Finally, Ansó as a village possesses extensive high quality summer pastures that residents are entitled to use for a small fee. This low-cost, high quality forage wealth creates an added incentive for residents to keep livestock. The narrow valley bottom that does not allow room for cultivation of hay or forage crops is one reason that historically all Ansó herders were transhumants, making use of the high mountains in summer and the Ribera in winter. This combination of characteristics that make Ansó and Hecho attractive places to live and raise livestock may also make the current apparent trend to increasing transhumance less applicable to other sites. It could also present somewhat unique additional opportunities for collaboration across sectors, with park managers and environmental interests.

CONCLUSIONS

This case study of the decline and reinvigoration of transhumance in the Valles Occidentales challenges the dominant narrative that transhumance is a practice of the past without present-day relevance and viability. As such, it illustrates that pastoral mobility in this region remains an important adaptation to take advantage of varying forage availability over space and time (high mountains in summer, crop aftermath in winter), using a production system that is more profitable than enclosed feeding for part of the year. Further, it shows how changing technology may facilitate the revitalization,

while changing social norms and gender roles potentially both facilitate and challenge continuity of this practice. Other challenges to continuity include poor conditions of droveroads, challenges to new incorporations and learning transhumance, uncertainty about subsidies and regulations, potential for increased predation from carnivores that are reintroduced or expanding their ranges naturally, and perceived low public respect for the herding profession.

An Economic Analysis of Transhumance

INTRODUCTION

In order to empirically evaluate herders' widespread perception of the profitability of transhumance, I collected primary data on the expenses and income associated with three types of operations, used these to parameterize a typical "model operation," and compared the three operation types under several different scenarios. This approach is based on a simple partial budget analysis approach (Alimi and Manyong 2000) that has been applied to ranch decision-making in the western US. The partial budget analysis together with a sensitivity analysis are used to compare the relative cost and revenue from different management choices, such as the alternative choice to sell cattle or buy hay in a drought (Feuz and Ritten 2014), under worst-case, likely and best-case cost and revenue scenarios. In this analysis, I compare three alternative management choices: stable-feed ewes during the winter, transhumance on foot to winter pastures, and transhumance by truck to winter pastures under worst, likely and best-case cost and income scenarios.

METHODS

DATA COLLECTION

I used a worksheet to collect detailed information on expenses and income for 6 sheep operations in the Valles Occidentales that practice 3 different management systems: transhumance on foot (n=3), transhumance by truck (n=2), and semi-extensive production (n=2) where sheep graze on communal summer pastures and are stable-fed during winter. One operation was in the process of converting to transhumance by truck, and data from this operation were used to parameterize both the semi-extensive and transhumance by truck systems. Because each operation differs in multiple ways, and I obtained data from only 2-3 operations of each type, I did not attempt a direct comparison of these operations. Rather, I used the data from the 6 different operations to create a believable "typical" sheep operation for the region as a baseline. I constructed an initial budget and conducted a preliminary analysis based on 3 worksheets and two semi-structured interviews. I showed these results to 3 additional producers



(one of each type), who highlighted missing costs and flawed assumptions, and provided 3 additional detailed budgets. Three important revisions came from the additional interviews that significantly affected the results. First, the initial models failed to account for lambs that herders retain as replacements for culled ewes (typically 20% of the base herd number of ewes). Second, the initial models assumed that all operation types had similar lambing percentages (150%). The follow-up interviews clarified that typical lambing percentages for transhumant herds (120%) are significantly lower than those for stable-fed herds (150%). Finally, the initial model did not account for the typical lambing pattern for all the operations interviewed in which many ewes lamb twice every three years. Finally, to determine a typical level of subsidy for an operation, I consulted the publically available information on EU PAC payments for each of the study communities to determine exactly how much each operation received in 2018. The values for the interviewed operations varied greatly, from 10,000-90,000 Euro, but for all the operations that receive subsidies in each village,

30,000 Euro is a typical amount for a mid-sized (1000 ewe) operation.

Data from all 7 budgets were used to develop the final base models of each operation type. These data, and additional research on typical production costs for semi-extensive and extensive sheep production (e.g. (Feuz et al. 2013)) were used to define the “best,” “likely,” and “worst” scenarios for costs and income, following Feuz and Ritten (2014).

