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Mapping the pastoral migratory patterns under land appropriation in East Sudan: the case of the Lahaween Ethnic Group

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The loss of about 4 million ha of land in East Sudan to mechanised rain-fed agriculture severely restricts pastoral mobility, as much of this land is the traditional rangeland for different transhumant pastoralists and smallholder farmers in the area. The aim of this paper is to map the current transformations of the migration patterns of transhumant pastoralists in East Sudan as a result of the land appropriation, by taking the Lahaween ethic group as an example. The paper followed a mixed approach of mapping, geo-coded field trips using GPS device, focus group discussion and key informant interviews. The findings showed that the annual movement of the Lahaween covers approximately 350 km. They spend 77% of their annual cycle in the summer areas. Frequent and rapid herd movement is a principal strategy in the process of coping with land appropriation. Other coping and adaptation mechanisms taken by the Lahaween included separation of animal types; separation of herds from households; fragmentation of households; use of vehicles and mobile phones in managing herds; entering the national game park; and crossing the international border. The need to promote and facilitate livestock mobility is a longstanding claim in the region. However, the continued neglect of livestock movement territories by state planners is a contested issue which might add a new dilemma of conflict to the country. The mapping exercise presented in this paper is expected to offer a technical guide for solving the problem of congested mobility. It also provides decision-makers with the current territories of pastoralists' movements.

KEY WORDS: Sudan, transhumant pastoralists, annual migration cycle, agricultural expansion, land use competition

Introduction

In spite of longstanding and persistent challenges facing pastoralism as a result of misunderstandings by African governments and development agencies, considerable groups of pastoralists still try to maintain the momentum of their seasonal migrations by developing and designing mechanisms that deal with emerging challenges. Recently, pastoralism in Africa has had to face new internal pressures, such as the expansion of agriculture into high-quality rangelands and external pressure from international investors. Although many pastoralists are changing their livelihood system, many continue to manage their livestock (Niamir 1991). By these means, pastoralism in Sudan has, over the past few decades, been able to transform itself through initiatives taken by the pastoral groups themselves without any help from planners and decision-makers (Ahmed 2014). Changing the pattern and mode of mobility remains the backbone of most of these initiatives and transformations to sustain their livelihood (Young *et al.* 2013). Though these initiatives were often associated with hardship, they also offer opportunities to acquire new knowledge, generate income and other resources, or create social networks across regions (Scheffran *et al.* 2012). Krätli *et al.* (2013) stated that the single most

important way of strengthening livestock production in Sudan is to secure the conditions for livestock mobility according to the logic of pastoral systems, through improving reliable and timely access to pastoral resources.

Despite the important role pastoralism plays in supporting local livelihoods and in contributing to the national economy in one of the world's poorest countries, pastoralism in Sudan is increasingly under threat from a combination of factors, largely related to development ambitions. Abbink *et al.* (2014) mentioned that changing land use patterns and disturbances to both the environment and livelihoods of pastoralists are obvious in areas of eastern Africa, which is home to one of the largest concentrations of pastoralists in the world.

Considered as a form of opportunistic management, livestock movement is used by pastoralists to avoid hazards and to seize opportunities within key land resources (Oba 2011). The pastoralists' movements in Gadarif State in East Sudan throughout recent decades, like those of many other similar groups in the region, have been severely disrupted. Unfettered agricultural expansion in the region has reduced grazing areas, disrupted pastoral routes and blocked access to watering points (Sulieman 2015). The rational use of rangelands through mobile livestock husbandry has long defined the most effective strategy for extracting value out of otherwise dry marginal lands (Galaty 2013; Abbink *et al.* 2014). Large-scale agricultural expansion in Africa is leading to a decline in the remaining congested rangelands; rangeland has been reduced from being grazing areas to being mere routes, with some of these even being completely blocked by cultivated fields (Schlee 2013; Sulieman 2013). A negative consequence has been the creation of a group of landless people, as land becomes increasingly concentrated in the hands of few elites (Rutten 1992; Sulieman 2015).

Historically, large-scale mechanised rain-fed agriculture was introduced to Gadarif region in 1944 to meet the food needs of army units stationed in the British colonies in eastern Africa during the Second World War (El-Tayeb 1985). Currently, the state owns around 4.2 million ha of cultivable land, located in the central and southern parts of the region. According to Verhoeven (2011), successive Sudanese governments have a long history of supporting land grabbing with various justifications. Most of the underlying reasons related to the interests of government to raise tax revenue, and to exert greater control over economic and political activities in the pastoral areas through resource grabs. For example, the 1970 Unregistered Land Act did not define the legal status of customary land rights and gave the government broad powers of land ownership. The act provided a legal basis for a massive wave of land acquisition (Manger 2006). O'Brien (1981) mentioned that, based on a top-down approach of economic transformation, Sudanese governments depicted large-scale intensive agriculture as the engine for growth, with export revenues fostering large industrial projects and the country producing enough food not just for internal consumption, but also to sell to a world increasingly worried about resource scarcity. Such agricultural investment benefited the wealthy educated elites and investors from urban centres not only within the region, but also from all over the country (Sulieman 2015).

The aforementioned land grabbing process has made East Sudan one of the hottest deforestation spots in Africa (Sulieman and Elagib 2012). Challenges to livestock mobility in Gadarif State are well documented (see for example El-Tayeb 1985; Shazali and Ahmed 1999; Elhadary 2010; Babiker 2012; Sulieman and Ahmed 2013; Sulieman 2013), including complete obstruction as in the case of physical barriers, such as blocked migratory routes associated with expansion of agriculture into communal rangeland in the northern parts of the state.

Little is currently known or documented about the actual seasonal and inter-seasonal livestock mobility patterns and pastoralist management strategies needed to adjust to and cope with such realities. Therefore, mapping the mobility patterns under the newly deteriorating conditions is expected to provide the information needed to support the development of sustainable solutions to the current pressing issue of livestock mobility in the area, as pastoralists realise that their migration corridors are caught in a complex tangle of land grabbing and as they design mechanisms to deal with this. This work uses the example of the Lahaween ethnic group in order to examine the current transformation in the seasonal migration pattern of transhumant pastoralists due to land appropriations in East Sudan, through (1) mapping the current seasonal and inter-seasonal mobility patterns by capturing their spatial and temporal components; (2) identifying different types of adaptation and coping mechanisms followed by pastoralists to maintain their livelihood; and (3) categorising emerging challenges and opportunities due to the transformed pattern of mobility.

Study methods and tools

The study adopted a mixed approach of focus group discussion (FGD), key informant interviews, geo-coded field trips, a mapping exercise and direct observations. The Lahaween ethnic group has been taken as representative of transhumant pastoralists in the Gadarif State, East Sudan. A total of five FGDs were conducted. Topics addressed during the FGD were corridors used by the Lahaween, herd composition, management strategies, grazing in game reserves, and cross-border pastoralism. In

order to obtain information on the annual movement of pastoralists a semi-structured interview was administered with six pastoralists. The questions were addressed to the head of the family in the presence of his sons, who are all normally engaged in the herding activities. Questions asked were about herd size and composition, pastures, water sources, corridors, the timing of migration, changes in daily routines during movements, and the number and condition of resting places. In addition to the interviews, we conducted a retrospective yearly movement with each of the six pastoralists. The objective of the retrospective yearly movement exercise is to trace the details of the annual cycle of movement (November 2014 back to October 2013) for each pastoralist. The details were then presented in a map to each pastoralist, and we worked together to pinpoint the location of the seasonal pastures and sketch the migration routes. This was followed by a digitising exercise using GIS software. The accuracy of these digitised results was further validated with ground truth coordinates of key sites which were collected via a handheld GPS device, or compared with recent Landsat 8 satellite imagery. The data depicting patterns of herd movements for three pastoralists were mapped out for this article. Other key informants interviewed included the Sheikh Elkhat (the tribal leader) of the Lahaween and the Directorate of the Range and Pasture Department, as well as one range expert.

The Lahaween[1] ethnic group and its distribution

The Lahaween are an Arabic speaking group whose presence in East Sudan dates back to the Mahdiyia period (1881–1898). They keep a multi-stock herd of camels, sheep and goats. When they first moved into their current area they were mainly keeping camels. Some of them cultivate crops during the rainy season, mainly for subsistence. The majority of the Lahaween are found in Gadarif State. Within Gadarif State they occupy both sides of the Atbara River and the Setit River in the south. During the dry season some groups stay further south along the Rahad River. In the rainy season their mobility stretches to Butana in the north. The corridors followed to make these movements are number 5, 6 and 7 (see Figure 1). The actual choice of corridor by pastoral groups, however, is intended to maximise access not only to fluctuating forage and water courses, but to the geography of the social networks of those managing herds (Bassett and Turner 2007). Livestock are a mobile store of wealth and are vulnerable to theft, and the risk of livestock loss increases in areas where pastoralists have few social contacts (Behnke *et al.* 2011).

The very rapid expansion of mechanised agriculture has encroached massively on rangelands. Due to this pressure, livestock corridors are narrower, less web-like and more linear (Sulieman 2013). During the 1984 drought, small herd owners were more vulnerable and their herds mostly perished during the drought. They left the boundary of the Lahaween villages and moved out to seek jobs. Some of them became wage labourers, and some of them migrated to Gulf countries to work as hired shepherds with the dream of rebuilding their herds when possible (Morton 1988).

Main types of seasonal migratory pattern among the Lahaween

The annual migration of transhumant Lahaween in Gadarif State is between the Butana communal rangelands in the north to areas along Atbara River and Rahad River in the south and southeast (Figure 1), covering an overall distance of approximately 350 km. Annual rainfall in the area ranges from 250 mm in the north to 800 mm in the south. This annual cycle consists of two journeys, northward and southward. The purpose of movement to the northern pastures during the rainy season is to take advantage of the brief growth of annual grasses on the Butana. After the end of the rainy season the Lahaween then move south due to the better availability of water and fodder there. The two areas are linked by corridors where both animals and households move. Table 1 shows the number of days within each of the three grazing areas they utilise during the annual cycle. The data indicate that pastoralists spend up to 77% of their year in the summer area, 13% in Butana and only 10% in corridors. Key informants mentioned that they used to spend around one-quarter of the annual movement in Butana and one to two months along the corridors benefiting from free access to crop residues. There are rest places along the corridors where pastoralists make breaks for a few days to a couple of weeks during the movement.

Movement in Butana during the rainy season

The Lahaween spread out in Butana from early August to late October, to places where the quality and quantity of water and pasture are from satisfactory to excellent. In seasons when there is a delayed or short rainy season they arrive late and leave the area early compared with normal seasons. Most of the Lahaween utilise the area near the corridors they will use on their southern migration. Finding suitable grazing and water is not pressing. But with the arrival of large numbers of animals and the rainy season half over, the choice of where to move has to be more carefully made. Herds of different owners may mingle at the water-pools and on the grazing areas. Nevertheless, local traditions of not allowing camps to occur too close to each other are still practised. During the interviews, pastoralists

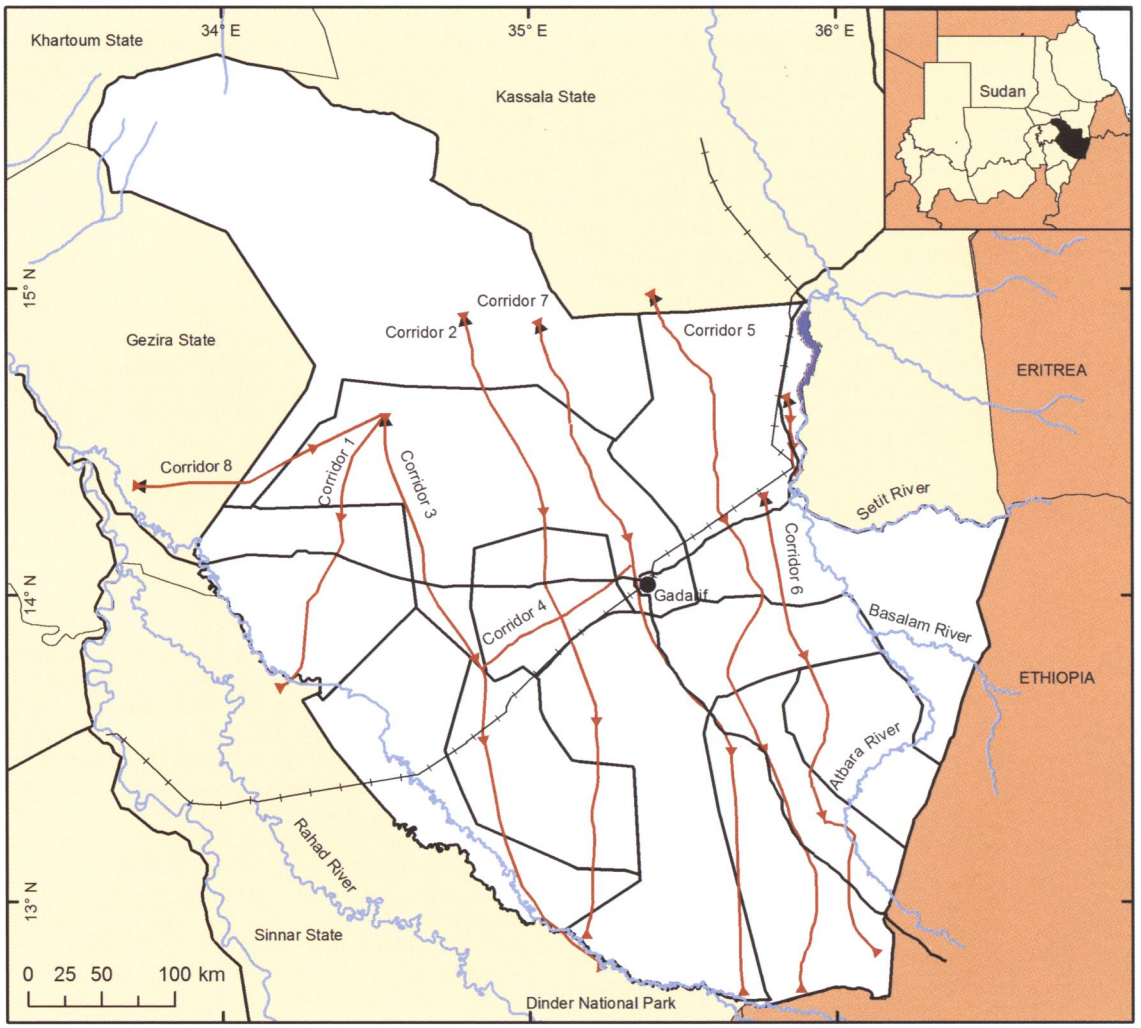

Figure 1 Map showing the layout of livestock seasonal migration corridors across Gadarif State in East Sudan
Source: Developed by the authors based on draft map from The Department of Range, Gadarif State

Table 1 Total numbers of days spent by six Lahaween pastoralists in the three grazing areas during the period from October 2013 to November 2014

Pastoralist	Butana	Corridor (both journeys)	Summer area
1	52	25	288
2	39	27	299
3	55	46	264
4	38	40	287
5	54	34	277
6	48	44	273
Average	48	36	281
%	13	10	77

mentioned that they used to spend a longer time in Butana, until the 1970s. Reasons given for the shortening of time in Butana were drought, degradation of natural vegetation, encroachment of large-scale agriculture and abolition of traditional tribal authorities that used to organise the utilisation of natural resources. According to Elhadary (2014) environmental degradation is among the most pronounced consequences of such changes. Nevertheless, Butana still remains the most favourable place for the Lahaween during the rainy season.

The natural vegetation cover, which mainly consists of annual herbaceous plants, is the main source of fodder. Water is available from different surface water sources collecting in natural depressions; or water runs off in seasonal water

courses. Being communal lands, movement in Butana is almost free once areas around villages and areas under cultivation are avoided. Figure 2 gives an impression of the landscape and the distribution of animals across it. However, in recent years land appropriation in the form of large-scale rain-fed agriculture has taken place and severely affects the free movement of pastoralists in the area (Sulieman 2015). The daily grazing routine for pastoralist herds shows that animals often leave the family camping place (*farig*) at around 8 am and return around 6 pm. The radius of grazing from the *farig* is relatively short, ranging from 3 to 4 km. Milk animals may leave late or arrive earlier to the *farig*. This is the time when milk yield is highest, so the households have convenient access to surplus milk and its associated products.

Movement along the corridors

The livestock corridors in Gadarif State were maintained in order to provide connectivity between the summer camping area in the south and the communal rangeland in the north, across the large-scale agricultural schemes in the central part of the state. Figure 1 shows the eight livestock corridors across Gadarif State according to the legislation passed by Gadarif State Assembly in 1997. The length of the corridors ranges from 66 to 290 km, while the width ranges from 150 to 300 m. Interconnectivity between routes is missing from the current design of the corridors. In such a situation, if a decision has been taken by a group of pastoralists to take any of the corridors, it is not possible to cross to another corridor. This reduces the flexibility of the migratory pattern and also hampers access to key resources, for example markets and veterinary services. Not surprisingly, tensions between large-scale farmers and pastoralists intensify along these pastoral corridors.

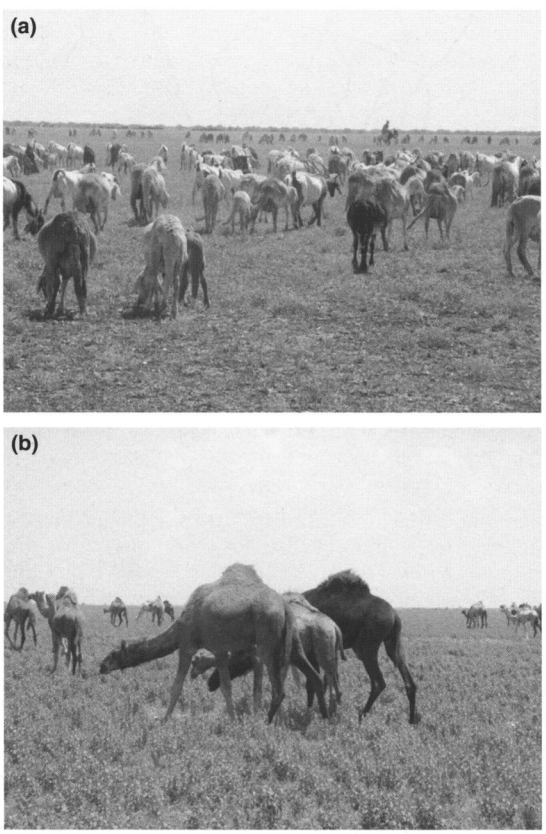

Figure 2 Distribution of livestock across the landscape in Butana during the rainy season [Colour figure can be viewed at wileyonlinelibrary.com]

Livestock seasonal migration routes represent the artery of any transhumant pastoralism system. Therefore, maintaining these routes and keeping them functioning are vital components of the existence of the pastoral systems. Today the problem is that livestock migration routes in Gadarif State are narrow zones crossing the vast mechanised agricultural fields, with very few and degraded rest points. Before the expansion of mechanised agriculture, the routes were several kilometres wide. The problem of the Lahaween under current circumstances is to try to avoid causing damage to cultivated land along the corridors and at the same time to fulfil the needs of their animals in terms of forage, water and other needs that may emerge.

Pastoralists need to use the corridors at least twice, to access the Butana communal lands in the north during the rainy season and back to their summer camping area in the southern part of Gadarif State. The southward journey starts during late October and must be done rapidly since areas surrounding the corridors are cultivated. This is the most difficult part of the southward journey. At this time of the year, cultivated crops are in a stage of maturity and are sensitive to damage. Pastoralists cover this part rapidly, with minimum possible halts even during the night. When pastoralists decide to begin their journey, they enter the corridor in the late evening to avoid high temperatures. