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Consequences of the Ongoing War on Pastoralist Mobility in Eastern Sudan

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SUMMARY

This study examines how the ongoing war in Sudan has reshaped pastoral mobility, livelihoods, and social relations in eastern Sudan, with a particular focus on Gadarif State. Pastoral mobility has long served as the primary mechanism through which pastoralists manage ecological variability, access seasonal grazing and water resources, and sustain livestock productivity. However, even before the conflict, mobility in Gadarif was increasingly constrained by agricultural expansion, corridor blockage, and growing competition over land. The war has now introduced a profound systemic shock, tipping an already fragile mobility system into a state of crisis.

Using qualitative fieldwork conducted in October–November 2025, including eight focus group discussions, 28 key informant interviews, and participatory GIS mapping, the study documents how the war has fragmented mobility routes and altered movement decisions. Participatory mapping reveals consistent contraction of migration distances, diversion away from the Butana communal rangelands and the Ethiopia–Sudan border, and prolonged stays within forested and agricultural zones in central and southern Gadarif. These changes reflect a shift from ecologically driven mobility to risk-avoidance mobility, as pastoralists prioritise safety from armed robbery, livestock looting, and insecurity along traditional corridors.

The consequences of disrupted mobility have been far-reaching. First, prolonged pastoral presence in farming areas has intensified farmer–herder conflict, transformed grazing and farming interfaces into zones of daily friction, and entrenched punitive systems of fines. Second, large numbers of livestock have accumulated in a few accessible areas, triggering overcrowding, the degradation of forest reserves, and the overuse of limited water resources. Third, prolonged exposure to disease-prone environments has led to widespread livestock illness, increased mortality, declining reproductive performance, and drastically reduced milk production.

These ecological and production shocks have translated directly into livelihood stress. Herders face reduced market participation, distressed livestock sales, rising production costs, and growing indebtedness. Household food security has deteriorated due to lower milk availability and the high cost of purchased staples, leading many families to reduce meal frequency or rely on less diverse diets. The study also documents a major shift in livelihood orientation. Pastoralists increasingly engage in crop farming, wage labour, charcoal production, petty trade, and transport services. While these diversification efforts provide short-term income, they often deepen environmental pressures and may anchor households to settled lives in ways that constrain future mobility.

The war has also accelerated land acquisition trends for residential and farming purposes. These practices reflect a search for security and stability but risk entrenching long-term sedentarisation and weakening traditional mobility systems. Gendered and generational impacts are pronounced. Women's workload has expanded dramatically, encompassing water collection, domestic labour, livestock care, and income generation. Young men have assumed greater responsibility for herding under risky conditions, while some have become involved in local defence groups. Girls' schooling has sometimes improved due to settlement, but boys' education has declined sharply.

Taken together, the findings show that the war is not simply a temporary disruption to mobility; it is reconfiguring pastoral livelihoods, identities, and social institutions in ways that may be difficult to reverse. Recovery efforts must therefore prioritise restoring safe mobility routes, strengthening land governance, addressing farmer–herder conflict, supporting hybrid livelihood systems, and protecting the ecological foundations of pastoralism. Without such interventions, the long-term viability of pastoralism in eastern Sudan remains at risk.

1 INTRODUCTION

Pastoral mobility in eastern Sudan is a long-established livelihood strategy designed to manage environmental variability and uncertainty in semi-arid and arid ecosystems (Scoones, 1994). Seasonal movements enable pastoralists to track the spatial and temporal availability of pasture and water, reduce exposure to drought and disease risks, and distribute grazing pressure across landscapes (Krätli et al., 2013). From a resilience perspective, mobility constitutes the primary expression of adaptive capacity within pastoral systems, allowing households to adjust herd composition, timing of movement, and grazing destinations in response to changing ecological conditions (Semplici and Campbell, 2023).

These mobility systems depend on the continued functioning of seasonal grazing routes, livestock corridors, dry- and wet-season grazing zones, and negotiated access arrangements with farmers and local authorities. Empirical evidence from eastern Sudan demonstrates that route continuity and corridor governance are central to pastoral viability: when corridors are maintained and access rules are predictable, pastoralists can flexibly adapt to climatic stress; when routes are fragmented or blocked, adaptive capacity is significantly reduced (Sulieman and Elagib, 2012; Sulieman and Ahmed, 2013; Sulieman, 2015). Mobility is therefore not only an ecological response but also an institutionally mediated practice that relies on social agreements, local governance, and the ability to negotiate access to resources.

Gadarif State represents one of the most important pastoral–agricultural interfaces in eastern Sudan, combining extensive rangelands, seasonal water points, and major rainfed mechanised farming schemes. However, this interface is also structurally fragile. Long-term processes of agricultural expansion, land commodification, and corridor enclosure have progressively reduced mobility options and increased competition over land (Sulieman, 2015; Sulieman, 2018). As a result, Gadarif increasingly functions as a stress point where pastoral resilience depends on the ability of institutions to mediate access under conditions of land scarcity and competing livelihood claims (Sulieman, 2024; Sulieman, 2026).

The escalation of armed conflict since April 2023 has introduced a profound systemic shock that compounds existing land-use pressures and fundamentally disrupts pastoral resilience mechanisms. At the same time, conflict severely constrains adaptive capacity by restricting mobility itself. Decisions about movement are increasingly driven by security risk rather than seasonal grazing logic, forcing pastoralists to concentrate livestock in relatively safer but ecologically congested areas or to abandon traditional routes altogether. This reduces flexibility, accelerates rangeland degradation, and increases the likelihood of conflict with farmers and other land users (Sulieman and Momale, 2025).

The ongoing war has severely constrained pastoral mobility in eastern Sudan by disrupting migration routes and limiting access to grazing and water. Insecurity, checkpoints, informal taxation, and livestock looting have increased the risks and costs of seasonal movement, forcing pastoralists to shorten migrations, abandon established corridors, or remain near farming areas. In Gadarif State, these constraints interact with long-standing land-use pressures and fragmented routes, disrupting traditional seasonal cycles linking the Butana rangelands with southern dry-season grazing areas (Sulieman and Momale, 2025).

Restricted mobility directly undermines pastoral livelihoods, food security, and social relations. As mobility is central to managing climatic variability and sustaining livestock productivity, its disruption leads to declining herd performance, rising production costs, and weakened pastoralists' incomes (Ellis and Swift, 1988; Wario et al., 2016). At the pastoral–agricultural interface, constrained movement has intensified farmer–herder conflicts, particularly through increased crop trespass and competition over limited land, reflecting the erosion of previously complementary relations between herders and farmers (Sulieman and Momale, 2025).

The study pursues four interrelated objectives. First, it analyses how the war has altered pastoral mobility patterns by examining changes in migration routes, timing, access to grazing areas and water points, and the influence of insecurity and looting on movement decisions. Second, it assesses the consequences of disrupted mobility, including impacts on livestock productivity, household income, food security, and reliance on negative coping

strategies. Third, it examines the coping and adaptation strategies adopted by pastoral households under conditions of insecurity and route loss, distinguishing between short-term coping responses and longer-term adaptations that may either sustain or erode resilience. Finally, it investigates how disrupted mobility is reshaping gender roles among pastoral households. Together, these objectives provide an analytical framework linking conflict, mobility disruption, livelihood outcomes, and social relations, generating evidence to inform conflict-sensitive and resilience-oriented interventions in eastern Sudan.

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Fallata (Fulbe) pastoralist woman preparing a decorated piece.

2. STUDY AREA

2.1 Geographic and ecological characteristics

Figure 1 (see page 9) shows the map of Gadarif State, which is in eastern Sudan along the Ethiopian border and forms part of the broader savanna semi-arid transition zone that supports both rain-fed agriculture and extensive pastoralism. The state is characterised by gently undulating plains interspersed with seasonal watercourses (Khors). Soils vary spatially, with cracking clay soils dominant in agricultural zones and lighter sandy or loamy soils prevalent in northern rangeland areas, shaping patterns of land use and vegetation cover.

