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Goat transhumance in Mediterranean Turkey: characterization and key factors driving its transformation

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Goat transhumance in Mediterranean Turkey is undergoing significant transformation due to intersecting political, economic, institutional, and environmental pressures. This study explores these changes by identifying the primary forces driving transformation and by analyzing the adaptive responses developed by transhumant pastoralists in this evolving context. Specifically, the research aims to both document and describe current goat transhumance practices and to assess how they are being reshaped by policy frameworks, market integration, ecological shifts, and socio-political dynamics. Through field-based ethnographic and ecological research conducted over two full migration seasons (2019–2023), the study offers insights into how traditional knowledge systems interact with sustainability paradigms—particularly green and circular economy principles—to manage uncertainty, maintain mobility, and support pastoral resilience. Data were gathered through participant observation, semi-structured "walk-and-talk" interviews with 15 families, and ecological surveys of migration routes, stopover areas, and herd-environment interactions. Ethnographic findings emphasized labor dynamics, gender roles, and mobility structures, while ecological data addressed pasture conditions and grazing impacts. Triangulating these data revealed the socio-ecological logic of transhumance under shifting conditions. Six core drivers were identified: rural urbanization and demographic trends, economic pressures and market integration, governmental and policy frameworks, impact of climate change, COVID-19 pandemic and the emergence of circular and green economic frameworks. Despite mounting pressures, the study highlights that pastoralists continue to engage in strategic adaptations—such as rotational grazing, breed diversification, and labor reorganization—grounded in long-standing ecological knowledge. The findings demonstrate that transhumance persists not as a relic of the past, but as a dynamic and ecologically efficient livelihood system capable of responding to multi-scalar rural challenges.

KEYWORDS

goat pastoralism, green and circular economy, Mediterranean Turkey, transformation, transhumance

Introduction

Transhumance, practiced by pastoral communities across remote regions of the world, is a sophisticated life management model developed through generations of ecological knowledge and adaptive resilience (Easdale et al., 2023; Manzano-Baena and Casas, 2010; Ocak, 2016; Oteros-Rozas et al., 2013; Zanon et al., 2022). It operates on a low-input, low-output system while making intensive use of natural, human, and social capital to generate economic, environmental, and cultural benefits. Globally, transhumance is recognized for its contribution to biodiversity conservation (Hilty et al., 2020), sustainable land use (Zanon et al., 2022), maintenance of cultural landscapes (Azcárate and Hevia, 2023; Hevia et al., 2013), reduced reliance on fossil fuels, minimal waste generation, and the provision of high-quality animal products (Easdale et al., 2023). These systems exemplify long-standing forms of human–environment interaction shaped by mobility, adaptation, and collective governance.

In the Mediterranean and Alpine regions, transhumance has also received institutional recognition. In 2019, it was inscribed on UNESCO's Representative List of the Intangible Cultural Heritage of Humanity, based on a joint nomination by Italy, Austria, and Greece. This recognition was reaffirmed in 2023 at the 18th session of the Intergovernmental Committee in Botswana, underscoring global concern for the preservation of mobile pastoral systems. While the inscription applies to select European contexts, it reflects a broader appreciation of transhumance as a living cultural heritage that fosters ecological stewardship and intergenerational continuity.

In Turkey, transhumance has a deep historical legacy and remains vital for rural livelihoods in ecologically marginal yet resource-rich upland regions. Particularly in Mediterranean Turkey, seasonal livestock mobility—especially goat transhumance—has shaped social institutions, cultural memory, and rangeland ecology. The practice represents an adaptive social-ecological system that evolves in response to climatic, topographic, and institutional dynamics (Coppock et al., 1986). Over centuries, transhumant communities have tailored livestock practices to highly variable environments, contributing to spatial diversity, ecological resilience, and resource-sharing regimes (Manzano-Baena and Casas, 2010). Routes used by transhumants often function as ecological corridors, linking high-value habitats and reducing landscape fragmentation (Hevia et al., 2013; Azcárate and Hevia, 2023; Hilty et al., 2020).

While often framed as a declining tradition, transhumance is increasingly being reinterpreted through the lens of innovation. Transhumant communities also exemplify what Zagata et al. (2020) define as "retro-innovators"—actors who consciously revive and recontextualize historic practices, ecological knowledge, and communal technologies to address contemporary sustainability challenges. Retro-innovation reflects a conscious process involving the critique of modernist paradigms, the recovery of long-forgotten experiential knowledge, and its integration with current socio-technical conditions. From this perspective, transhumance is not a disappearing tradition but a dynamic and future-oriented practice that aligns with green economy models, circular resource use, and climate adaptation strategies. These potential benefits, however, are highly contingent on the policy and institutional contexts in which pastoralists operate. These retro-innovative benefits, however, depend on careful stewardship, including the maintenance of traditional grazing thresholds to prevent overuse and ecological degradation.

Despite its significance, transhumance in Mediterranean Turkey is under pressure from a range of structural and policy-related challenges that merit closer investigation. The absence of a national mountain area management plan has left pastoral communities without proper institutional support. At the same time, weak representation at the governmental level has resulted in a lack of coordinated efforts to safeguard pastoralist rights. Inefficiencies in implementing pasture laws, coupled with limited success in rural development projects, have exacerbated the situation. Additionally, persisting rural poverty, frequent shifts in agricultural policies, and mismanagement of pasturelands have placed further strain on transhumant communities. Overgrazing and declining productivity, coupled with difficulties in marketing livestock products and security concerns in remote mountain areas, have further discouraged younger generations from continuing this way of life (Akbas and Baykal, 2022). However, there is limited research on how these transformations are being negotiated in practice—particularly in the western Taurus region—and what this means for the future of transhumance as a viable livelihood system.

While academic interest in transhumance has grown, most studies in Turkey focus on Eastern Anatolian practices (Albayrak, 2020; Siddiq and Şanlı, 2020; Thevenin, 2011) or the socio-economic transformation of pastures in Southeastern Anatolia (Bakırcı, 2019). Notably, Ertas (2020) explores the impact of pasture bans and land privatization on pastoral sheep farming in Eastern Turkey, offerimfng valuable insights for policymakers. Important archaeological studies have explored the origins of pastoralism in Anatolia (Arbuckle, 2012; Hammer and Arbuckle, 2017), yet there remains limited research on contemporary goat transhumance in the western Taurus region, particularly through the lens of institutional transformation and adaptive governance.

This study aims to document goat transhumance and investigate the transformation by identifying the main political, economic, socio-ecological, and institutional drivers interact to reshape transhumant mobility, and how herders develop adaptive strategies in response. Drawing on ethnographic fieldwork and ecological observations conducted over two full migration cycles (2019–2023), the study contributes to scholarship on contemporary transhumance practices between

Mediterranean region and Anatolia, also explores the role of green and circular economy models in ensuring the sustainability of transhumance, emphasizing local strategies for managing uncertanitys, market integration dynamics, and adaptive pastoral practices.

Timeline of Turkish transhumance and state of the art

The term transhumance originates from the Latin words "*trans*" (across) and "*humus*" (ground) (Bhasin, 2011) and is believed to have emerged in the Mesopotamian region during the Mesolithic Period (Arnold and Greenfield, 2006; Nandris, 1985). Livestock domestication began around 10,000 BC, particularly in the Fertile Crescent, which spans present-day Turkey and Iran (Arbuckle et al., 2014). In Anatolia, the transition from hunting-based economies to livestock-based systems during the Neolithic period marked the origins of pastoralism (Arbuckle, 2014). Transhumance predates the arrival of Turkic communities in the 11th century, as historical accounts describe mobile pastoralism in the region long before their settlement. Herodotus (fifth century BC) observed nomadic groups wintering in Bodrum (a town in Western Turkey), describing their way of life as distinct from urbanized civilizations.

Historically, Anatolian highlands served as summer pastures, while Mediterranean coastal rangelands provided winter grazing grounds. Transhumance spread throughout the Fertile Crescent, influencing regional cultures and production systems. During the Ottoman period, transhumant communities, referred to as "Turkomen" and later "Yörük" (meaning "those who walk"), maintained their pastoral traditions despite state-imposed efforts to settle them (Sahin, 2006). The Ottoman Empire attempted to regulate transhumance by registering nomadic groups as "konar göçer" (seasonal migrants) in the 16th–18th centuries. These groups were assigned various economic roles, such as mine workers, lumberjacks, bridge and road constructors, and suppliers for the Ottoman army, which relied heavily on their livestock (İnalcık, 2014). Judicial records from 1672 indicate that the Aleppo Turkomens were required to provide 17,000 sheep for the army (İnalcık, 2014). Transhumant groups in Rumelia, a division of the empire that included present-day Albania, North Macedonia, and Thrace, were also employed in mines and fortresses (Gokbilgin, 1957). The Ottoman administration sought to curb nomadism by promoting urbanization and taxation, as mobile pastoralists were difficult to govern and tax efficiently (Oksay and Çelik, 2011). Policies were designed to either sedentarize these groups or restrict their migration patterns to ensure administrative control (Lindner, 1983). Both the Ottoman Empire and the Republic of Turkey implemented policies that progressively curtailed transhumant mobility in Anatolia. In the Ottoman period, nomadic communities such as the Yörüks were registered as *konar-göçer* (seasonal migrants) and gradually subjected to administrative control, taxation, and labor obligations, which aimed to integrate them into sedentary frameworks (İnalcık, 2014; Sahin, 2006; Lindner, 1983). This sedentarization agenda persisted into the Republican era, where state-led modernization projects—particularly under the 1926 Settlement Law—sought to transform mobile pastoralists into settled agriculturalists, viewing mobility as incompatible with centralized governance and national development goals (Bates, 1973; Barkey, 2008). These historical continuities underscore a long-standing institutional tendency to "slow" or suppress transhumance in favor of fixed settlement.

Contemporary Turkey remains home to various pastoral and nomadic communities, including the Laz and Georgian nomads in the Black Sea region, the Turkic, Turkomen, and Tahtacı groups in Western Anatolia and the Taurus Mountains, and predominantly Kurdish pastoralists in Eastern Anatolia (Büyükcan Sayılır, 2012). The Mediterranean region, with its unique bioclimatic conditions, has historically been a primary habitat for goat transhumance, providing vital sustenance for local communities. However, in recent decades, traditional goat transhumance has declined due to socio-economic shifts, insufficient governmental support, restrictive pasture laws, limited subsidies, land-use changes, and climate variability. Additionally, conflicts between transhumants and local villagers, as well as restricted access to essential services such as healthcare, education, and security, have further exacerbated challenges for these communities.

Despite these adversities, transhumance persists in Turkey, albeit on a reduced scale with a distinctive social structure (Table 1). Unlike most European countries, where transhumant movements over 10 km typically involve trucks (Malzac et al., 2024), on-foot goat transhumance remains prevalent in Mediterranean Turkey. Goat pastoralists cover approximately 400–450 km in 30–45 days during the spring migration from Mediterranean highlands to Central Anatolian pastures (Ocak, 2016). However, shrinking migration routes and agricultural expansion force communities to traverse narrow corridors, accelerating the migration process to avoid conflicts. Conversely, the autumn migration follows a more regulated pace, as harvested fields present fewer constraints. Migration routes, traditionally passed down through generations, remain stable unless disrupted by land-use changes or access restrictions (Ates et al., 2024). In the Mediterranean region, goat pastoralists continue to migrate on foot, whereas sheep pastoralists in central, western, and southeastern Anatolia increasingly rely on transportation by truck. Community names often reflect the breeds they raise, such as Beritan, Şavak, Akkeçili, Sarıkeçili, Karakeçili, Akkoyunlu, and Karatekeli. Determining the precise population of transhumant communities remains challenging due to gaps in the national livestock inventory, which does not differentiate between production systems. However, fieldwork interviews indicate that the Sarıkeçililer community comprises approximately 150 families, each living in its own tent

TABLE 1 Main transhumance communities and their location in Turkey.

Transhumant communities	Region	Raised animals
The Laz and Georgian	Black Sea Region	Goat
Turkomen and Tahtacı	West Anatolia	Sheep
Kurdish	South East and East Anatolia	Sheep
Turkish	Central and West Anatolia and Mediterranean	Goat

TABLE 2 Data collection and analysis.

Data source	Data analysis	Period
Semi-structured walk and talk interviews with transhumant herders (n: 15)	Interviews have been recorded and transcribed, analyzed as text	2019 April, May, June, July, October, November
Participant observation (n: 140)	Documented into field notes, analyzed as text	2019–2023
Taking photos (n: 868)	Analysis of visual materials	2019–2023
Archival data (n = 120)	Analysis of verbal and visual materials	2014–2023

with five to six households. The Sarıkeçililer are notable for their organized structure, which includes an association dedicated to preserving their production practices and traditional way of life.

Goat transhumance in the Mediterranean region relies on locally adapted Hair and Honamlı goat breeds, which are well suited to the area's environmental conditions and grazing systems. This traditional practice plays a crucial role in food security by ensuring a stable supply of animal-derived products. However, seasonal migration, commencing in April, frequently disrupts education, limiting many community members to primary schooling. Furthermore, inadequate healthcare facilities in both summer and winter pastures, as well as along migration routes, pose significant hardships. Given these dynamics, this study aims to analyze not only the historical and contemporary aspects of transhumance in Turkey but also the transformations it has undergone in recent years and the underlying drivers of these changes.

Materials and methods

Study area

This study examines the seasonal transhumant practices of the Sarıkeçililer community in southern Turkey, who migrate annually between coastal highlands near Aydıncık (Mersin Province) and upland pastures near Seydişehir (Konya Province) (Figure 1). The region encompasses both Mediterranean and continental mountain climates. Coastal zones experience annual precipitation between 600 and 1,100 mm, with warm, arid summers and mild, wet winters. In contrast, the upland pastures—located between 1,500 and 2,200 m near Seydişehir—receive approximately 1,100 to 1,300 mm of annual precipitation (TSMS, 2024), most of which falls as snow from November through March (Sensoy and Demircan, 2016). This climatic diversity supports a wide range of ecosystems. Accordingly, the Anatolian biogeographical region harbors 28 protected areas and sustains significant biodiversity across various ecoregions (Ambarli et al., 2016; Sekercioglu et al., 2011). Vegetation displays clear altitudinal stratification. Lower elevations (0–800 m) are dominated by maquis shrublands and secondary growth, including *Arbutus andrachne, Quercus coccifera, and Laurus nobilis*. At mid-altitudes, mixed coniferous forests, especially *Pinus brutia, Pinus nigra, and Juniperus* species, are prevalent. Subalpine zones above 1,500 m support species-rich grasslands alongside *Cedrus libani and Abies cilicica* stands.

The Sarıkeçililer follow a biannual migratory cycle. From November to April, they winter in the coastal highlands, where forage remains accessible. During April and May, they ascend along traditional northward routes to reach summer pastures. From May through October, they graze flocks in high-altitude areas before descending gradually to winter settlements in late October. These seasonal migraation, covering 400–450 km and last aproximatelly in 30 days. National agricultural statistics do not distinguish transhumance from other livestock production systems, limiting the resolution and relevance of available figures. Consequently, most insights into flock size, migration patterns, and community demographics stem from independent research efforts, local observations and community knowledge rather than official data collection. Current estimates, based on field interviews (2016–2020), local administrative records (2020) and data from Sarıkeçililer Association for Solidarity and Mutual Aid (2019), suggest that approximately

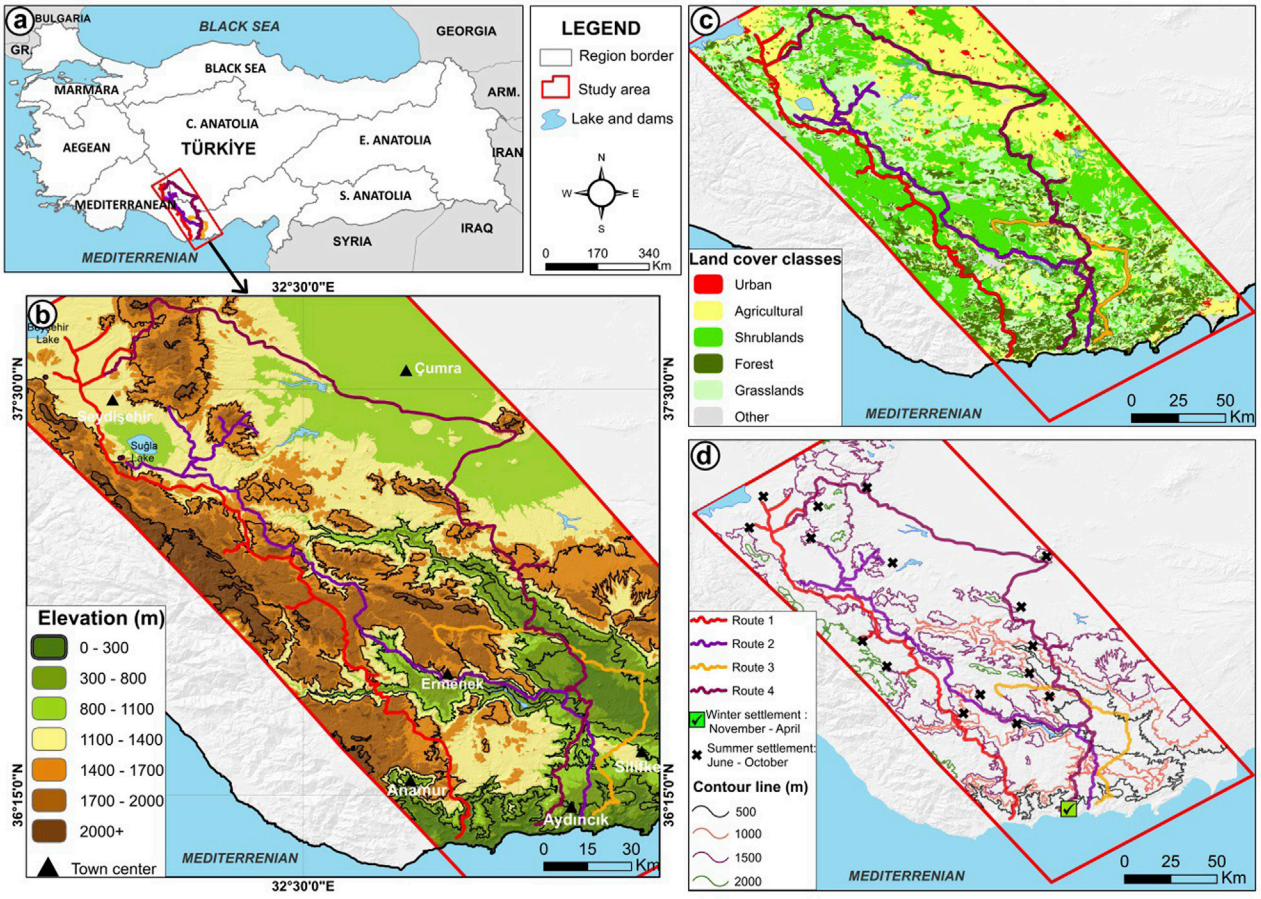

FIGURE 1
Study area **(a)** location, **(b)** elevation map, **(c)** land cover classes adapted from CORINE 2018 maps, and **(d)** the temporal and spatial dynamics of migration routes.

150 households continue to practice goat transhumance, managing an estimated 90,000 goats along these routes.

Data collection

Field data were gathered over two consecutive years (2019–2020) along transhumant migration routes from Mersin Province to the Konya region, encompassing both settlement areas and cultural festivals (Table 2). The Sarıkeçililer community comprises approximately 150 families. Fifteen households were selected using snowball sampling—a widely employed non-probability method in ethnographic research, particularly effective for socially interconnected or hard-to-reach populations where trust is vital (Noy, 2008; Biernacki and Waldorf, 1981). Initial participants, identified based on their continued engagement in full transhumant migration, referred researchers to additional families, facilitating broader access and ensuring the inclusion of diverse household perspectives while respecting community dynamics. Households were selected to reflect diversity in flock size and geographic distribution along the traditional migration corridor. Flock sizes among surveyed households ranged between approximately 500 and 600 goats, depending on household labor availability and resource access. The migration corridor covered extends from the coastal highlands near Aydıncık (Mersin Province) to the upland pastures around Seydişehir (Konya Province), spanning diverse climatic zones and ecological conditions. Within each household, interviews were conducted with multiple family members—including adult men and women, youth, and elders—to capture varied perspectives on migration, labor roles, ecological knowledge, and adaptive strategies (Moktan et al., 2008). Interview questions were designed to explore not only pastoral practices but also perceived changes in transhumance patterns and the adaptive strategies herders employ in response to ecological and institutional pressures. Primary data sources included semi-structured walk-and-talk interviews and participant

observation during full transhumant cycles from Mersin to Konya. Researchers embedded themselves within the migrating community, conducting longitudinal participant observation. Daily activities, decision-making processes, and knowledge transmission were documented. Interviews were audio-recorded with informed consent, then transcribed and translated into English. Photographic documentation and detailed field notes captured social, cultural, and gendered dynamics relevant to transhumant pastoralism.

Ecological observations aimed to document how herders interact with rangeland environments. Key indicators included vegetation condition, pasture use, water availability, and stopover site characteristics. Observations covered dominant plant species, ground cover, overgrazing signs (e.g., erosion, trampling), and herder-reported forage quality. Grazing intensity, dung accumulation, site selection, and spatial behavior were recorded systematically. Stopover sites (*konalga*) were assessed for vegetation density, shade, and water proximity. Observations spanned two migration cycles (spring and autumn of 2019 and 2020). According to Turkish State Meteorological Service data, the Taurus uplands received 950–1,050 mm of precipitation in 2019 and 850–950 mm in 2020, with notably drier conditions in spring 2020 (TSMS, 2024). Observation points were selected collaboratively with herders based on traditional ecological knowledge, targeting ecologically significant areas. Sites were stratified across environmental gradients (e.g., elevation, vegetation type, and soil condition), ensuring ecological and cultural representativeness. Topics discussed during interviews included migration challenges, gendered labor roles, natural resource management, livestock production, and transhumance-related products. Participants were informed about the study's aims, assured confidentiality, and provided consent for recordings and photographs. Expert consultation with anthropologist Dr. Atilla Erden offered valuable guidance on historical and contextual aspects of transhumance.

Data analysis

Interview transcripts and field notes were analyzed using inductive thematic coding, applying a grounded theory approach to identify recurring patterns and key themes. Codes were iteratively refined through constant comparison. Ecological data were analyzed using standard indicators of pasture condition, grazing pressure, and water availability. These data were cross-verified with ethnographic findings through triangulation—a qualitative strategy that enhances credibility by validating insights across multiple data sources (Denzin, 1978; Patton, 1999). This triangulated analysis integrated interviews, observations, and photographic evidence to ensure interpretive accuracy and reduce potential bias. SPSS software supported the organization of qualitative data, assisting in synthesizing household-level narratives and ecological observations. Expert input from Dr. Erden further contributed to contextualizing the findings, particularly in relation to historical migration patterns and socio-environmental changes. By combining ethnographic, ecological, and documentary data—and incorporating intra-household diversity—the study provides a holistic understanding of the socio-ecological dynamics shaping contemporary pastoralism in Mediterranean Turkey.

While the study employed inductive thematic coding to identify patterns from interview transcripts and observational field notes, not all transformation drivers were derived solely from this grounded process. In particular, themes such as climate change, the COVID-19 pandemic, and the relevance of Green and Circular Economy frameworks were included as analytically significant drivers based on their prominence in international literature and policy discourse on pastoralism. Their inclusion reflects a triangulated methodology, wherein empirical field data were cross-referenced with macro-contextual dynamics. Participants frequently referenced unpredictable seasonal weather, mobility restrictions during the pandemic, and adaptive shifts in livestock and resource use aligned with sustainability concepts—substantiating the relevance of these broader drivers in the localized context of Mediterranean Turkey.

Results

Characteristics of goat transhumance

Migration and pastoral practices

The spring migration spans six to 7 weeks, covering 8–10 km per day, totaling 400–450 km. It begins in mid-April in Mersin (Mediterranean region) and concludes in the summer pastures of Konya (Central Anatolia) around June (Figure 1). These highland pastures serve as summer grazing areas for approximately 4.5–5 months. By mid-October, the transhumant communities gradually descend to lower altitudes, returning to their winter settlements in Mersin province. The migration route requires prior approval from local authorities, including the Regional Municipality and the Ministry of Environment, Urbanization and Climate Change. This seasonal pattern has persisted for centuries, with minor route modifications driven by administrative decisions or environmental factors. Each year, the number of stops, duration of stay at each site, and specific migration paths are subject to change based on governmental permissions and ecological conditions. These stopover locations, known as "konalga," are individually named, often reflecting historical or cultural associations. Hearthstones mark the tent settlement areas, symbolizing the community's temporary homes during migration (Figure 2). These waypoints function as cultural landmarks, forming an ancient navigational system akin to a traditional GPS. The location of each stop is strategically chosen

FIGURE 2
Heart stones on the migration route.

FIGURE 3
Typical cistern and wells along the route.

based on the availability of water sources, such as wells and fountains (Figure 3). As families depart, they leave the hearthstones undisturbed, enabling them to recognize their previous settlements upon their return.

Migration begins early in the morning, with family roles clearly defined in advance. Experienced young male and female shepherds are responsible for guiding the goats along the route, ensuring that herds remain cohesive and avoid cultivated fields. Damage to crops can lead to conflicts with settled communities, which are typically mediated by elders or women through monetary compensation or livestock donations. Traditionally, personal belongings and tents were transported on camels, accompanied by donkeys and horses. While modern days transhumants increasingly rely on tractors and trucks, challenging mountainous roads often limit their practicality. Historically, camels were adorned with decorative face bells "*Gübürdek*" and beaded ornaments "*Keydirme*" before embarking on their journey (Figure 4). They were also covered with colorful sacks "*Alaçuval*" and intricately woven kilims "*Cicim.*" Until the 1990s, settled populations would gather along migration routes to witness this spectacle, which resembled a ceremonial procession. However, such displays have largely disappeared. Today, only a few remaining camel convoys persist, led by a respected female figure within the transhumant group. This tradition underscores the matriarchal structure of the community, where women hold a prominent role in decision-making and social organization (Figure 5).

All the transhumant communities demonstrate a profound awareness of natural resource limitations and the environmental impacts of overgrazing, vegetation loss, and erosion. These concerns, frequently expressed in interviews, reflect a deliberate strategy to mitigate ecological degradation. To ensure sustainability, they employ rotational grazing, minimizing the time spent in a single location to prevent land exhaustion. This practice aligns with traditional agroecological methods documented in Ottoman records, which highlight the resource management expertise of Anatolian pastoralists (Sahin, 2006). By synchronizing grazing with the flowering periods of shrubs and selectively browsing understory vegetation in forested areas, they contribute to ecosystem stability. Additionally, the

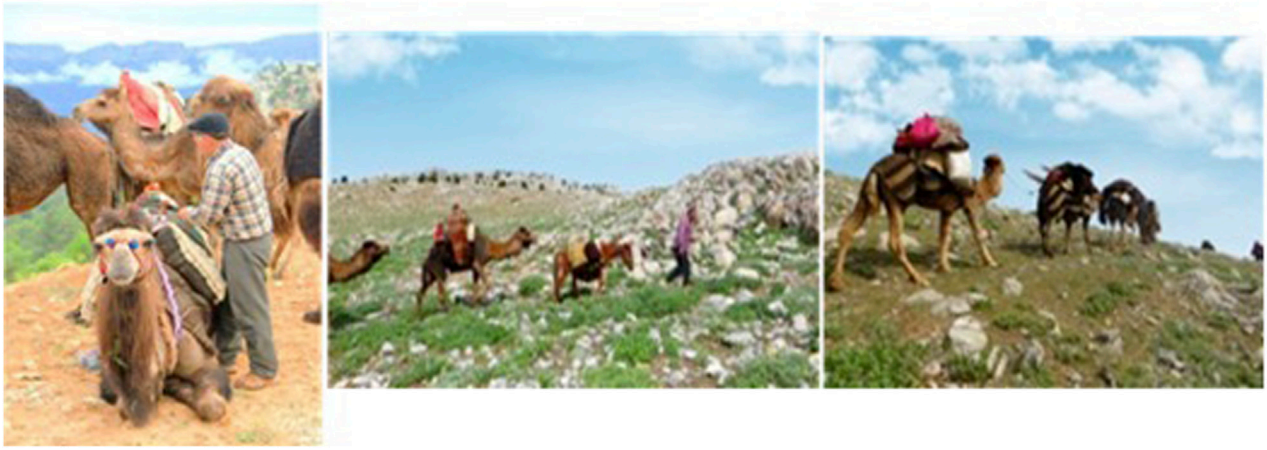

FIGURE 4
Camel convoy on the migration route decorated with face bells.

FIGURE 5
Woman leading the camel convoy.

natural deposition of urine and manure enhances soil fertility, reduces erosion, and improves water quality in catchment areas (Mediterranean Consortium for Nature and Culture, 2013). Transhumant goat grazing also plays a crucial role in forest management. The pastoral goat communities closely monitor herd movement to minimize damage to young trees and bark. Grazed reforested areas benefit from natural fertilization, promoting forest regeneration. Furthermore, transhumant flocks significantly reduces wildfire risk compared to ungrazed areas. By consuming understory vegetation and low shrubs, goats limit the accumulation of flammable biomass, decreasing fire intensity and spread. Their trampling also buries volatile pine needles, further reducing fire hazards. The effectiveness of goat grazing in fire prevention has been widely documented (Rosa García et al., 2012). Beyond vegetation management, transhumant flocks interact with broader ecological processes. As herbivores, they utilize natural forage and water sources while serving as prey for predators such as foxes, wolves, and occasionally bears. Predator protection in the communities relies primarily on Anatolian shepherd dogs and, in some cases, rifles. Despite these measures, predator attacks remain a significant challenge. In accordance with ecological traditions, livestock attacked and killed by predators are not buried or consumed by the community but are left for scavengers, contributing to nutrient cycling within the ecosystem (Figure 6).

These evolving patterns of mobility, influenced by both ecological conditions and administrative oversight, highlight emerging pressures on the continuity of traditional transhumant routes—issues explored further in the discussion of environmental and institutional drivers. At the same time, these shifting practices reflect a deeper transformation in the spatial and temporal logic of transhumant mobility. Rather than


FIGURE 6
Goat died by a predator attack and hung on a tree for natural recycling.

merely reacting to external constraints, herders increasingly engage in situational mobility—a flexible, real-time recalibration of routes, timing, and labor roles in response to dynamic ecological conditions and administrative regulations. This marks a transition from traditional fixed-route pastoralism to a more contingent and adaptive mobility regime, grounded in localized knowledge and responsive decision-making. These changes, therefore, represent not only adaptation but a structural reconfiguration of the mobility system itself.

Gender role

Transhumant societies are generally male-dominated and paternalistic, reinforcing male supremacy and the subjugation of women (Bhasin, 2011). However, the role of women varies across cultures, with a common characteristic being their ability to perform multiple tasks simultaneously, drawing on ancestral knowledge and specialized skills. In Turkish transhumance, particularly among the Sarıkeçililer, women occupy a distinctive position due to the community's shamanistic heritage and matriarchal family structure. They form the backbone of the household economy, as livestock production and processing depend heavily on their labor. Unlike many other Turkish transhumance groups, Sarıkeçililer women exert considerable influence over household decision-making.

Their primary responsibilities include childcare, animal product processing, livestock breeding, firewood collection, and meal preparation. As integral contributors to the socio-economic structure, they bear a substantial workload. Marriage patterns further reinforce their role, as pastoralist men, often from shepherding families, typically marry women raised in similar environments. These women acquire a deep understanding of pastoral life from an early age and are well-prepared for its demands. While livestock production requires the cooperation of both men and women, female involvement is particularly pronounced. Men primarily construct shelters to protect livestock from predators and harsh weather and are responsible for dismantling and rebuilding homes during migration. They also collaborate with women in twisting and spinning goat hair into thread, whereas women predominantly weave textiles for clothing, food containers, and tent coverings. Beyond their economic contributions, women play a crucial role in conflict resolution within transhumance communities. Nevertheless, despite their active participation in economic and social life, they are generally excluded from independently making decisions regarding the marketing of livestock and animal products, as such matters require their husbands' consent. This reflects broader gender disparities in disadvantaged regions of developing countries, where women often have limited decision-making authority and unequal access to resources. The expanding roles of women within the Sarıkeçililer community—especially under growing labor shortages and shifting household structures—reflect broader socio-economic transformations and gendered adaptations discussed in the following section.

The black tent

The black tent serves as the central living space for transhumant communities, fulfilling multiple functions, including accommodation, meal preparation, guest reception, and storage. The tent floor is covered with felt, providing insulation and comfort (Figure 7). Its thick, heavy structure offers shade in summer and effective protection against the cold in winter. Tents are typically spaced fairly apart from each other, ensuring privacy while mitigating overgrazing, reducing

FIGURE 7
Tent weaving woman and central pole in the tent.

competition, and minimizing environmental impact (Figure 8). Woven by the women of the household, these tents have a lifespan of 7–10 years (Ocak, 2016). Goat hair, the primary material for tent construction, is shorn and cleaned in July before being spun into yarn for weaving. The distinctive thick weave pattern allows visibility from the inside while preventing outsiders from seeing in. However, traditional handicrafts such as rug weaving are declining, primarily due to the heavy workload associated with large livestock herds. Weaving is traditionally performed on a loom known as the ıstar (Figure 7a). The tent is supported by five poles: a central pole, measuring 2.5 m in height, positioned at the structure's core, and four outer poles, each 20 cm shorter, arranged in a square formation approximately 4 m apart (Figure 7b). Both the warp and weft of the tent fabric are made from yarn that is twisted twice, ensuring durability in adverse weather conditions, such as strong winds. The entrance consistently faces east, with bedding placed to the right. Opposite the entrance, sacks containing clothing and valuables are stored, including *Alaçuval*—special sacks used for foodstuffs and valuables. Measuring approximately 2 m by 70 cm, *Alaçuval* are traditionally adorned with woven motifs to distinguish their contents. Additionally, these sacks serve as part of a young girl's dowry in preparation for marriage. The diminishing practice of tent weaving among Sarıkeçililer women, driven by shifting labor demands and herd management pressures, signals broader changes in cultural continuity and gendered labor roles—dimensions explored further in the discussion of socio-economic transformation.

Flock management and economic significance

The Hair and Honamlı goat breeds (Figure 9) and their crossbreeds constitute the predominant local goat population, primarily raised for meat production. While some families also maintain small flocks of sheep and a few camels, goats remain central to their livestock management practices. Hair and Honamlı goats are recognized as the hardiest among Turkish goat breeds due to their exceptional adaptability to extreme climatic conditions, rugged terrain, limited forage availability, endemic diseases, and traditional, non-specialized handling practices (Yilmaz et al., 2012). These breeds play a significant role in the livelihoods of rural communities, providing essential sources of protein, economic stability, and traditional dairy products. Despite challenges these goats remain highly resilient and integral to local agricultural systems.

The average flock size per household ranges between 500 and 600 goats. These flocks are managed along a 400–450 km migration route stretching from Mersin's coastal highlands to the upland summer pastures of Seydişehir in Konya Province, traversing varying altitudes and bioclimatic zones. The average milk yield is approximately 110lt/goat (Toplu and Altınel, 2008). However, milk production is not a primary objective and is mainly reserved for household consumption, particularly in the form of cheese and yogurt. Goat hair holds no commercial value, and the primary sources of dietary protein for the community are goat meat and milk. Flocks rely exclusively on rangeland pastures and shrubs, with supplementary feeding limited to a small quantity of grain during the final trimester of pregnancy. All family members actively participate in livestock management, particularly during the kidding season. After birth, does remain close to the family tent for several days under observation, receiving provided feed rather than grazing freely. Newborn kids remain with their dams until they are sufficiently strong to join the flock. Kids are marked with ear notches for identification and further distinguished through unique names or symbols based on ear shape, hair color, age, or other physical characteristics. Young family members, often serving as shepherds, can individually recognize goats based on these distinguishing features. Additionally, Anatolian Shepherd dogs are commonly kept to protect flocks from predators.

FIGURE 8
The Black tent.

FIGURE 9
Hair and Honamlı goats on the migration route.

The mating season occurs between August and October, with kidding taking place in January and February. Kids remain with their dams until June or July, when natural weaning occurs as milk production ceases. The community does not engage in commercial dairy production; milking is practiced only in late June and July for household consumption. There is no strictly defined weaning period, as kids continue nursing until milk supply naturally diminishes. Milking is conducted only after ensuring that kids have suckled adequately.

Goat hair is sheared annually in July and August, with an average yield of approximately 1 kg per one-year-old goat. Traditionally, the fiber was combed into yarn, dyed, and woven into tents and clothing. However, this labor-intensive process, historically performed by women, has declined due to shrinking household sizes and evolving socioeconomic conditions. As a result, goat hair is now primarily repurposed as fertilizer for banana plantations and as an insulation material in the construction industry (Ates et al., 2024). The availability of ready-made products has further diminished the necessity of hair processing, which is no longer prioritized over other, more pressing tasks.

The recognition of goat manure as a valuable byproduct has only emerged in the past two decades. However, within the community, manure remains secondary to overall livestock production. The shift toward manure utilization is primarily driven by reductions in grazing areas, which have constrained seasonal migrations and reduced herd mobility. In the past, when pastures were more extensive, manure collection was impractical. With the current limitation of grazing lands, families can now gather manure from stationary resting areas of their flocks. The collected manure is primarily utilized as organic fertilizer in greenhouse agriculture (Ates et al., 2024).

The evolving uses of livestock products—from declining goat hair utilization to increased manure valorization—illustrate adaptive strategies shaped by shifting market conditions and land-use constraints, themes analyzed in detail in the discussion on economic transformation. These evolving practices suggest that transhumance is not static; rather, it is undergoing

transformation shaped by economic marginalization and limited institutional support. Herders' adjustments in breed preferences, seasonal labor distribution, and manure usage exemplify localized adaptation strategies within a dynamic pastoral system.

Meat and dairy production

Following the gradual weaning period in June and July, kids are sold to butchers in summer pastures, providing families with crucial income after a year of labor. However, due to their mobile lifestyle and limited market access, families are unable to engage in meat processing themselves. Goat sales, particularly culled ones and male kids for traditional feasts, serve as the primary source of cash income.

Dairy production, specifically the preparation of tuluk cheese—a traditional cheese aged in treated goat hide—represents another vital economic activity. Goats are milked in June and August for the production of tuluk cheese and salted yogurt, both of which are highly valued for their long shelf life. Milking and dairy processing are primarily carried out by women. The labor-intensive cheese-making process preserves both traditional knowledge and economic sustainability. The production of tuluk cheese involves several preparatory stages. Goat hides must be carefully removed in one piece, salted, and sun-dried before undergoing repeated treatments with strained yogurt and salt over several weeks. Once the hide is fully processed, it is stitched back into its original shape and used to store fresh cheese. The cheese itself is produced by adding rennet to fresh milk. After 12 h of draining, the curd is transferred to woven bags, salted, and stored for 2 weeks. It is then crumbled, mixed with additional salt and black caraway seeds, and packed tightly into the prepared goat hides. The cheese is aged for several months in caves or cold storage before being sold in village markets, where its value increases with age.

The continued reliance on traditional dairy processing and limited meat market integration underscores the tension between cultural continuity and economic marginalization—pressures that shape the evolving livelihood strategies analyzed in the following discussion.

Emerging drivers of transformation: ethnographic and ecological insights

The transformation of transhumant pastoralism in Mediterranean Turkey is not a consequence of isolated factors but rather the cumulative result of interacting structural pressures. Field data collected through longitudinal ethnographic immersion and ecological monitoring during two migration cycles (2019–2020) identified six principal drivers reshaping the practices, viability, and resilience of goat transhumance: demographic transition, market marginalization, institutional constraints, climate variability, pandemic-induced disruption, and the unrealized potential of sustainability frameworks.

Demographic transition and rural urbanization

Interviews revealed a widespread concern over intergenerational discontinuity in transhumance. Younger family members increasingly prioritize formal education and urban employment over pastoral livelihoods, perceiving them as physically arduous and socially devalued. This demographic shift has resulted in diminished household labor capacity and weakened traditional knowledge transmission. Consequently, elderly and female household members now bear increased responsibilities for herd management and migration logistics. These findings align with broader regional trends in the devaluation of pastoral identity and the feminization of agricultural labor under rural depopulation dynamics.

Market marginalization and economic constraints

Respondents underscored multiple economic stressors: volatile livestock prices, lack of formal market infrastructure in upland zones, and rising input costs, including veterinary care and transportation. Transhumant families primarily sell kids post-weaning but lack access to meat processing, cold chain logistics, or niche markets. This economic precarity is compounded by their exclusion from subsidy schemes designed for sedentary producers. The data confirm that market pressures are driving shifts toward semi-sedentary systems and herd downsizing, undermining the ecological and economic rationale for long-distance mobility.

Institutional constraints and governance failures

Herders consistently reported difficulties in navigating fragmented and inconsistent regulatory frameworks. Permit acquisition for migration routes is bureaucratically burdensome and often subject to changing local and national directives. Protected area designations and conservation policies have increasingly restricted access to seasonal pastures, without offering viable alternatives or compensation. Interviewees described a governance landscape that privileges sedentary agricultural models, with limited legal recognition for the spatial-temporal logic of pastoral mobility. These constraints have led to route compression, intensified pasture use, and conflict with settled communities.

Climate variability and environmental stressors

Ecological observations corroborate herder narratives regarding the declining reliability of seasonal vegetation and water availability. In both 2019 and 2020, early spring droughts disrupted migration timing and reduced forage productivity in mid-altitude zones. Respondents adapted by shortening stopover durations, delaying ascent, or modifying grazing intensity—responses indicative of flexible, knowledge-based ecological management. These shifts, however, impose additional stress on animal health, workload, and pasture regeneration. The findings support the view that transhumant systems are on the frontlines of climate-induced ecological instability, yet lack systemic adaptation support.

COVID-19 pandemic

The pandemic introduced acute systemic shocks, further destabilizing transhumant viability. Movement restrictions imposed during 2020 interrupted scheduled migrations, forced herd concentration in suboptimal grazing zones, and escalated conflict over pasture access. Simultaneously, closure of local livestock markets disrupted income generation and reduced cash flow. The repurposing of mountain areas for domestic tourism and recreation during lockdowns created new forms of spatial competition, increasing the vulnerability of herders operating in contested commons. These observations underscore how global crises exacerbate structural marginality in mobile pastoral systems.

Underutilization of green and circular economy synergies

Despite extensive alignment between traditional transhumant practices and sustainability principles—such as manure recycling, low fossil-fuel dependency, and rangeland stewardship—there is little institutional recognition or financial incentivization for these contributions. Interviewees expressed awareness of their ecological role but frustration at the absence of market or policy mechanisms that valorize their sustainability practices. This represents a critical missed opportunity: transhumance is a latent asset within green transition frameworks, yet remains unintegrated into environmental planning or certification schemes that could secure long-term viability.

These six interconnected drivers, derived from ethnographic fieldwork and ecological assessments, provide an integrated framework for understanding the ongoing transformation of goat transhumance in Mediterranean Turkey. They validate the thematic analysis presented in the discussion and demonstrate how herders employ innovative, grounded strategies to navigate shifting socio-ecological terrains.

Cultural continuity and perceived heritage loss

Ethnographic accounts gathered during fieldwork illuminated a profound sense of cultural precarity among transhumant communities. Many participants articulated concerns over the erosion of traditional practices—including oral histories, communal rituals, and artisanal knowledge systems such as black-tent weaving and tuluk cheese production. Elders frequently described a "disconnect" between younger generations and ancestral knowledge, noting the waning participation in seasonal festivals, storytelling, and intergenerational skills transmission. Participants also expressed ambivalence toward recent attempts by external institutions—NGOs, cultural organizations, or media—to valorize transhumance as "intangible heritage." While such efforts were seen as validating, they were also perceived as superficial or symbolic, lacking material support or structural impact. Several community members critiqued the aestheticization of transhumance in public discourse, highlighting a dissonance between celebratory representations and their lived experience of marginalization.

Moreover, participants conveyed that although practices such as transhumant migration, tent-making, and gendered labor persist, they are increasingly decoupled from the socio-ecological and spiritual meanings they historically carried. Concerns were voiced about the dilution of cultural identity under pressures from tourism, policy interventions, and shifting land-use norms. These narratives collectively underscore that transhumant pastoralism is not only under threat ecologically and economically, but also culturally. The community's sense of being active stewards of a living tradition, rather than passive subjects of heritage discourse, emerged as a key theme—providing an empirical foundation for the discussion on cultural preservation and heritage recognition that follows.

Discussion

Key drivers influencing the transformation of transhumance: a categorized analysis

The transformation of transhumance is shaped by a complex interplay of environmental, economic, social, and political factors. While historically rooted in sustainable pastoral systems, transhumance has undergone significant changes due to shifting socio-economic structures, evolving land-use patterns, climate change, policy interventions, and market dynamics. Our findings not only characterize these transformative pressures but

also document how goat pastoralists have actively adapted their practices in response—through shifting migration patterns, herd management, and labor organization. These transformations, although regionally distinct, exhibit common trends across pastoralist communities—including goat herders in Mediterranean Turkey—where traditional practices are increasingly challenged by modernization and socio-ecological pressures. This section categorizes and analyzes the key drivers influencing the transformation of transhumance, emphasizing that the same forces affecting broader transhumant systems also shape the livelihoods and practices of goat pastoralists in this specific region. Recognizing these parallels enhances our understanding of how localized changes reflect global pastoral transitions and highlights the urgent need for context-specific adaptation strategies.

Socio-economic factors: rural urbanization and demographic trends

The transformation of transhumance is closely linked to socio-economic shifts, particularly the declining attractiveness of pastoralism among younger generations. Alternative livelihood options in urban centers and changing aspirations have led to a loss of interest in traditional livestock farming. Younger people increasingly view transhumance as physically demanding and economically insecure (Manzano-Baena and Salguero-Herrera, 2018), a perception that is equally evident among goat herding communities in Mediterranean Turkey. As a result, the continuity of goat transhumance is at risk, with elders struggling to transfer specialized knowledge on herd mobility, pasture use, and climate adaptation.

This generational disconnect is further deepened by formal education, which often alienates youth from pastoral knowledge systems (Oteros-Rozas et al., 2013). In the Taurus Mountains and surrounding coastal hinterlands, goat pastoralism has historically depended on intergenerational learning. Today, however, many young people leave rural areas permanently, leading to labor shortages, shrinking herd sizes, and the abandonment of traditional routes. As elder pastoralists retire without successors, valuable knowledge regarding pasture rotation, livestock health, and climate adaptation may be lost (Fernández-Giménez et al., 2017). Consequently, elderly household members and women increasingly manage herds under challenging conditions, with limited labor and institutional support—paralleling broader patterns across transhumant regions (Nori et al., 2008).

Education plays a dual role in this shift. While increased access to schooling provides opportunities beyond pastoralism, it simultaneously contributes to the erosion of traditional pastoral knowledge (Oteros-Rozas et al., 2013). Changing social aspirations have made pastoral livelihoods less desirable, especially as they are often associated with hardship and marginalization. The depopulation of rural areas, particularly in Mediterranean and Central Asian pastoral regions, has led to a diminishing labor force for livestock management as younger generations seek employment opportunities in urban centers (Lasanta et al., 2017). Demographic shifts—including rural depopulation, urban migration, and infrastructural expansion—have further influenced seasonal livestock movements. These changes result in labor shortages, disrupted family structures, and reduced access to grazing lands (Lasanta et al., 2017; Krätli and Schareika, 2010). This demographic shift has also reconfigured family structures, with women and elderly individuals increasingly assuming responsibilities for livestock care, often with inadequate support and resources (Nori et al., 2008). In Mediterranean Turkey, the reconfiguration of pastoral territories and erosion of identity is particularly visible as families relocate to urban and peri-urban areas. The expansion of agriculture, infrastructure, and tourism fragments migration routes and limits access to water and pasture (García-Ruiz and Lasanta-Martinez, 1990; Linstädter et al., 2013). Consequently, many herders have shifted toward semi-sedentary systems, leading to reduced rotational grazing, biodiversity loss, and declining animal performance.

Additionally, pastoralists now face intensified competition for resources due to growing demands from agriculture, tourism, and conservation initiatives, restricting access to grazing lands and water sources (Linstädter et al., 2013). These pressures are particularly acute for goat pastoralists in Mediterranean Turkey, where traditional upland grazing areas are increasingly encroached upon. Faced with limited access to pasture and rising resource competition, many pastoralists have shifted toward semi-sedentary systems. However, the loss of rotational grazing practices has often led to overgrazing, reduced biodiversity, and declining animal performance. While not listed as a primary driver of change in this study, the motorization of access to pastures represents an important historical inflection point in the broader transformation of transhumance. Mechanization altered migration pace, duration, and the nature of family involvement—particularly among sheep pastoralists. In the case of the Sarıkeçililer, who continue to migrate predominantly on foot, the effects of motorization have been more limited. Nonetheless, it has influenced the transport of supplies and tents and contributed to the reorganization of labor roles within migrating households. As such, motorization intersects with broader demographic and socio-economic changes, though it is not a stand-alone driver in the transformation of goat pastoralism in this region.

These socio-demographic transformations do not act in isolation. Rather, they intersect with shifting economic conditions that also influence the viability and direction of transhumant pastoralism in Mediterranean Turkey.

Economic pressures and market integration

Building on the demographic and social changes outlined above, economic pressures—particularly those related to market integration and structural exclusion—present a

critical set of challenges for transhumant communities. The future of transhumance is shaped by several crucial factors, including social, economic, and political decisions at both national and regional levels. These decisions carry significant weight due to their inherent unpredictability and the lack of long-term reliability. The strategies adopted by mountain pastoralists for livestock management play a vital role in this context.

Over time, transhumance in many parts of the world has evolved from a traditional subsistence-based practice to one increasingly integrated into market economies. However, this trend is less pronounced in Turkey, where transhumance—particularly among goat pastoralists in Mediterranean regions—continues to operate largely outside formal commercial structures. It remains deeply rooted in cultural traditions, household-level subsistence, and informal local exchange networks. The partial detachment from structured markets renders these systems more vulnerable to marginalization, as they are often overlooked by policy instruments that prioritize commercially oriented and sedentary production models. As a result, the sustainability of Turkish transhumance is shaped not by market integration alone, but by a combination of policy neglect, institutional exclusion, and competition over land and resources. This economic marginalization is particularly visible among goat pastoralists in Mediterranean Turkey, whose livelihoods have historically depended on seasonal mobility and ecological knowledge. As markets expand and standardize production practices, traditional herders are increasingly subject to price volatility and policy environments that disadvantage extensive systems. Market pressures have brought both opportunity and strain, as pastoralists navigate new expectations for productivity without corresponding support for mobile systems.

Economic viability is a crucial determinant of transhumance sustainability. Pastoral communities are increasingly integrated into national and global markets, subjecting them to fluctuations in livestock prices, feed costs, and transportation expenses. The rising cost of maintaining flocks, coupled with the declining profitability of extensive livestock production, has put significant financial strain on transhumant herders. Market pressures have also influenced flock composition and grazing patterns. To remain competitive, many farmers have shifted towards high-yield breeds that require more intensive feeding and management, making traditional migratory routes less viable. This is also observed among goat keepers in Mediterranean Turkey, where pressure to adopt more productive but less resilient breeds undermines the ecological advantages of local genetic resources and traditional grazing cycles. Furthermore, large-scale commercial livestock production, supported by subsidies and infrastructure, often outcompetes transhumant pastoralism, forcing many herders to either modify their practices or abandon them altogether. Market fluctuations, increased competition, and the rising costs of livestock maintenance make transhumance less economically viable. Another economic constraint is the lack of access to financial services. In many regions in Turkey, transhumant pastoralists struggle to obtain credit, insurance, and other financial tools that could help them mitigate risks associated with climate variability, disease outbreaks, and market fluctuations. This lack of financial resilience makes pastoralists more vulnerable to external shocks, further accelerating the decline of transhumance (Krätli and Schareika, 2010). Among goat herders in the Taurus Mountains, these limitations are particularly acute. Mobile herders often operate informally or lack the legal documentation needed to access formal finance, rendering them structurally disadvantaged in adapting to market integration or climate-induced shocks. Alongside economic restructuring and demographic shifts, the role of formal governance and regulatory regimes has been decisive in shaping the changing conditions for transhumance. These institutional dynamics merit separate attention.

Government and policy frameworks

Government and policy frameworks have fundamentally reshaped the dynamics of goat transhumance in Mediterranean Turkey. Conservation initiatives, land tenure reforms, and livestock regulations—while often introduced to modernize agriculture or safeguard natural resources—have produced unintended consequences for mobile pastoralism. Specifically, protected area designations and forestry policies have limited access to critical seasonal grazing corridors, while tenure reforms have largely failed to accommodate the spatial fluidity of transhumant land use. These institutional rigidities have marginalized mobile pastoralists, embedding a structural bias that favors sedentary farming systems.

This policy orientation routinely neglects the ecological benefits of transhumance—such as sustaining habitat connectivity, promoting biodiversity, and mitigating wildfire risk—despite evidence of its adaptive and low-impact nature. In Mediterranean Turkey, goat herders navigating traditional migration routes increasingly encounter bureaucratic barriers and shrinking access to upland pastures, now often repurposed for forestry, tourism, or conservation (Gurung and Seeland, 2008).

Livestock regulations further complicate mobility. Administrative demands tied to mandatory registration systems and veterinary controls—though important for disease surveillance—are often misaligned with the flexible temporal and spatial rhythms of transhumance. These policy mismatches not only threaten pastoral socio-economic sustainability but also compromise landscape-level ecological resilience.

To maintain transhumance as a viable practice, policy frameworks must evolve toward more flexible and inclusive governance models. This involves legal recognition of seasonal mobility, integration of pastoral corridors into spatial planning, and participatory governance that includes pastoral voices. Without such structural adjustments, existing regulatory regimes risk accelerating the erosion of both traditional herding systems and their associated ecological services.

These challenges are not unique to Turkey. Comparative insights from other regions reinforce the argument that structural and institutional neglect hampers pastoral resilience. Adamou (2024), for instance, critiques agricultural policies in the Sahel for failing to address climate risks, suggesting conservation farming and diversified livestock strategies as alternatives. Primi et al. (2025) similarly note how weak policy alignment and soil degradation undercut transhumance-based livestock farming. Although these examples emerge from different geographic contexts, they illustrate a common failure to support mobile systems under changing environmental and socio-economic conditions.

In Europe, the role of policy in shaping transhumance is equally significant. Esgalhado et al. (2024) evaluate the impact of Common Agricultural Policy (CAP) payments, finding that while general CAP mechanisms are insufficient, those explicitly linked to transhumance yield better outcomes for sustaining mountain pastures. These findings underscore the importance of designing subsidies and conservation strategies that explicitly incorporate the needs of mobile livestock systems. As Krätli and Schareika (2010) argue, subsidies and services disproportionately benefit sedentary producers, exacerbating the exclusion of mobile herders—a pattern echoed in Mediterranean Turkey.

Globalization compounds these trends. While it opens market opportunities, it also redirects policy attention toward high-output, sedentary livestock production and away from traditional mobile practices (Gurung, 2019). Conservation-driven land reclassifications further reduce pasture availability, exacerbating insecurity over tenure and access. The absence of clear legal recognition for transhumant herders in Turkey has contributed to ongoing marginalization, exposing them to land-use conflicts and infrastructural neglect.

The situation is particularly acute in the Taurus Mountains and surrounding regions, where mobile herders operate within ambiguous legal environments that prioritize sedentary livestock systems. These conditions mirror challenges elsewhere in Europe, where CAP-linked payments often fail to support mobile systems unless explicitly designed to do so (Esgalhado et al., 2024). In Turkey, the absence of targeted support mechanisms heightens the vulnerability of goat pastoralists dependent on seasonal upland access.

To counter these challenges, policy instruments must prioritize the formalization of mobility rights and the inclusion of pastoral systems in rural development strategies. Recognizing transhumant herders as ecological stewards and cultural custodians is crucial for designing supportive legal and institutional frameworks. As Nori et al. (2008) and Ocak (2016) observe, the failure to formalize pastoralist rights perpetuates resource conflicts and pressures mobile communities toward sedentarization. Integrating transhumant systems into regional land-use planning is thus not only a matter of social equity but a necessary step for environmental sustainability and climate resilience. Without such integration, the long-term viability of transhumance—and the socio-ecological systems it supports—remains increasingly at risk.

Climate change

Climate change, which has led to a range of challenges affecting mountain communities worldwide, has emerged as a major driver of transformation within pastoral systems. It alters seasonal weather patterns, reduces pasture productivity, and limits water availability—factors that are central to the viability of transhumant livestock production. Climate change affects livestock in two principal ways: first, through the reduction in the quality and quantity of forage, and second, via direct physiological impacts resulting from increased temperatures. A series of related consequences are expected, as highlighted in a report by the European Environment Agency (2017). The report emphasizes that in parts of southern Europe, including the Mediterranean basin, rising temperatures, increasing drought, and elevated carbon dioxide levels will negatively affect livestock productivity and health. Conversely, in northern Europe, a more favorable impact is anticipated, such as an extended growing season and increased forage availability, potentially benefiting livestock systems in those regions.

Rising temperatures, prolonged droughts, and increasingly erratic precipitation cycles are expected to disrupt traditional migration routes, making it more difficult for pastoralists to access sufficient grazing resources (Fernández-Giménez and Fillat, 2012). These disruptions are particularly consequential in mountainous areas where vegetation growth is already seasonal and constrained by elevation. In many regions, shifting climate conditions have altered vegetation composition and reduced aboveground biomass, thereby lowering the carrying capacity of pastures. The availability of key fodder species has declined, forcing herders to either travel longer distances in search of grazing land or invest in supplementary feed—both of which increase operational and economic burdens. These outcomes are acutely felt by goat pastoralists in Mediterranean Turkey, where pasture-based systems rely heavily on altitudinal migration and seasonal forage diversity. Moreover, extreme weather events—such as heatwaves, heavy snowfalls, and flooding—have become more frequent, posing direct threats to livestock survival. In Turkey, episodes of extreme precipitation, prolonged drought, and climatic disasters like windstorms have led to mass livestock mortality, particularly within extensive transhumant systems (Ocak Yetisgin et al., 2022). These events not only reduce herd size and productivity but also undermine household resilience, especially in rural communities with limited access to veterinary services, feed reserves, and emergency infrastructure.

The increasing unpredictability of weather patterns also poses challenges for migration planning and pasture use

timing. For goat herders practicing transhumance in Mediterranean Turkey, the timing of departure to and from highland pastures—historically determined by phenological and climatic cues—has become less reliable. Early drought onset in summer, delayed forage growth in spring, or unexpected snowfall in autumn can force last-minute changes to herd movement or reduce the duration of grazing periods. These changes threaten both the ecological sustainability of rangelands and the economic stability of pastoral households. As such, climate-induced disruptions not only compromise pasture access and herd health, but also increase labor demands and management uncertainty. In this context, the sustainability of transhumant goat pastoralism in Mediterranean Turkey will increasingly depend on the integration of climate risk assessments into herd mobility planning. Developing adaptive strategies—such as diversified forage systems, flexible migration calendars, and improved sheltering infrastructure—will be essential to safeguard animal welfare and ensure the continuity of transhumance under changing climatic conditions.

COVID-19 pandemic

The COVID-19 pandemic had far-reaching consequences across various sectors of the global economy, including transhumance and pastoral production systems. These traditional livestock management practices, which rely on seasonal mobility to access grazing lands, were particularly affected due to movement restrictions, economic disruptions, and shifts in policy frameworks. While the severity of the impact varied by region, common challenges emerged, including reduced access to grazing areas, disruptions in livestock markets, and increased vulnerability of pastoralist communities. One of the most striking transformations triggered by the pandemic was the shift in how mountainous regions were perceived and utilized, further compounded by the ongoing effects of climate change. Predictions made during the crisis regarding changes in land use, economic restructuring, and increased interest in remote and tranquil areas have largely materialized (Akbas and Baykal, 2022). As restrictions limited urban tourism, many turned to rural and highland areas in search of safer outdoor experiences. However, this growing interest in mountain regions for tourism and recreation has raised concerns about the potential touristic encroachment on pasturelands, further straining resources essential for transhumant communities. The expansion of farm-based experiential and educational tourism, while presenting economic opportunities, also risks altering the function of pastoral spaces, potentially marginalizing traditional livestock farming and weakening the foundations of transhumance.

Transhumance is highly dependent on the free movement of livestock between seasonal grazing lands. However, during the pandemic, many governments implemented strict lockdown measures, leading to border closures and restrictions on interregional movement. This directly affected pastoralists who rely on cross-border migration for pasture access. COVID-19 lockdowns prevented their movement, leading to severe overgrazing in limited accessible areas and increased livestock mortality due to lack of adequate fodder. Furthermore, the pandemic caused widespread economic slowdowns, reducing demand for livestock products, particularly meat, milk, and hides. With restricted market access and lower purchasing power among consumers, pastoralists experienced declining incomes and increased poverty levels. In many parts of the world, livestock markets were temporarily closed or operated at limited capacity, disrupting sales and trade. Limited transportation options meant that even when pastoralists had livestock ready for sale, reaching buyers became a challenge. Also, in some regions, livestock prices collapsed due to oversupply in local markets where movement was restricted. Many transhumant and pastoralist groups belong to marginalized communities with limited access to healthcare and government support. The pandemic exacerbated their existing vulnerabilities by restricting access to veterinary services, food supplies, and essential health resources. Remote pastoralist communities often had little access to COVID-19 testing, treatment, and vaccinations. With disrupted livestock markets and reduced grazing access, many pastoralists struggled to feed their families. Some had to slaughter their animals for subsistence, reducing their future income-generating capacity. Pandemic-related economic slowdowns eliminated these opportunities, worsening financial distress. The COVID-19 pandemic posed unprecedented challenges for transhumance and pastoral production systems worldwide. Restrictions on movement, disrupted livestock markets, and increased vulnerability among pastoralists threatened the sustainability of traditional pastoral practices.

Transhumance and the green and circular economy: a pathway to sustainable pastoralism

Green and circular economy models offer strategic opportunities to enhance the sustainability of transhumance and pastoral production systems. In the face of intensifying climate change, biodiversity loss, and rural marginalization, integrating pastoralism into these frameworks is not merely beneficial—it is essential. Historically, transhumant communities have contributed to biodiversity conservation, carbon sequestration, and sustainable land management. Yet today, they are increasingly constrained by restrictive policies, land-use conflicts, and market pressures. The green economy, as defined by Davies (2024), emphasizes low-carbon, resource-efficient, and socially inclusive growth. Within this paradigm, transhumance functions as a climate-smart practice, fostering ecosystem regeneration, maintaining habitat connectivity, and sustaining extensive livestock production. Grazing lands managed by pastoralists act as carbon sinks, helping to offset greenhouse gas emissions (Sharifian et al., 2022). In addition,

well-regulated herd mobility contributes to soil fertility, prevents erosion, and supports wildlife migration routes (Hatfield and Davies, 2006). These characteristics position transhumance as a nature-based solution for climate adaptation and land restoration. Despite these ecological contributions, transhumance remains underrepresented in national and international policy agendas. Many governments continue to prioritize intensive livestock production or conservation regimes that limit pastoral mobility, often exacerbating land tenure insecurity and resource competition (Diogo et al., 2021). To realize the full potential of transhumance within a green economy, policy frameworks must acknowledge its ecological value and embed it within broader sustainability planning. Recommended actions include developing a global policy framework for sustainable livestock systems, conducting cost–benefit comparisons of extensive and intensive models, fostering ecological niche markets, and integrating pastoralist knowledge systems into innovation platforms (McGahey et al., 2017). Since green economies aim to decouple economic growth from environmental degradation while promoting equity (UICN ve UNEP, 2014), transhumant livestock systems can become a central pillar of these goals. Likewise, the principles of the circular economy—which emphasize reuse, repair, and resource efficiency—align naturally with traditional pastoral practices. Since its formal adoption by the EU in 2018 (OREE, 2019), the circular economy has gained prominence in livestock policy. Pastoralists have long operated within closed-loop systems: livestock manure is recycled as organic fertilizer, mobile structures are repaired and reused, and water is managed through strategic seasonal distribution (Ates et al., 2024; Piemontese et al., 2024; Rodríguez Rigueiro, 2021). However, emerging threats such as plastic waste, overgrazing, and land conversion increasingly challenge the ecological integrity of these systems. Innovations—such as biodegradable feed packaging, solar-powered infrastructure, and circular waste management—can strengthen the environmental resilience and viability of transhumant systems. Ensuring that transhumance thrives within green and circular models requires a fundamental shift in governance. Policymakers must move beyond exclusionary conservation policies and adopt integrated socio-ecological approaches that promote mobility, landscape connectivity, and rural equity (Easdale et al., 2023). Legal protections for grazing rights and secure tenure systems are vital to prevent displacement. Additionally, expanding organic and climate-certified livestock schemes could enhance market access for pastoralists, while reinforcing sustainable production methods (Fernández-Giménez and Wilmer, 2024). The inclusion of indigenous and local knowledge in climate adaptation strategies is equally critical, given pastoralists' extensive experiential understanding of ecological dynamics.

As retro-innovators, transhumant communities reframe traditional practices as regenerative strategies aligned with low-carbon, circular, and inclusive sustainability paradigms. The intersection of transhumance with green and circular economy principles offers a viable, forward-looking framework for sustainable livestock development. With adequate policy support, technological innovation, and market incentives, transhumance can evolve into a climate-resilient practice that contributes to food security, rural revitalization, and ecosystem restoration. Recognizing pastoralism not as a vestige of the past but as a cornerstone of sustainable agriculture is essential for building inclusive and regenerative futures. By embedding low-carbon practices, circular resource use, and adaptive governance into pastoral systems, transhumance can continue to thrive as a model of environmental stewardship in the twenty-first century.

Preserving transhumance as cultural heritage: national realities in Turkey

International organizations such as the United Nations (UN), the Food and Agriculture Organization (FAO), UNESCO, and the European Union (EU) have taken the lead in efforts to preserve and promote pastoralism as both a cultural and ecological heritage. In parallel with these global initiatives, national governments, local administrations, universities, and regional civil society organizations have also played a role in cultural preservation. Various outreach tools—such as documentaries, websites, blogs, concerts, exhibitions, festivals, and educational programs—have been employed to raise awareness and underscore the enduring value of transhumance. While technological advancements, digitalization, and circular and green economy models offer potential opportunities for revitalizing transhumance, they have yet to make a significant impact in Turkey's mountainous regions. Unlike some countries where reverse migration from cities to rural areas is reshaping pastoral economies, Turkey has not yet experienced a comparable movement. However, tourism has begun to emerge as a major challenge, particularly in the Black Sea and Taurus Mountains, where increasing visitor activity is encroaching upon traditional grazing lands.

The transformation of transhumance in Turkey began with the motorization of access to pastures (instead of walking on foot), which significantly altered traditional pastoral practices. This mechanization changed many aspects of how transhumance had been traditionally carried out—such as the pace, duration, family involvement, labor roles (e.g., men's and women's roles), the nature of migration itself, and the socio-cultural routines that accompanied the journey. Additionally, the timing and duration of seasonal migrations have been affected, leading to disruptions in established patterns of livestock movement. These transformations have also contributed to the degradation of both tangible and intangible rural cultural heritage, threatening the continuity of knowledge and traditions that have shaped Turkey's pastoral identity for centuries.

Compared to developed countries, Turkey's institutional efforts to support transhumance remain insufficient. While some developing nations share similar structural weaknesses, a key difference is that organizations such as the UN and FAO have implemented numerous projects and aid programs to support pastoralists in regions affected by ethnic conflicts, land and water disputes, theft, and livestock diseases. These challenges are particularly pronounced in African countries, where pastoralist communities rely heavily on external support to sustain their livelihoods. Despite regional differences, one universal factor remains consistent: the central role of rural women and shepherds in sustaining transhumance culture. Across all countries, however, societal perceptions of their value and contributions vary significantly, highlighting deep contrasts in how different cultures recognize and support pastoralist traditions.

The future of transhumance in Turkey hinges on stronger institutional engagement, comprehensive policy reform, and well-designed economic incentives. Without such targeted interventions, the ongoing decline of this centuries-old practice may accelerate, leading to irreversible cultural and environmental consequences. Recognizing transhumance as both a living ecological strategy and a cultural legacy is essential for its continuity. This requires an integrated approach that combines sustainability tools, adaptive governance, and the transmission of traditional pastoral knowledge.

Conclusion

Goat transhumance in Mediterranean Turkey endures as a historically rooted yet dynamically evolving system shaped by a complex interplay of ecological, cultural, economic, and political factors. This study demonstrates that while the system retains its adaptive value—particularly in maintaining pastoral livelihoods, conserving indigenous knowledge, and supporting landscape-level ecological processes—it is increasingly vulnerable to multi-scalar pressures. Key drivers of transformation include rural depopulation, loss of traditional migration corridors, weakening intergenerational knowledge transmission, and restrictive land use policies. These dynamics are further compounded by climate variability and the absence of formal recognition for mobile pastoralism within national development strategies. Despite these challenges, transhumance remains an active contributor to rural resilience. Its embeddedness in local ecologies, gendered labor organization, and low-input mobility strategies suggest that it can offer viable alternatives to sedentary livestock production, especially under mounting environmental stress. However, the system's continuity cannot be assumed in the absence of deliberate institutional support. Legal recognition of seasonal mobility rights, reintegration of traditional pastoral routes into land-use planning, and equitable access to veterinary, financial, and market services are critical for ensuring its future viability.

The study also underscores the need to reposition transhumance within broader sustainability discourses. By aligning pastoral mobility with emerging frameworks such as the green and circular economy, new opportunities may arise for creating value-added niche markets, encouraging eco-social innovation, and reinforcing the environmental legitimacy of mobile systems. Importantly, policy reform must go hand in hand with community participation and respect for culturally embedded knowledge systems. Without such integrative and adaptive approaches, the erosion of transhumant practices will not only diminish cultural heritage but also undermine the broader resilience of agro-pastoral landscapes. The continuity of transhumance in Turkey depends on robust institutional engagement, coherent policy reform, and context-specific economic support mechanisms. Without such targeted interventions, the decline of this centuries-old pastoral system is likely to accelerate, resulting in irreversible losses to both cultural heritage and ecological integrity. Recognizing transhumance not merely as a remnant of the past, but as a dynamic socio-ecological practice, is essential for its future. Its preservation requires an integrated approach that combines sustainability-oriented tools, adaptive governance models, and the intergenerational transmission of traditional pastoral knowledge. Only through such a holistic framework can transhumance continue to contribute meaningfully to rural resilience, biodiversity conservation, and sustainable land use in marginal landscapes.

Data availability statement

Requests to access the datasets should be directed to SO sezenocak1@gmail.com.

Ethics statement

Participants were informed about the study's aims, assured confidentiality, and provided consent for recordings and photographs.

Author contributions

SO conceived and designed the study, conducted the research in collaboration with SC, and both authors contributed equally to writing and revising the manuscript. All authors reviewed the results and approved the final version of the manuscript.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that no Generative AI was used in the creation of this manuscript.

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