BASELINE MODELS AND ASSUMPTIONS

The basic assumptions in the baseline budget for each operation type are depicted in Table 3, and assumptions on production characteristics (lambing percentages, replacement rate, etc.) in Table 4. Assumptions on unit prices were developed by combining data from the 7 actual operation budgets to determine a cost that would be most representative of herders residing in Ansó or Hecho with “derechos de vecinos” (residents’ rights) to communal summer, spring and fall pastures associated with these villages. These combinations were not necessarily

Table 3 Baseline assumptions for model “typical operation” for a sheep operation in the Valles Occidentales of Ansó and Hecho.

COSTS/EXPENSES				
Item	Unit	No of Units	No of Days	Unit Cost/Revenue (Euros)
Spring, summer & fall pasture (communal)	per ewe for the season		210	2
Winter pasture (leased)	ewe day		155	0 semi-extensive 0.06 transhumant
Grain, hay and straw for sheep	ewe day		155	0.26 semi-extensive 0.01 transhumant
Grain for lambs	per lamb			10
Medicines and parasite treatment	ewe			2.25
Veterinarian	ewe			1.50
Vehicle fuel	km/day	30 semi-extensive 75 transhumant	365	0.15
Vehicle maintenance and repair	annual cost			3000 semi-extensive 5000 transhumant
Trucking	truckload	1 per 500 ewes		400
Herder Compensation (salary, lodging/food)	per month	0 for operations < 2000 ewes; 12 for operations 2000 ewes or more		1500
Social Security	operator and employee	1 for operations of < 2000 ewes; 2 for operations 2000 or more ewes		3500
Shearing	ewe			1.30
Insurance	ewe			0.30
Housing	monthly rent	0 semi-extensive 6 transhumant		250
REVENUE				
Sale of lambs	lamb			67
Sale of wool	ewe			0.68
Sale of cull ewes	ewe			10
Subsidies	operator			30000

Table 4 Production characteristics of the different operation types.

REPRODUCTION CHARACTERISTICS	Semi-Extensive	Transhumant Trucks	Transhumant Foot
Lambing percentage	1.5%	1.2%	1.2%
Lambs retained for replacement	20% of ewes	20% of ewes	20% of ewes
Average times a ewe lambs each year (2.5-3 times every 2 years)	1.3	1.3	1.3
Average ewe deaths per year	15% of herd	15% of herd	15% of herd
Cull ewes sold per year	5% of herd	5% of herd	5% of herd
Ram purchases	None, rams from own herd	None, rams from own herd	None, rams from own herd

averages, because one of the actual operations was not located in Ansó or Hecho and thus had substantially higher summer pasture rental costs than are typical for the western-most valleys.

SCENARIO COMPARISON AND SENSITIVITY ANALYSIS

First, I conducted baseline analyses for each operation type using the assumptions in Tables 3 and 4, varying only the number of ewes (500, 1000, 2000). For operations of 2000 sheep or more, 2 workers were assumed for social security, and 12 months of a herder salary (Table 6).

Next, following the partial budget analysis methodology, I conducted a simple sensitivity analysis comparing the relative profitability of the semi-extensive operation to transhumance by foot and to transhumance by trucks under different income and cost scenarios. This analysis shows the outcome in terms of increased relative profits or losses of switching from semi-extensive production to each type of transhumance. For this analysis the lambing rates of the transhumance operations were held constant at 120%, while those of the semi-extensive operation varied from 130% (worst case), to 150% (likely case), and 170% (best case).

Feed costs had the greatest uncertainty and variability among surveyed operations. These costs included per ewe stable-feeding costs (for semi-extensive), per ewe pasture lease costs (for transhumants) and per lamb feed costs (all operation types). For the sensitivity analysis, I used a combination of the highest per ewe feed (semi-extensive) or pasture lease (transhumant) costs and the highest per lamb cost for the worst-case cost scenario. The likely cost scenario used the values in Table 3.

Following the model of Fuez and Ritten (2014), I used a partial budget analysis in Excel to assess the impact on revenues/losses of switching from semi-extensive production to transhumance by truck and to transhumance on foot. This analysis only considers the elements of the budget that differ between the operation types. Elements that are constant across operations are not included. Table 5 shows the assumptions used in the best, likely and worst-case scenarios.

RESULTS

Table 6 Depicts the assumptions for 3 scenarios for a typical sheep operation in the Valles Occidentales of Ansó and Hecho. All other assumptions were constant among the 3 operation types and are listed in Tables 3 and 4.

Table 5 Cost assumptions used for best, likely and worst-case scenarios

	Income		Costs	
	Semi-Extensive	Transhumant	Semi-Extensive	Transhumant
Worst	130% lambing rate	120% lambing rate	.40 Euros per ewe day (grain, hay feed) 16 Euros per lamb	.13 Euros per ewe day (pasture lease) 16 Euros per lamb
Likely	150% lambing rate	120% lambing rate	.26 Euros per ewe day 10 Euros per lamb	.06 Euros per ewe day 10 Euros per lamb
Best	170% lambing rate	120% lambing rate	.13 Euros per ewe day 6 Euros per lamb	.04 Euros per ewe day 6 Euros per lamb

Using the baseline, “most likely” assumption values for herd productivity (lambing percentages) and feed and pasture costs, transhumance is less profitable than semi-extensive production at small herd sizes (500 ewes) (Tables 7 and 8). Transhumance by truck is almost indistinguishable from semi-extensive production at 1000 ewes (Table 9), and transhumance by foot becomes slightly more profitable at this herd size (Table 10). Both types of transhumance become more profitable than semi-extensive production at the 2000 ewe herd size under the likely, typical cost and income scenarios (Tables 11 and 12).

Tables 7-12 show the impact on relative profit of switching from semi-extensive production to transhumance on foot or transhumance by truck at each of three operation sizes: 500, 1000 and 2000 ewes. When costs are high and operation sizes medium to large, transhumance by foot is always more profitable than semi-extensive production, even at the highest lambing rates for semi-extensive operations. It is substantially more profitable when semi-extensive lambing rates are low (130%), even though this is still a higher lambing rate than for transhumance operations (120%).

DISCUSSION

I used a simple analysis of a model typical sheep operation under three different production systems: semi-extensive where ewes are stable-fed all winter, transhumance by truck, and transhumance by foot, to assess herders' reported observations of the greater profitability of transhumance production systems in the region of the Valles Occidentales of the Aragonese Pyrenees. To my knowledge, there have been no prior published analyses of the relative profitability of these three production systems in this region or elsewhere in Spain. The analysis demonstrates that for this model typical operation, transhumance on foot is the most profitable production system when costs for all systems are high or typical, lambing rates are low or typical, and herd sizes are large. At small herd sizes (500 ewes), transhumance is only more profitable than semi-extensive production when costs are high and semi-extensive lambing rates are low or typical. Transhumance is more profitable at likely costs only if semi-extensive lambing rates are low (130%). At moderate (1000 ewes) or larger (2000 ewes or more) herd sizes, the relative profitability of transhumance is greater, but the profitability is only substantially greater when costs are high and/or lambing rates for semi-extensive production are low. Transhumance by trucks always has a relatively lower profitability than transhumance on

Table 6 Comparison of three production systems for a model “typical” sheep operation in the Valles Occidentales of Ansó and Hecho, Huesca, Spain under three different production scenarios: 500 ewes, 1000 ewes; and 2000 ewes

Scenario 1 - 500 ewes	Three Alternative Production Systems for a Model “Typical” Operation		
Assumptions	Semi-Extensive	Transhumant Trucks	Transhumant Foot
Lambing rate	150%	120%	120%
Herd size	500 ewes, 750 lambs	500 ewes, 600 lambs	500 ewes, 600 lambs
Communal pasture cost (spring, summer, fall)	210 days	210 days	210 days
Leased pasture cost (winter)	0 days	155 days @ 0.06 Euro per ewe	155 days @ 0.06 Euro per ewe
Ewe feed costs	155 days @0.26 Euro per ewe	155 days @0.01 Euro per ewe	155 days @0.01 Euro per ewe
Lamb feed costs	10 Euros per lamb	10 Euros per lamb	10 Euros per lamb
Travel costs	30 km/day	75 km/day	75 km/day
Vehicle maintenance	3000 Euro per yr	5000 Euro per yr	5000 Euro per yr
Trucking costs	0	2 trucks	0
Winter housing	0	6 months	6 months
Scenario 2 - 1000 ewes			
Herd size	1000 ewes, 1500 lambs	1000 ewes, 1200 lambs	1000 ewes, 1200 lambs
Trucking	0	4 trucks	0
Other assumptions stay the same			
Scenario 3 - 2000 ewes & hired herder			
Herd size	2000 ewes, 3000 lambs	2000 ewes, 3000 lambs	2000 ewes, 2400 lambs
Trucking	0	8 trucks	0
Social security	2	2	2
Herder salary/support	12 months @ 1500 Euros per month	12 months @ 1500 Euros per month	12 months @ 1500 Euros per month
All other assumptions same			

Table 7 Relative profit (loss) in Euros of switching from semi-extensive production to transhumance by trucks for a 500 ewe operation, under different income and cost scenarios. See Table 5 for best, likely and worst income and cost assumptions. Values rounded to nearest Euro.

		Income		
		worst	likely	best
		1.3% semi-extensive lambing rate	1.5% semi-extensive lambing rate	1.7% semi-extensive lambing rate
Costs	Worst	10871.3	4241.25	-2388.8
	Likely	5056.25	-2353.8	-9763.8
	Best	-3728.8	-11659	-19589

Table 8 Relative profit (loss) in Euros of switching from semi-extensive production to transhumance by foot for a 500 ewe operation, under different income and cost scenarios. See Table 5 for best, likely and worst income and cost assumptions.

		Income		
		worst	likely	best
		1.3% semi-extensive lambing rate	1.5% semi-extensive lambing rate	1.7% semi-extensive lambing rate
Costs	Worst	10071.3	3441.25	-3188.8
	Likely	4256.25	-3153.8	-10564
	Best	-4528.8	-12459	-20389

Table 9 Relative profit (loss) in Euros of switching from semi-extensive production to transhumance by trucks for a 1000 ewe operation, under different income and cost scenarios. See Table 5 for best, likely and worst income and cost assumptions.

		Income		
		worst	likely	best
		1.3% semi-extensive lambing rate	1.5% semi-extensive lambing rate	1.7% semi-extensive lambing rate
Costs	Worst	26106.3	12846.3	-413.75
	Likely	14476.3	-343	-15164
	Best	-3093.8	-18954	-34814

Table 10 Relative profit (loss) in Euros of switching from semi-extensive production to transhumance by foot for a 1000 ewe operation, under different income and cost scenarios. See Table 5 for best, likely and worst income and cost assumptions.

		Income		
		worst	likely	best
		1.3% semi-extensive lambing rate	1.5% semi-extensive lambing rate	1.7% semi-extensive lambing rate
Costs	Worst	27706.3	14446.3	1186.25
	Likely	16076.3	1256	-13564
	Best	-1493.8	-17354	-33214

Table 11 Relative profit (loss) in Euros of switching from semi-extensive production to transhumance by trucks for a 2000 ewe operation, under different income and cost scenarios. See Table 5 for best, likely and worst income and cost assumptions.

		Income		
		worst	likely	best
		1.3% semi-extensive lambing rate	1.5% semi-extensive lambing rate	1.7% semi-extensive lambing rate
Costs	Worst	58176.3	31656.3	5136.25
	Likely	37156.3	3716.25	-22124
	Best	-223.75	-31944	-63664

Table 12 Relative profit (loss) in Euros of switching from semi-extensive production to transhumance by foot for a 2000 ewe operation, under different income and cost scenarios. See Table 5 for best, likely and worst income and cost assumptions.

		Income		
		worst	likely	best
		1.3% semi-extensive lambing rate	1.5% semi-extensive lambing rate	1.7% semi-extensive lambing rate
Costs	Worst	61376.3	34856.3	8336.25
	Likely	38116.3	8476.25	-21164
	Best	2976.25	-28744	-60464

foot, but the patterns are similar relative to semi-extensive production. This analysis thus provides initial evidence of the economic rationality of transhumance under contemporary environmental and economic conditions. It also helps explain why operations that aim to expand herd sizes are more likely to switch to transhumance.

There are several limitations to this preliminary analysis, which should be considered an initial attempt to be further developed, verified and tested. A primary limitation of the current analysis is uncertainty about a number of the assumptions. First, the analysis omitted some types of costs, such as interest and depreciation, and some types of income, such as income from sales of cull ewes. However, follow up questioning with the interviewees suggested that this income is minimal. Second, there was tremendous variation in feed costs among interviewed operations, including both per ewe stable feeding costs and per ewe pasture lease costs. The sensitivity analysis addresses this to some degree, but more research is needed on a larger sample to understand average costs of production for different operation types. Third, this analysis assumed that all operations spend a similar amount of time on the communal spring, summer and fall pastures, and all must pay winter feed costs (either grain and hay or leased pasture) for the same amount of time. Fourth, the analysis did not account for potential differences in weight gain and lamb prices, but assumed that all operations sell lambs at the same size for the same price. Finally, the analysis also may have oversimplified transportation costs for the two types of transhumants by assuming that transhumants on foot have no trucking costs, when some operations truck a portion of their herd.

A second major limitation is that the analysis does not account for a number of economic and other factors that influence the broader social and economic costs and benefits of transhumance. Broader costs include the social costs of transhumance, such as family separation or logistical complications of moving children between school systems, etc. Economic

costs that are not accounted for include the labor requirements and costs of long distance transhumance and the potential added time and labor costs associated with semi-extensive production such as the time required daily to clean barns and feed confined animals. I did assume that both types of operations require at least one hired herder when they reach 2000 ewes. In addition, the analysis does not account for potential increased veterinary and animal health costs of semi-extensive operations due to greater likelihood of disease transmission, animal stress, and less healthy air quality in barns.

Finally, each operation is unique and transhumant herders in particular often have very individualized approaches to securing pastures, labor for moves, or refining their production system through specialized feeding or other management actions. Individual producers may therefore have particular strategies and circumstances that reduce costs or increase productivity. Thus, it is important that this analysis not be taken to represent the details of any specific operation, but rather to be representative of characteristics that are typical of operations in the region.

CONCLUSIONS AND IMPLICATIONS

This preliminary analysis illustrates the gains in profitability of transhumance on foot over semi-extensive livestock production for sheep producers in the Valles Occidentales, especially for larger operations (1000 ewes or more), when feed costs are typical or high. These results align with interview data from both sheep and cattle producers from the area and provide quantitative evidence to demonstrate the economic rationality for the resurgence in transhumance in this region in recent years. However, as the model typical operation is based on a limited number of interviews and the analysis is preliminary, further research is needed to 1) obtain cost and revenue data from a larger sample of operations of each type, 2) identify and parameterize other costs and assumptions not included in the current

model, and 3) test additional scenarios, such as the impact of direct marketing on profitability, for example. In addition, a similar model operation and comparison could be developed for cattle operations in the area, which have also resumed transhumance. A complete cost-benefit analysis would include non-monetary costs and benefits as well, including social costs of transhumance and potentially animal-welfare and environmental benefits.

This analysis also suggests additional studies to see what level of increased profitability would incentivize herders to take up transhumance. Finally, it suggests that a useful tool for producers could be an interactive budgeting tool (such as are common in the US), that would allow herders to assess the impacts of various production decisions and marketing strategies on costs, revenue and profitability.

Conclusions & Recommendations

CONCLUSIONS

The findings of this report challenge the dominant narrative of the demise of transhumance in rural Spain, showing that transhumance remains a relevant and profitable practice in some regions. So relevant and profitable that in one case study region, the number of practicing transhumants on foot has increased in recent years. The knowledge that transhumant herders create and maintain through active use continues to develop and adapt in response to a dynamic social-ecological context. Yet transhumance and the transhumant herders who practice it face significant challenges. At the most fundamental level, the conditions of *vías pecuarias* are precarious despite legal protections, creating the potential for a positive feedback loop in which shrub, cropland and paved road encroachment into the *vías* makes the passage of animals difficult or impossible due to both physical barriers and insufficient forage. The reduced number of transhumant animals, in turn, contributes to shrub invasion and neglect of maintenance by responsible government agencies. A second

significant challenge remains conciliation of transhumant family relationships with the mobile lifestyle that transhumance requires. While technology has eased this challenge somewhat, changing gender norms may also create new challenges as more women become the primary operators of livestock enterprises or pursue careers outside the home. Third, transhumance, like other forms of extensive livestock production in Spain, relies heavily on subsidies, the future of which are uncertain and which are subject to various abuses. Fourth, regulations and bureaucracy are a particular bane to transhumant herders, who are often subject to additional paperwork and requirements when they cross borders between autonomous regions and because they typically must maintain infrastructure in both summer and winter grazing areas. Fifth and finally, transhumants, like other extensive producers and rural residents, feel neglected by the government and misunderstood by the broader public, and this may ultimately affect their sense of pride and identity with their herding occupation and transhumant way of life.

RECOMMENDATIONS FOR POLICY AND OUTREACH

Many of the findings in this report are new to science but not to those working on behalf of extensive and transhumant livestock producers. The research results in this report suggest areas where policy reform or improved implementation of existing laws and policies is needed if the aim is to support viable transhumance into the 21st century. The following are some of the key policy and outreach recommendations based on the findings.

1. Improve maintenance of existing *vías pecuarias* and management compatible with livestock passage. This includes brush removal, enforcement of legal widths of the *cañada* (penalize landowners that cultivate or fence in parts of the *cañada*), removal of physical barriers that block passage, provision of alternate routes when the main route has been appropriated for a paved road, and enforcement of regulations that prohibit herbicide use in the *vías pecuarias*.
2. Consider national and/or regional legislation to protect the rights of transhumants beyond the existing law for *vías pecuarias*.
3. Provide additional infrastructure to support transhumant livestock and herders such as corrals, watering troughs, camping facilities or refugios, bathing and sanitation facilities (e.g. pit toilet).
4. Sensitize public service providers such as schools and health clinics to the situation of transhumant families. Identify models of family work-life consilience that support transhumance, including situations where one spouse works outside of the livestock operation.
5. Maintain EU CAP supports for extensive livestock production, such as payments for use of remote and high nature values areas and improve ways that eligible areas are calculated to account for forage value of woodlands and grazeable shrublands. Advocate for specific payments for transhumance on foot at the EU, national and/or regional levels.
6. Improve implementation of EU CAP to control abuses that lead to poor grazing management or harm animal welfare.
7. Raise public awareness of the benefits of transhumance for the environment; animal welfare and production of high-quality animal products; and maintenance of rural life, cultural landscapes, and traditional knowledge.
8. Facilitate constructive multi-stakeholder dialog and collaborative problem solving among transhumant and extensive producers and other key stakeholders such as government, environmental and animal rights organizations.
9. Provide professional development and peer-to-peer knowledge exchange for transhumant pastoralists and families.
10. Develop opportunities for new and first-generation herders to learn and take up transhumance via apprenticeship programs or an “*escuela de pastores*” (shepherds’ school) that focuses specifically on transhumance.

RECOMMENDATIONS FOR FURTHER RESEARCH

- 1.** Conduct a deeper and more systematic examination of transhumant herders' traditional knowledge related to soil, plants and wildlife, especially species of conservation concern or prone to conflict with humans; climate and weather; ethnoveterinary knowledge; applied animal behavior (herding practices); and traditional processing of animal products.
- 2.** Carry out in-depth analysis of changes in transhumant knowledge and practices among herders who continue to practice transhumance.
- 3.** Examine the role of social relationships and social skills (as a dimension of TEK) in the evolution and maintenance of transhumance.
- 4.** Explore the roles of women and evolving gender roles and social norms more broadly in maintaining, abandoning and transforming transhumance. Document successful strategies for family consilience and schooling in transhumant families.
- 5.** Investigate communal pasture governance, changes in governance institutions over time, and their relationship to or impacts on transhumance.
- 6.** Study how transhumance is learned and how transhumant TEK is transmitted within and across generations.
- 7.** Research the drivers and incentives/facilitating factors to abandon, continue, or take up transhumance, historically and in the current time.
- 8.** Undertake more rigorous economic analysis of transhumance on foot and by truck relative to semi-extensive production systems.
- 9.** Develop an interactive budgeting tool to allow current and prospective producers to evaluate relative profitability of different production scenarios.
- 10.** Examine the role of herder and transhumant identity in maintenance, abandonment and transformation of transhumance in the 21st century.



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