Ecologically, Gadarif State encompasses several functionally distinct grazing zones that underpin pastoral mobility systems. The northern and north-eastern parts of the state overlap with the Butana communal rangelands, a semi-arid grazing zone traditionally used during the wet season due to its expansive open pastures and relatively low cropping intensity. The central belt of Gadarif functions as a key transit and interface zone, where pastoral routes intersect with large-scale rain-fed mechanised farming schemes. This area contains many of the main livestock corridors (see Figure 1) that enable seasonal movement between northern and southern grazing areas. The southern parts of the state, which receive comparatively higher rainfall and contain more permanent water points, are critical dry season grazing destinations and are closely integrated with agricultural landscapes through access to post-harvest crop residues (Sulieman, 2026).

Seasonal rainfall patterns are a defining feature of the ecological context shaping pastoral mobility in Gadarif State. Rainfall is unimodal, typically beginning in June, peaking between July and August, and tapering off by September or early October. Average annual rainfall increases from north to south, creating a gradient in pasture availability and vegetation productivity. Thus, annual rainfall in the state varies from less than 250 mm in the northernmost areas to more than 800 mm in the southernmost areas. During the rainy season, pasture regeneration in the Butana rangeland supports northward livestock movements, while the dry season prompts a southward shift towards areas with residual moisture, surface water, and crop residues. This seasonal rhythm has historically underpinned traditional mobility strategies, allowing pastoralists to balance forage availability, water access, and disease risk across space and time. However, over the past three decades, this pattern has been increasingly disrupted by the progressive narrowing and blockage of livestock routes, driven by agricultural expansion, land fragmentation, and competing land uses. These changes have been accompanied by a marked intensification of farmer–herder conflicts, particularly along contested corridors and at the agricultural–pastoral interface. More recently, even prior to the eruption of the ongoing war, fragile security conditions in the Butana area, especially from around 2019, have further constrained mobility, increased exposure to violence, and heightened tensions between pastoral and farming communities (Sulieman, 2024; Sulieman, 2026).

These geographic and ecological characteristics collectively create a system in which pastoral mobility is closely aligned with seasonal rainfall and pasture dynamics. However, the combined effects of long-term obstruction of livestock routes, escalating farmer–herder conflict, and pre-war insecurity have fundamentally reshaped this system. As a result, some pastoralist groups have abandoned their seasonal northward movements into the Butana rangeland and instead reoriented their mobility within the central and southern parts of Gadarif State, while others have shifted towards more localised or year-round mobility confined largely to southern areas. Such reconfigurations of movement patterns have direct implications for livestock productivity, rangeland condition, and the long-term sustainability of pastoral livelihoods in Gadarif State (Sulieman, 2026).

2.2 Livelihood systems

Crop farming and pastoralism constitute the main rural livelihoods in Gadarif State. Increasingly, however, these activities are being combined within the same livelihood systems, reflecting adaptive responses to environmental and socio-economic pressures

(Sulieman, 2024). Crop production is undertaken in two principal forms: smallholder farming, practiced mainly by rural communities; and large-scale mechanised farming, dominated by farmers based in urban centres. The expansion of mechanised agriculture has occurred largely at the expense of natural vegetation cover and communal grazing lands, contributing to growing pressure on pastoral mobility and rangeland resources (Sulieman and Ahmed, 2013).

Pastoralist groups in Gadarif State include the Lahaween, Rufaa, Fallata (also known as Fulbe or Fulani), Kinana, Beni Amer, Handendowa, and Rashayda, each characterised by distinct herd compositions and livelihood strategies adapted to the state's diverse agro-ecological conditions. The main livestock raised include camels, cattle, and sheep. In recent decades, sheep have become a common component across most of these groups, reflecting their growing market preference and economic importance.

2.3 Conflict context

The ongoing war in Sudan has significantly affected eastern Sudan through widespread insecurity, weakened governance, and large-scale displacement, even in the absence of sustained frontline fighting. These dynamics have disrupted land-based livelihoods and undermined the institutional conditions that support pastoral mobility and access to resources.

Gadarif State has emerged as one of the main hosting areas for internally displaced persons (IDPs) since the outbreak of the war in April 2023. Its relative stability and location have attracted displaced populations from neighbouring conflict-affected states, particularly Khartoum, Al Gazeria, Sennar, and Blue Nile (Figure 1). In addition to civilian displacement, Gadarif has received pastoral and agro-pastoral groups fleeing insecurity in these areas, often relocating with livestock. This influx has intensified pressure on land, water, grazing areas, and services, especially in rural areas where mobility corridors intersect with agricultural land.

Insecurity along key livestock corridors and transit routes has intensified due to farming encroachment and escalating conflict, particularly following the expansion of the ongoing war in neighbouring Khartoum and Al Gezira states, which border the Butana region. These corridors are critical for linking northern grazing areas, including the Butana rangelands, with southern dry season grazing zones. Border areas towards Ethiopia have also become increasingly uncertain, restricting access to long-standing transboundary grazing and trade networks. Within this context, Gadarif State has already experienced a growing tendency of farmer–herder conflict, driven by corridor blockage, crop damage disputes, and heightened competition over land and water. Overall, the combined effects of war-related displacement, corridor insecurity, and intensifying farmer–herder conflict have transformed Gadarif into a major pressure point, reshaping pastoral mobility patterns and increasing the risk of livelihood erosion and further conflict.

Figure 1: Location of the study area

3. METHODOLOGY

3.1 Study design

The study adopts a qualitative, conflict-sensitive research design to examine how the ongoing war has affected pastoral mobility, livelihoods, and social relations in Gadarif State. To spatially contextualise these insights, satellite imagery was used to map land resources and settlement patterns in the Um Sagata area (see Figure 2), which is a key pastoral area where groups from multiple pastoralist communities have increasingly settled. In addition, a Participatory Geographical Information System (PGIS) was applied in selected cases to reconstruct and compare pre-war and post-war mobility routes and territorial use. A gender-sensitive lens was incorporated throughout the research design, including the deliberate inclusion of women's perspectives in qualitative discussions and participatory mapping exercises, to capture gender-differentiated experiences of mobility, access to resources, and conflict.

3.2 Data collection

Data collection focused primarily on the Um Sagata area (Figure 2), which is a major summer camping and congregation zone for pastoralists and a critical seasonal hub along grazing routes used by many pastoralist groups such as Fallata, Rufaa, and Bani Amir. An additional site was Elshowak (Figure 1), which is a major concentration area for the Lahaween group. Fieldwork was conducted during October and November 2025.

Table 1 provides detailed information on the composition and coverage of the focus group discussions (FGDs). Informants were drawn from diverse social and institutional

groups to capture a wide range of perspectives. A total of eight FGDs were conducted with the Fallata and Rufaa communities in Um Sagata, stratified by gender and age and involving men, women, male youth, and female youth. In parallel, 28 key informant interviews (KIIs) were undertaken with pastoralist representatives from the Lahaween, Fallata, Bani Amir, and Rufaa groups, as well as with institutional actors. Of these, four KIIs were conducted with officials: two with staff from the Department of Range and two with local experts from the Um Sagata area. Table 2 provides detailed information on the composition and coverage of the KIIs.

Table 1: Focus group discussions conducted with the groups of respondents

Category	Type of meeting	No. of participants
Fallata	Men of all ages	15
	Women of all ages	12
	Male youth	12
	Female youth	9
Rufaa	Men of all ages	15
	Women of all ages	12
	Male youth	16
	Female youth	11

Table 2: Key informant interviews conducted with the groups of respondents

Category	No. of men	No. of women
Lahaween	4	0
Fallata	4	0
Bani Amir	4	0
Rufaa	7	5
Government officials	4	0

3.3 Participatory mapping

Participatory GIS mapping was used to document changes in pastoral mobility by enabling pastoralists to reconstruct movement routes before and after the outbreak of war in April 2023. Through facilitated group sessions, participants mapped key grazing areas, water points, and seasonal routes, allowing comparison between pre-war mobility patterns and current practices shaped by insecurity.

Abandoned, avoided, and newly adopted routes were identified through collective discussion and validation. Routes were classified based on whether movement had ceased, was deliberately bypassed due to risk, or had shifted to alternative pathways to avoid conflict-affected areas. This process generated spatially grounded evidence of how the war has reconfigured pastoral mobility networks and constrained access to grazing and water in Gadarif State.

3.4 Data analysis

Data were analysed using thematic topics aligned with the study objectives, focusing on changes in mobility patterns, livelihood impacts, coping strategies, and social relations. Findings were triangulated across focus group discussions, key informant interviews, and participatory mobility maps. This integration of narrative and spatial evidence strengthened

the credibility of the analysis and provided a better understanding of how the war has reshaped pastoral mobility and livelihoods in Gadarif State.

3.5 Ethical considerations

The study followed ethical principles suitable for conflict-affected research, including informed consent, voluntary participation, and the protection of confidentiality and anonymity. Data collection was designed to minimise risk to participants, avoid sensitive identifying information, and ensure inclusive participation across gender and social groups.

Group of Fallata (Fulbe) children in a fareg (camp) in southern Gadarif, Sudan.

4. FINDINGS

4.1 Changes in pastoral mobility patterns

4.1.1 Mobility before the war

Before the eruption of the ongoing war, livestock movement in Gadarif State typically began in July, depending on the onset of rainfall. Herds first congregated in central staging areas, particularly forest zones, before proceeding northwards to the Butana region, which historically functioned as the principal rainy season grazing area. Livestock remained in Butana for approximately two to three months, generally between August and October, benefiting from abundant natural pasture, low disease pressure, and wide grazing spaces. By the late 2010s, however, access to Butana had become increasingly uneven, with fewer herds able to complete this full seasonal cycle. As water availability declined toward the end of the rainy season, herds gradually returned southward, where they remained during the summer months.

Informants emphasised that this seasonal movement was not ad hoc but followed established calendars closely linked to rainfall timing and vegetation growth. KIIs further noted that livestock health, calving success, and milk production were historically dependent on sustained access to the Butana during the rainy season, highlighting the significance of recent mobility contractions for pastoral livelihoods even before the onset of large-scale warfare.

Before the outbreak of war in April 2023, pastoral mobility in eastern Sudan generally followed a relatively predictable seasonal circulation system structured around rainfall patterns, pasture availability, and livestock health requirements. However, even prior to the war, this system had been increasingly affected by a range of structural and security-related factors that reduced and constrained mobility. Informants describe a traditional north–south seasonal movement, with herds moving away from humid, disease-prone southern zones during the rainy seasons and returning southwards during the dry season to access permanent water sources. At the same time, many informants noted that growing restrictions along livestock corridors, rising farmer–herder conflict, and deteriorating security conditions had already led some pastoralists to reduce their range of mobility, limiting movements to the central and southern parts of Gadarif State, while others shifted towards year-round residence in southern areas.

Prior to the war, pastoral mobility in eastern Sudan was organised around three interconnected grazing zones that together formed a coherent seasonal system. The Butana region in the north was consistently identified as the most important rainy grazing area. Informants described it as an open rangeland characterised by abundant palatable vegetation, wide grazing spaces, and relatively low disease pressure. Both cattle and small ruminants depended on access to Butana during the rainy months to recover body condition, improve fertility, and build resilience ahead of the dry season. However, in recent decades, this role of Butana has been increasingly undermined by the wide expansion of large-scale mechanised farming and the rapid growth of artisanal gold mining, both of which have encroached on rangelands, fragmented grazing territories, and obstructed traditional livestock routes. Livestock health, calving success, and milk production were closely associated with the ability to remain in this zone for an extended period, an option that has become progressively constrained even before the outbreak of the current war.

In the central zone of Gadarif State, natural forests constituted the principal resting and camping locations for herds, both before proceeding northwards to the Butana rangelands and during their return southwards. The southern agricultural zone is primarily used during the dry and summer seasons, providing permanent water sources and access to crop residues essential for sustaining livestock when northern grazing becomes unviable. Movement between these zones relied on demarcated livestock corridors linking southern, central, and northern grazing areas. KIIs further noted that these corridors were historically recognised by pastoral communities and local authorities, even where formal demarcation or enforcement was weak.

4.1.2 Mobility after the outbreak of war

Following the outbreak of war in April 2023, pastoralists reported the abandonment or temporary suspension of several previously used migration routes, particularly those leading to the Butana area. Informants consistently indicated that avoidance was driven primarily by insecurity rather than conditions. Informants described widespread fear of livestock seizure, armed attacks, and killings, informed both by direct incidents and by accounts relayed from herders coming from conflict-affected areas such as Gezira, Sennar, and Dinder. As a result, many herders chose not to send their livestock northward during the first two seasons of the war, even in years when pasture conditions were favourable.

Specific locations were repeatedly identified as unsafe and therefore avoided, including parts of areas neighbouring or within Butana. Armed robbery, often involving vehicles and firearms, emerged as a new and decisive factor shaping route choice. Informants corroborated these accounts, noting that insecurity in the Butana and adjacent corridors led many herders to stop short of core grazing areas, divert to alternative destinations, or remain in central zones rather than risk movement through contested routes. In this context, mobility decisions became increasingly precautionary and based on risk avoidance rather than seasonal routine.

A second major change reported was a significant reduction in mobility distances, combined with longer periods of stay in fewer locations. Rather than undertaking full seasonal movements between southern areas and the Butana, many pastoralists described remaining for extended periods in the southern and central parts of the state, particularly around mountains, forests, and river-adjacent zones. This strategy was deliberately adopted to minimise the risk of trespassing and crop damage in intensively farmed areas, where encroachment could trigger conflict. As a result, movement became increasingly confined to short distances, with herds circulating locally rather than progressing along long-established corridors.

This immobility resulted in prolonged stays in areas not historically used for extended grazing, especially during the rainy season. Informants highlighted that some herds that previously spent up to three months in the Butana were now either unable to reach the area or could only remain briefly before returning south. KIIs further explained that even when security conditions improved slightly, herders often moved cautiously and returned early, limiting their risk exposure. The outcome was a compression of mobility in both space and time, fundamentally altering seasonal grazing calendars.

In response to insecurity and restricted access to traditional routes, some pastoralists redirected their movements eastward, particularly towards Kassala State and areas east of the Atbara River towards the border with Eritrea. Informants reported that this shift reflected an attempt to avoid the most insecure northern routes while still accessing pasture and water. The forest resting areas adjoining eastern routes became important alternatives, serving as destinations rather than transitional spaces.

However, movement towards international border areas was described as highly selective and cautious. While some herders moved eastward within Sudanese territory, informants consistently reported avoiding the Ethiopian border due to persistent insecurity, attacks on herders, and livestock theft. Eritrean border areas were also largely avoided. They noted that these eastward shifts contributed to overcrowding in forest zones and agricultural areas, increasing pressure on grazing and water resources and setting the stage for heightened competition and conflict with farmers.

4.1.3 Mapping the mobility patterns and territories before and after the war

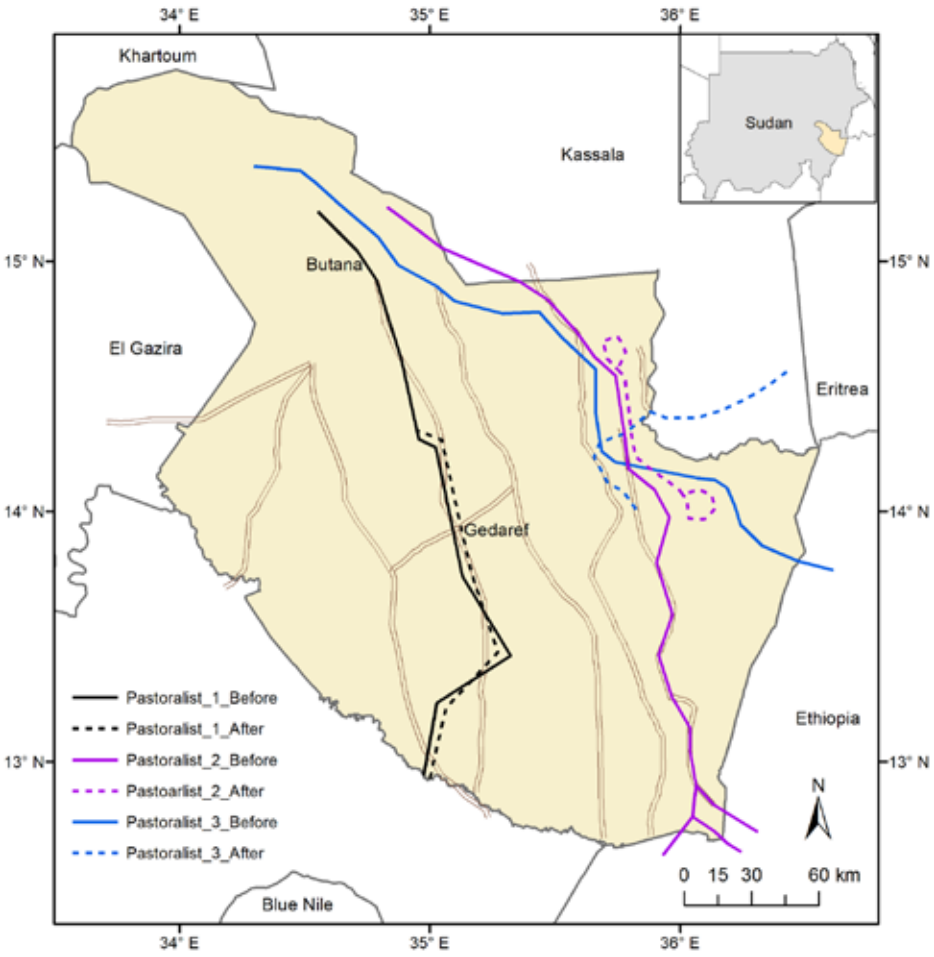
The participatory mapping evidence reveals a consistent pattern of mobility contraction and spatial reconfiguration among pastoralists following the outbreak of war. Across all three cases, access to historically important dry- and wet-season grazing areas – particularly Butana and the Ethiopia–Sudan borderlands – has been significantly reduced or abandoned altogether. In response, pastoralists have adopted risk-avoidance strategies that prioritise

security over pasture quality, resulting in shorter migration distances, prolonged stays in agricultural zones or forested resting areas, and the emergence of new mobility corridors towards relatively safer eastern borderlands. These shifts have intensified pressure on limited grazing resources, increased overlap with cultivated areas, and heightened the potential for farmer–herder tensions, underscoring how armed conflict is actively reshaping pastoral territoriality, seasonal decision-making, and livelihood resilience in eastern Sudan. Figure 2 depicts participatory GIS mapping of seasonal mobility routes and grazing territories of three pastoralists in Gadarif State, Sudan, showing shifts in transhumant movements before and after the eruption of the ongoing war. The map illustrates route contraction, diversion away from Butana and from the border areas with Ethiopia, and partial reorientation towards alternative grazing zones, including forest reserves and the Kassala–Eritrea border area.

Case one: Rufaa sheep herder (Figure 2: Pastoralist 1)

The first case represents a Rufaa pastoralist whose mobility traditionally followed a northward trajectory. Before the war, his flock moved from the southern fringes of Gadarif State into the heart of the Butana rangelands during the rainy season. After the outbreak of war, this movement became severely restricted. He was forced to turn back midway and no longer reached Butana. Instead, he remained year-round within the central and southern parts of the state, areas dominated by rainfed mechanised and smallholder agriculture. This marks a significant spatial contraction of his grazing territory and a shift towards a much more localised and constrained mobility system.

Figure 2: Participatory GIS–based examples of three pastoralists' mobility routes in Gadarif State before and after the outbreak of war.



Case two: Lahaween camel herder (Figure 2: Pastoralist 2)

The second case concerns a Lahaween camel herder whose dry-season range previously extended along the Ethiopia–Sudan border, with movements occasionally crossing into Ethiopia. During the rainy season, his herds migrated northwards into Butana. Since the onset of war, he has withdrawn entirely from the borderlands because of insecurity and heightened threat. During the rainy season, instead of continuing to Butana, he now remains in a major forested resting area, effectively truncating his migration route. This demonstrates both a spatial retreat away from contested border zones and a strategic shift to safer but less optimal grazing locations.

Case three: Lahaween sheep herder (Figure 2: Pastoralist 3)

The third case also involves a Lahaween sheep herder. Before the war, his dry-season movements centred on the El-Fashaga area, with occasional crossings into Ethiopia, while his rainy-season trajectory took him into Butana. After the war, he rerouted completely away from the Ethiopian border during the dry season. During the rainy season, instead of moving northwards to Butana, he shifted eastwards, travelling towards Kassala and spending the rainy season along the border with Eritrea. This represents a major reorientation of his mobility corridor, shaped by insecurity, territorial contestation, and the need to avoid high-risk zones.

4.2 Consequences of disrupted mobility

4.2.1 Intensification of farmer–herder conflict

The intensification of farmer–herder conflict following the outbreak of war is closely linked to the year-round concentration of pastoralists in farming zones. Informants consistently indicated that insecurity and fear of violence prevented the majority of herders from undertaking seasonal movements to northern grazing areas, forcing them to remain throughout the year in southern and central zones dominated by rainfed agriculture. This marked a significant departure from pre-war patterns, when pastoral presence in farming areas was limited, temporary, and regulated through established mobility schedules.

Informants described how this prolonged and continuous presence of livestock in farming zones dramatically increased the frequency of frictions between herders and farmers. Agricultural areas that previously experienced short periods of overlap during migration now become permanent sites of livestock grazing, resting, and water access. As a result, any trespass of livestock was perceived by farmers as encroachment, leading to disputes. Informants highlighted that conflicts were no longer confined to the end of the harvest season but occurred daily.

Agricultural expansion into former grazing land, livestock corridors, and forest areas further intensified these tensions. Informants reported that farmers cultivated land up to riverbanks, khors, and traditional routes, leaving herders with limited options for movement or access to water. In this context, crop damage—whether accidental or unavoidable—became a central trigger of conflict. Herders described being routinely fined for minor encroachments, with compensation demands perceived as excessive and difficult to contest, particularly in the absence of effective mediation.

Informants emphasised that the year-round stay of pastoralists in farming zones transformed conflict dynamics. Rather than episodic disputes managed through customary arrangements, conflicts became monetised and punitive. Herders accompanying livestock were frequently detained until fines were paid, forcing households to sell animals or borrow money. KIIs noted that this practice not only deepened mistrust between farmers and herders but also reinforced power asymmetries, as pastoralists lacked secure tenure or institutional protection in these zones.

Overall, the war-induced immobility fundamentally reshaped farmer–herder relations by converting farming zones into permanent pastoral spaces without corresponding governance

mechanisms. The resulting year-round cohabitation intensified conflict, increased economic burdens on pastoralists, and further constrained mobility, creating a self-reinforcing cycle in which insecurity, immobility, and conflict mutually sustain one another.

4.2.2 Overcrowding and degradation of accessible grazing areas

Disrupted mobility following the outbreak of war led to the spatial concentration of livestock in a limited number of accessible and relatively secure areas, particularly in the southern and central parts of the state. Informants consistently reported that large numbers of herds were unable or unwilling to move to the Butana region and instead remained for extended periods in forest zones, mountainous areas, and around agricultural schemes. These areas, which had previously functioned as transitional or seasonal spaces, became long-term grazing zones, resulting in severe overcrowding.

Informants described how the arrival of livestock from neighbouring states and conflict-affected regions further intensified pressure on these accessible areas. Herds originally from Gezira, Sennar, Dinder, and the Blue Nile were reported to have converged on the same southern corridors and forest zones, beyond the land's carrying capacity. As a result, grazing resources deteriorated rapidly, with informants noting the disappearance of palatable grasses, the cultivation of remaining fallow land, and the degradation of forest cover due to continuous grazing and agricultural encroachment.

Informants highlighted that the forest resting areas are particularly affected. Once a temporary staging zone, it became a year-round destination for many herders, leading to extensive overuse of pasture and the clearing of forest land for cultivation. KIIs warned that this prolonged concentration of livestock was pushing some forest and rangeland areas toward ecological collapse, reducing their future viability as grazing reserves and undermining the resilience of pastoral systems.

4.2.3 Increased competition over water points

Restricted movement also intensified competition over water resources, especially in areas where livestock remained concentrated for long periods. Informants described growing difficulties in accessing rivers, khors, and seasonal water points, particularly during the summer months. In many cases, traditional access routes to rivers were reported to be blocked by agricultural embankments or cultivated fields, forcing herders to negotiate passage or abandon certain water points altogether.

Informants reported that water scarcity was exacerbated by the sheer number of animals sharing limited sources. Natural waterholes and reservoirs in forest zones dried up more quickly than before due to overuse, while rivers became increasingly difficult to access. As a result, some herders were forced to transport water to their livestock using carts or trucks, a practice that was previously uncommon and financially burdensome. KIIs confirmed that dependence on purchased or transported water had increased significantly since the war, raising production costs.

Competition over water also heightened tensions with farmers and local landholders. Informants noted frequent disputes arising when livestock approached cultivated riverbanks or irrigation areas, while KIIs highlighted that water access had become a major trigger for fines, harassment, and conflict. This means that disrupted mobility transformed water from a seasonal constraint into a persistent and contested resource, reshaping pastoral decision-making and increasing vulnerability.

4.2.4 Deterioration in livestock health and productivity

Informants consistently reported that disrupted mobility following the outbreak of war had pronounced consequences for livestock health and productivity. They repeatedly linked declining animal health to prolonged stays in southern and central zones during the rainy and rainy seasons, areas characterised by high humidity, dense insect populations, and limited access to good, or nutritive pasture. In contrast to pre-war conditions, when seasonal

movement to the Butana region allowed livestock to escape disease-prone environments, herds were now exposed for extended periods to conditions conducive to illness and stress.

Informants described a marked increase in disease incidence among livestock since the war. They reported frequent outbreaks of diseases that were previously uncommon in these areas, attributing their spread to overcrowding, the mixing of herds arriving from different regions, and the absence or disruption of veterinary services during the early stages of the conflict. In several accounts, herders noted that livestock now required regular veterinary treatment, whereas before the war, such interventions were limited. The proliferation of flies, mosquitoes, and other vectors during the rainy season was repeatedly cited as a major factor contributing to illness, particularly among cattle.

Increased livestock mortality was another widely reported outcome. Informants described rising death rates among cattle, sheep, and goats, especially during periods of prolonged immobility. Informants explained that weak body condition, disease exposure, and inadequate nutrition combined to reduce animals' ability to survive. They confirmed that mortality had increased significantly compared to pre-war years, noting that deaths were particularly high among young animals and among herds that remained concentrated in forest zones throughout the rainy season.

Disrupted mobility also undermined reproductive performance. Informants regularly reported declining birth rates and poor survival of newborn animals. Informants described situations in which cattle gave birth, but calves died shortly afterwards due to disease, insect infestation, or the poor physical condition of their mothers. They further explained that the inability to access the Butana region during key seasonal windows disrupted established breeding cycles, resulting in fewer successful pregnancies and weaker offspring. As a consequence, even when births occurred, they did not translate into herd growth.

Taken together, increased disease, higher mortality, and reduced reproductive success led to observable declines in herd size. Informants reported that herd numbers had either stagnated or decreased despite continued efforts to maintain livestock holdings. In some cases, losses were compounded by distress sales driven by the need to cover rising costs for feed, water, and veterinary care. KIIs noted that these trends eroded the productive base of pastoral livelihoods, reducing not only immediate output but also the capacity for future recovery.

4.2.5 Disrupted livelihoods, marketing, and income

Across the FGD and KII sessions, informants consistently emphasised that declines in animal health rapidly led to livelihood stress. Reduced access to high-quality grazing and prolonged exposure to disease-prone environments resulted in lower output from herds, particularly in terms of milk production and marketable animals.

Informants reported a substantial decline in milk production following the disruption of seasonal mobility. They explained that weakened livestock, inadequate nutrition, and frequent illness reduced milk yields, depriving households of a key source of food and income. In several accounts, milk, which previously formed the backbone of daily household consumption, became scarce or disappeared entirely, increasing dependence on purchased food and heightening vulnerability.

The deterioration in livestock condition also affected livestock sales. Informants noted that fewer animals were fit for sale, and those brought to market were often weak, infected, or underweight. As a result, herders described returning from markets without selling animals or being forced to accept unfavourable prices. Informants highlighted that the inability to sell healthy animals reduced herders' bargaining power and disrupted normal marketing cycles that previously allowed households to sell selectively during normal situations.

Under these conditions, distress selling became widespread. Informants described herders being compelled to sell animals, including female stock, not to invest or expand production, but simply to meet immediate needs such as food purchases, veterinary treatment, fines related to crop damage, or the cost of water and feed. Informants confirmed that increased costs of production, combined with declining returns, forced households to

liquidate assets more frequently and in larger numbers than before the war, accelerating herd depletion and long-term livelihood erosion.

In addition to reduced livestock quality, informants reported growing difficulties in accessing markets. Insecurity along routes, fear of robbery, and the need to move cautiously limited herders' ability to track animals to major livestock markets. Some informants noted that herders avoided certain markets altogether or travelled in groups to reduce risk, increasing transaction costs and time spent away from livestock and households. They further explained that insecurity disrupted normal livestock flows, leading to irregular market supply and unpredictable trading conditions.

Informants' accounts of prices reflected a paradoxical situation. While animal prices were sometimes reported to have increased, herders stressed that real returns had declined due to sharply rising costs. Expenses related to veterinary drugs, purchased feed, water transport, and informal payments or fines absorbed a larger portion of the income from sales. They pointed out that the proliferation of veterinary pharmacies and increased reliance on medication were clear indicators of rising production costs. Consequently, even when animals were sold, profits were often insufficient to sustain households or reinvest in herds.

4.2.6 Difficulties in achieving household food security

Across FGDs and KIIs, informants emphasised that pastoral households depend heavily on livestock as a primary source of daily household consumption. These households particularly rely on livestock products, such as milk. As animal health deteriorated and milk production declined, families experienced growing difficulty meeting basic food needs. In several accounts, milk, which previously constituted a regular component of household diets, became scarce or unavailable, forcing households to rely more on market-purchased staples.

Informants described experiencing periods of acute hunger that were more frequent and prolonged than before the war. They mentioned that reduced livestock output, combined with rising costs for water and veterinary care, left households with limited cash to purchase food. While some informants noted that complete food shortages were not general, many reported increased anxiety about food availability and a reduced capacity to absorb shocks, particularly during the summer season when livestock were weakest.

Meal reduction emerged as a common coping response. Informants described households reducing the number of meals consumed per day or limiting portion sizes to stretch available food supplies. In some cases, households prioritised children or working adults when food was scarce, while others relied on selling livestock at unfavourable prices to avoid more severe deprivation. Informants confirmed that declining livestock productivity and constrained market returns forced households to adjust consumption patterns, even when livestock prices appeared high in nominal terms.

Informants also reported noticeable dietary changes, characterised by reduced diversity and increased dependence on low-cost staple foods. With the decline in milk availability and shortage of milk supply and limited purchasing power, diets shifted away from animal-source foods toward cereals and purchased grains. They highlighted that this shift represented not only a nutritional loss but also a significant change in pastoral food practices, as milk and other livestock products had previously underpinned both dietary adequacy and cultural food norms. Informants further noted that these dietary adjustments reflected broader livelihood stress rather than temporary seasonal variation.

4.2.7 Transformation of livelihood identity and social roles

Informants reported that prolonged immobility and restricted access to grazing areas compelled many pastoralists to engage in alternative livelihood activities that went beyond short-term coping. Informants described increasing involvement in farming, wage labour, petty trade, and forest-based activities, such as firewood collection and charcoal making, particularly in areas where herders remained year-round within farming zones.

Informants provided detailed accounts of pastoralists making substantial investments in agricultural production, including purchasing or renting farmland, acquiring agricultural machinery, and forming group-based farming arrangements. These activities were often described as necessary responses to declining livestock productivity and income, rather than normal diversification. In several interviews, respondents noted that pastoralists who had never previously cultivated land were now managing sizeable plots or operating machinery, indicating a qualitative shift in livelihood orientation rather than temporary supplementation.

Despite being framed as an adaptation, informants expressed growing concern about the erosion of pastoral knowledge systems and herd-based livelihoods. They highlighted that the time they spend in farming or working for wages reduced attention to herd management, seasonal mobility skills, and intergenerational transmission of pastoral knowledge. Some informants worried that younger generations were losing familiarity with migration routes, grazing strategies, and livestock management practices that had historically defined pastoral identity.

Several informants explicitly questioned the reversibility of these livelihood shifts. While some pastoralists hoped to return to full mobility if security improved, others acknowledged that investments in land, machinery, and settled production tied households more permanently to farming zones. They suggested that as herds declined and dependence on agriculture increased, pastoralism risked becoming a secondary activity rather than the core livelihood. This raised concerns about identity loss and long-term vulnerability, particularly if conflict persisted or environmental conditions deteriorated.

4.2.8 Youth labour substitution and militarisation

Informants consistently reported that young men increasingly replaced elder people in herding, as older household members settled with families while younger men moved with livestock or managed herds in insecure environments. This substitution of labour reflected both the physical demands of herding under constrained mobility and the heightened security risks associated with movement.

In addition to herding responsibilities, young men were frequently described as engaging in agricultural labour, wage work, and informal income-generating activities to meet household needs. They mentioned that prolonged immobility in farming zones expanded opportunities and pressures for youth to participate in farm labour. At the same time, they reported that some young men became involved in military mobilisation and local defence efforts, particularly in response to the proximity of conflict zones and perceived threats to land, livestock, and communities. Participation in these efforts was often framed as both a protective necessity and a social obligation, especially where the presence of formal state forces is weak. This exposure to militarisation introduced new risks for youth, including physical harm, psychological stress, and long-term disruption of livelihood pathways.

The generational impacts of disrupted mobility were uneven. While boys' schooling and educational continuity declined, girls' access to education sometimes improved following settlement, as families remaining in one place were better able to enrol girls in nearby schools. However, this relative improvement occurred alongside increased domestic and agricultural responsibilities for girls, reflecting a redistribution rather than a reduction of labour burdens.

4.3 Coping and adaptation strategies

4.3.1 Immediate coping responses

In response to disrupted mobility and declining livestock productivity, pastoral households adopted a range of immediate coping responses aimed at meeting short-term subsistence and cash needs. Informants described distressed sales of livestock as the most common and urgent strategy. Herders reported being compelled to sell animals, not because of

favourable market conditions, but to cover essential expenses such as food purchases, veterinary treatment, water costs, fines related to crop damage, and household medical needs. In several accounts, informants noted that they were forced to sell animals at low prices, including breeding females, thereby undermining the long-term viability of their herds.

Borrowing emerged as a second critical coping mechanism. They mentioned that pastoral households increasingly relied on short-term loans from relatives, livestock traders, market intermediaries, and veterinary pharmacies. Unlike pre-war borrowing, which was described as occasional and seasonal, post-war borrowing was portrayed as continuous and unavoidable. Loans were commonly used to purchase food, pay for medicines, or finance livestock maintenance costs, particularly when animals brought to market could not be sold or fetched very low prices. Several informants emphasised that indebtedness accumulated quickly, trapping households in cycles of borrowing and forced sales.

Reliance on social networks and informal support systems also intensified. Informants described seeking assistance from kin, neighbours, and community members, including food sharing, small cash transfers, and temporary hosting of family members during periods of acute stress. They highlighted that while such networks remained vital, their capacity to absorb shocks was increasingly strained, as many households within the same communities faced similar pressures simultaneously. They noted that social support mechanisms that once functioned as safety nets were becoming less reliable under prolonged crisis conditions.

Together, these immediate coping responses reflect attempts to manage acute livelihood stress rather than strategies for recovery. While distress sales, borrowing, and reliance on social networks helped households survive in the short term, informants consistently acknowledged that these measures eroded productive assets, deepened indebtedness, and weakened social resilience over time.

4.3.2 Changes in settlement and engagement in farming practices

Sedentarisation is not a new phenomenon among pastoralists in Gadarif State. However, informants indicated that the ongoing war and the associated restriction of pastoral mobility have significantly accelerated both the pace and scale of this process. As prolonged stays within farming areas became normalised, many pastoral households moved towards partial or full sedentarisation. They described families settling with women, children, and older household members in or near farming villages, while younger men continued to move with livestock along shorter, more localised routes. They further noted that some households sought greater security by acquiring land, through purchase, rental, or informal arrangements with local landholders, marking a gradual departure from exclusive reliance on shared grazing commons.

The expansion into crop farming emerged as a central component of this adaptation. Informants described pastoralists cultivating land for the first time or expanding existing plots to supplement declining livestock-based incomes. Farming practices included rainfed crop production on rented or purchased land, cultivation within forest areas under informal arrangements, and sharecropping with large-scale farmers. They also reported cases of pastoralists investing in tractors and other machinery, sometimes forming groups to jointly manage farming operations or rent equipment to others.

While often framed as necessary coping strategies, informants expressed ambivalence regarding the long-term implications of these shifts. Informants highlighted concerns that increased engagement in farming reduced labour and time available for herd management, weakened pastoral mobility skills, and altered household priorities. They further observed that investments in land and farming infrastructure anchored households more firmly to fixed locations, potentially constraining future mobility even if security conditions were to improve. Together, these findings suggest that recent changes in settlement and farming practices reflect not only short-term responses to war-induced immobility, but also an acceleration of longer-term livelihood transitions with uncertain reversibility.

4.3.3 Increasing preference for land acquisition and ownership

The Um Sagata area (Figure 3) is an example of the increasing preference among pastoralists to settle and acquire their own land. Overall, smallholding agriculture is the dominant land use, covering most of the lowland areas. These smallholder fields form a dense mosaic of relatively small plots, indicating intensive rain-fed farming typical of rural Gadarif. In contrast, large-scale farming schemes are more limited and spatially concentrated, appearing mainly as larger, more regular blocks in specific parts of the area.

Natural vegetation occurs as fragmented patches interspersed among cultivated lands, particularly along watercourses, around mountain foothills, and in less accessible areas. These patches are the main grazing areas and seasonal resource reserves, reflecting the agro-pastoral character of the landscape. Bare land is present in scattered pockets, often adjacent to cultivated fields or near settlement areas, suggesting fallow land, degraded surfaces, or zones under pressure from cultivation and grazing.

The area includes several mountainous zones, which form prominent landscape features. These upland areas are largely uncultivated and appear to constrain agricultural expansion, while also influencing drainage patterns and land use distribution in the surrounding lowlands. They also represent impart fodder source for pastoralists.

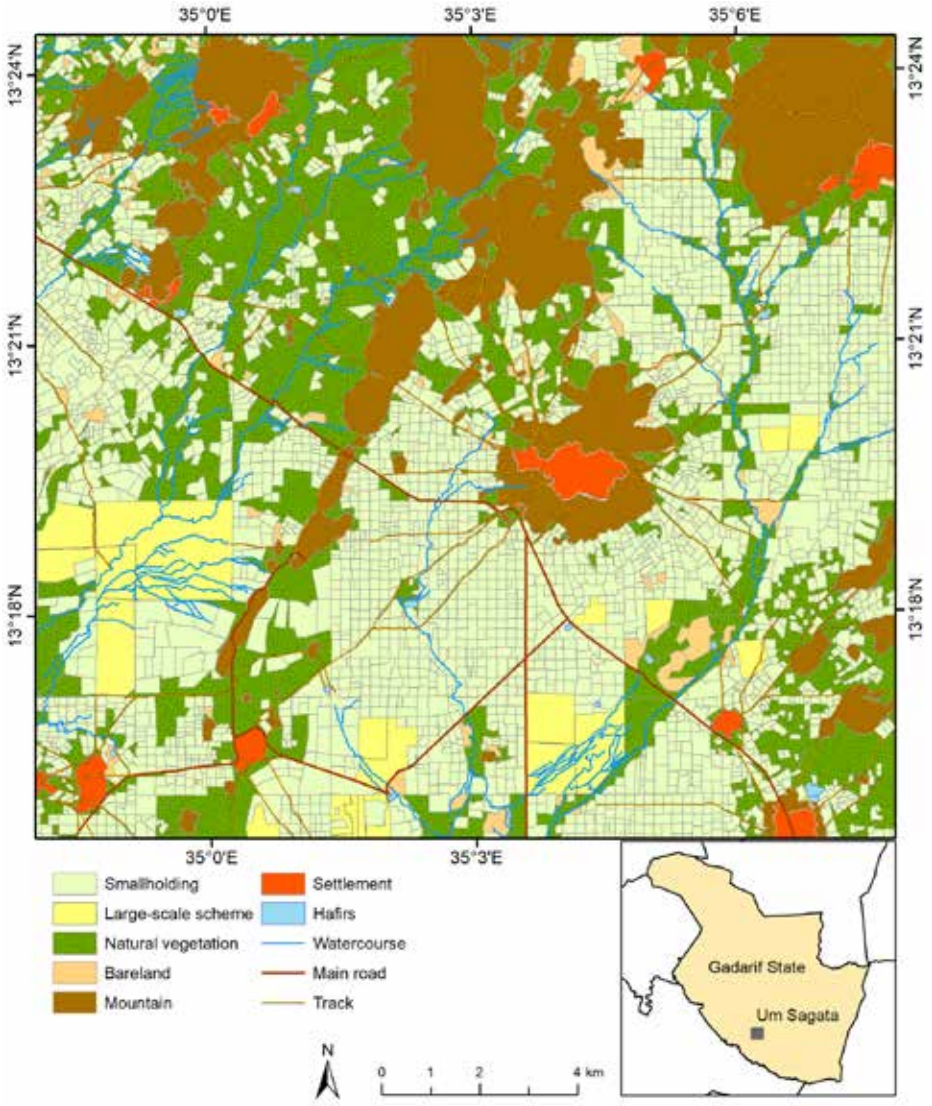
Settlements are relatively small, often at the intersection of roads and tracks or near agricultural land, reflecting their role as service and residential centres within a farming landscape. The road network consists of a main road traversing the area and numerous secondary tracks, providing connectivity between villages, farms, and surrounding regions.

Hydrologically, the map shows a network of seasonal watercourses and hafirs (man-made water harvesting bonds). These features are critical for both human and livestock water supply and strongly influence settlement locations, farming patterns, and grazing routes.

The main transhumant pastoralists settled in the area are Rufaa and Fallata. Rufaa started to settle in the area in the late 1980s, while Fallata began to settle in the area in the late 1990s. However, after the eruption of the ongoing war, there is an increased preference among pastoralists, especially Fallata and Rufaa, to acquire and own land for housing and farming. The main strategies they follow differ between the two groups. When they started to settle in the area, Rufaa used to purchase agricultural land collectively in small groups, and now they do so on an individual basis. Fallata are still owning land in the form of small groups, whom and relatives and have kinship. They also did not register the land under their names. The land is still in the name of the local farmers from whom they purchase the land, and annually they ask them to go to the office of the Mechanised Farming Corporation in Gadarif to pay on their behalf the annual land lease money.

Since the outbreak of the ongoing war, both groups have shown a growing preference for securing land for both residential and farming purposes. This marks a notable shift from their earlier mobility patterns. This evolving pattern of land acquisition reflects broader shifts in pastoralist settlement behaviour driven by insecurity, displacement pressures, and the need to stabilise livelihoods in a rapidly changing context.

Figure 3: Land use and land cover composition of the Um Sagata area in Gadarif State, eastern Sudan.



4.3.4 Livelihood diversification

Disrupted mobility following the outbreak of war compelled pastoral households to diversify their livelihoods beyond livestock and crop farming to secure cash income and meet rising daily expenses. Informants reported increased engagement in wage labour, forest-based activities, trade, and transport-related services, particularly in and around agricultural areas where households had become partially or fully settled. These activities were generally described as necessity-driven responses to declining livestock productivity rather than planned livelihood strategies.

Wage labour emerged as one of the most common diversification pathways. Informants described household members—especially young men—working as daily labourers on the large-scale agricultural schemes, smallholding farms, and nearby settlements to earn cash for food, water, and veterinary costs. Such work was often irregular and poorly paid, but it provided an immediate source of income at a time when livestock sales were constrained.

Informants also reported engagement in charcoal production and firewood collection, particularly in forested areas where livestock had become concentrated. They indicated that these activities were undertaken by both men and women, although usually at small scales, and were used to generate quick cash. They highlighted concerns that increased reliance on forest-based livelihoods contributed to environmental degradation, especially in areas already under pressure from prolonged grazing and agricultural expansion.

Small-scale trade represented another important diversification strategy. Informants described buying and selling livestock, agricultural products, and basic goods within local markets. Some herders started to practice livestock trading roles, acting as intermediaries between producers and markets. Informants noted that while trade offered income opportunities, it also exposed households to new risks, including market volatility, debt, and insecurity along transport routes.

Some pastoralists became involved in transport-related services, including the use of carts, trucks, and tractors to transport water, livestock, or agricultural produce. Informants reported that transporting water to livestock had become a livelihood activity, as well as a necessity. Pastoralists renting out vehicles or machinery to other farmers and herders for a fee, reflecting adaptive use of assets under constrained mobility conditions.

Overall, livelihood diversification provided short-term income and reduced immediate vulnerability, but informants stressed that these activities were often insecure, environmentally damaging, and insufficient to replace the economic and social value of livestock-based livelihoods.

4.3.5 Long-term implications of adaptation

Table 3 summarises the consequences of the coping responses and longer-term adaptations practiced by pastoralists during the ongoing war. While the coping and adaptation strategies adopted by pastoral households enabled short-term survival under conditions of war and disrupted mobility, informants said that these responses carry significant long-term implications for pastoral livelihoods, social organisation, and resilience. A central long-term implication identified in the transcripts is the erosion of herd-based livelihood viability. Continued distress sales, rising mortality, and weakened reproduction reduced herd sizes and undermined households' ability to rebuild livestock assets. They noted that as herds declined, households became increasingly dependent on non-pastoral income sources, making a full return to mobile pastoralism progressively more difficult, even if security conditions were to improve. Although informants reported some recent improvement in security, and noted that during the 2025 rainy season some pastoralists were once again able to reach the Butana area, they emphasised that the situation remains fragile and far from stable. Several informants expressed concern that pastoralism was gradually shifting from a primary livelihood to a secondary activity, especially among younger generations.

Informants also highlighted the risk of entrenching settlement and land-based dependencies. Investments in farmland, machinery, housing, and local economic activities tied households more firmly to specific locations. They acknowledged that these commitments reduced flexibility and constrained future mobility, while questioning whether households that had acquired land or entered long-term farming arrangements would be able—or willing—to resume seasonal migration. This raised concerns about potentially irreversible changes to mobility systems that historically functioned as critical risk-management strategies in variable environments.

Informants further point to intergenerational consequences of the ongoing adaptation practices. Increased labour burdens on youth and exposure to militarisation were all seen as shaping future livelihood trajectories away from pastoralism. At the same time, women's expanded roles in farming, household management, and decision-making were described as both adaptive and burdensome. Informants expressed uncertainty about whether these changes would contribute to longer-term empowerment or deepen inequalities and stress within households.

Informants also underscored the institutional and governance implications of adaptation. The weakening of customary mobility governance and the growing reliance on individual negotiation, fines, and informal arrangements were seen as undermining collective management of land and resources. Informants warned that without restored livestock corridors, functional grazing reserves, and effective conflict-resolution mechanisms, current adaptations risk locking pastoralists into increasingly precarious livelihoods characterised by environmental degradation, conflict, and chronic vulnerability.

Overall, while adaptation strategies have enabled pastoral households to cope with immediate shocks, they also risk reconfiguring livelihoods, identities, and social relations in ways that may be difficult to reverse, despite some improvements in mobility conditions, carrying profound implications for post-conflict recovery and long-term resilience.

Table 3: Adaptation practices adopted by pastoralists in Gadarif State following the outbreak of the ongoing war.

Practice	Type	Short-term benefit	Long-term implication
Distress livestock sales	Immediate coping	Cash for food, fees, and medicine	Herd depletion and loss of breeding stock
Borrowing and short-term loans	Immediate coping	Liquidity for essentials	Debt cycles; dependency on traders
Relying on kin and social networks	Immediate coping	Food, cash support, and hosting	Network exhaustion; reduced reciprocity capacity
Group travel and convoys to markets	Immediate coping	Reduced robbery risk	Higher transaction costs; delayed marketing
Water trucking and carts to herds	Immediate coping	Maintain herds in place	Rising costs; unequal access by wealth
Herd splitting and partial movement	Risk management	Protect assets; flexible grazing	Fragmented households; labour strain
Prolonged stay in farming zones	Adaptation	Safety; access to crop residues	Chronic farmer–herder conflict; route loss
Partial/full sedentarisation	Adaptation	Reduced exposure to insecurity	Reduced mobility options; identity shift
Land acquisition and renting plots	Adaptation	Secure settlement and farming base	Locked-in land dependence; disputes
Expansion into crop farming	Adaptation	Supplement income and food	Labour diversion; weaker herd management
Wage labour	Diversification	Immediate income	Precarious work; schooling disruption
Charcoal making and firewood cutting	Diversification	Quick cash	Environmental degradation; legal/social risks
Small trade and livestock trading	Diversification	Income buffering	Market volatility; debt exposure
Transport services (water and livestock)	Diversification	Income; mobility support	Asset wear; fuel and maintenance burden

4.4 Gendered impacts of mobility restrictions

4.4.1 Changes in women's workloads

Restrictions on pastoral mobility following the outbreak of war led to a substantial increase in women's workloads, particularly in households that remained year-round in farming and settlement zones. Informants reported that women assumed greater responsibility for water collection, domestic labour, and day-to-day livestock care, especially as men and young men moved with herds or became involved in guarding livestock and defending territories. Water collection became more time-consuming and physically demanding as access points grew more distant or contested, requiring women to walk longer distances, often on foot or with donkeys.

In addition to water collection, women took on expanded roles in household provisioning and livestock-related tasks within settled areas. Informants said that women were increasingly responsible for feeding animals kept near homesteads, managing enclosures to prevent crop damage, and caring for sick or weakened livestock. Domestic labour also intensified, as women had to balance childcare, food preparation, and household management with income-generating activities such as farming or petty trade. Informants emphasised that these cumulative demands significantly increased physical strain and reduced time for rest.

Informants further noted that the intensification of women's workloads occurred in a context of limited access to services and support. The absence of men during critical periods – such as illness, childbirth, or conflict-related displacement – left women managing multiple responsibilities simultaneously, increasing stress and vulnerability.

4.4.2 Decision-making and power relations

Mobility restrictions also reshaped decision-making processes and power relations within pastoral households. Informants reported that as men spent extended periods away with livestock or engaged in security-related activities, women increasingly made everyday decisions regarding food allocation, schooling, settlement arrangements, and coping strategies. In some cases, women decided whether households should remain in one location, move to another settlement area, or adjust daily routines in response to insecurity or environmental stress.

While this expanded involvement in decision-making reflected women's growing responsibility, informants stressed that it emerged from necessity rather than a deliberate shift toward empowerment. They indicated that major strategic decisions—such as selling large numbers of livestock, purchasing land, or relocating herds—often remained under male authority, even when women bore the consequences of those decisions. They also highlighted that the separation of households led to fragmented decision-making, with men and women making parallel decisions in different locations, sometimes resulting in tension or miscommunication.

Overall, the findings suggest that mobility restrictions created a complex reconfiguration of power relations: women gained greater autonomy in daily matters but remained constrained in broader strategic decisions, leading to uneven and often burdensome forms of responsibility.

4.4.3 Changing roles of elderly men and youth

Restrictions on mobility also transformed the roles of elderly men and youth within pastoral households. Informants reported that elders and youth assumed crucial responsibilities for herding, security, and income generation, often under risky conditions. Young men increasingly replaced older household members in herding activities, managing livestock over shorter and more localised routes while remaining on alert to security threats. This intensified labour burden frequently coincided with engagement in agricultural wage labour or other income-generating activities.

Youth roles shifted markedly. Informants described declining school attendance among boys, as they were prioritised for herding, farm labour, or mobilisation to defend territories. In contrast, girls' schooling sometimes improved following settlement, as families remaining in one place could enrol girls in nearby schools, although this occurred alongside increased domestic and agricultural responsibilities. Some young men were reported to have joined armed mobilisation efforts, framing participation as both a protective necessity and a social obligation, thereby increasing their exposure to violence and long-term risk.

Informants underscored that these gendered and generational shifts altered household dynamics and future livelihood trajectories. Men's prolonged absence placed additional pressure on women, while youth assumed adult-like, elder-like responsibilities at an early age. Together, these changes indicate that mobility restrictions reshaped not only labour allocation but also social roles, authority, and intergenerational relations within pastoral communities.

5. REFLECTION AND CONCLUSION

5.1 Reflection on findings

The findings from this study demonstrate that the ongoing war has triggered a profound reorganisation of pastoral mobility systems in eastern Sudan, compounding pre-existing constraints associated with corridor fragmentation, agricultural expansion, and deteriorating local security. Participatory mapping and qualitative evidence reveal that the seasonal logic underpinning mobility—following rainfall patterns, accessing the Butana during the rainy season, and returning southwards during the dry months—has been severely undermined. Rather than being guided by ecological considerations, movement decisions have become dominated by risk aversion, with pastoralists prioritising personal and herd safety over pasture quality or seasonal routine.

The war has produced a consistent pattern of route contraction, avoidance of high-risk zones, and prolonged stays within farming and forested areas. These shifts have intensified pressures on already constrained lands in the central and southern parts of Gadarif State, accelerating rangeland degradation, depleting water resources, and intensifying farmer–herder conflicts. The dynamics observed indicate a systemic shock with cascading ecological, economic, and social consequences.

The study also highlights that the consequences of immobility extend well beyond livestock production. Declines in animal health, disruption of market access, increased costs of production, and reduced milk production collectively erode household food security and economic stability. The responses adopted—distress sales, borrowing, wage labour, crop cultivation, and land acquisition—demonstrate both resilience and vulnerability: while they enable short-term survival, they often carry long-term risks that may compromise future livelihood recovery.

Importantly, the findings show that the war has accelerated structural transformations already underway. Sedentarisation, integration into crop agriculture, and growing preference for land acquisition reflect deeper livelihood reorientation processes. These shifts raise critical questions regarding the sustainability of pastoral livelihoods, the erosion of intergenerational pastoral knowledge, and the future configuration of pastoral–agricultural relations in eastern Sudan.

Gendered and generational impacts underscore additional layers of vulnerability. Women's workloads have intensified, their responsibilities have diversified, and their decision-making roles have expanded—but largely under conditions of necessity rather than empowerment. Youth, meanwhile, face diverging trajectories, with increased involvement in herding, wage labour, and, in some cases, local militarisation. Together, these effects reveal that the war is reshaping social relations and labour dynamics as much as it is transforming mobility systems and resource access.

5.2 Conclusion

The disruption of pastoral mobility in Gadarif State illustrates how armed conflict can fundamentally alter the ecological, economic, and social foundations of mobile pastoralism. While pastoralists have demonstrated considerable adaptability through changes in settlement patterns, diversification of livelihoods, and pursuit of land-based security, the cumulative effect of these responses risks locking households into more sedentary, agriculturally dependent, and environmentally precarious livelihoods.

These findings carry several broader implications. First, the erosion of mobility systems threatens the long-term viability of pastoralism as a productive and resilient livelihood in eastern Sudan. Without the ability to move freely between grazing zones, pastoralists face declining herd productivity, rising vulnerability to climatic variability, and deepening dependence on unsustainable coping mechanisms. Second, the increasing overlap between pastoral and agricultural spaces driven by prolonged staying in farming zones heightens the risk of persistent farmer–herder conflict unless effective land-use governance and negotiated access arrangements are restored. Third, wartime adaptations may prove

difficult to reverse even if security improves, given investments in farming, land acquisition, sedentarisation, and the generational shifts already underway.

For policy and humanitarian actors, the evidence highlights an urgent need to protect remaining mobility corridors, strengthen conflict-sensitive land governance, and support recovery pathways that recognise pastoralism's continued importance in eastern Sudan's dryland economy. Interventions must prioritise the reopening and safeguarding of routes, rehabilitation of degraded grazing reserves, improved access to water and veterinary services, and mechanisms to mediate land-use disputes. Equally, support is needed for households that have diversified or settled, ensuring that emerging hybrid livelihood systems remain viable without undermining pastoral resilience.

Ultimately, restoring and sustaining pastoral mobility will be central to any strategy for livelihood recovery, resource governance, and social stability in post-war eastern Sudan. The findings of this study provide a foundation for designing such interventions and underscore the importance of integrating mobility, land governance, and conflict dynamics into future planning and policy responses.

Fallata (Fulbe) pastoralist on the move in southern Gadarif, Sudan.

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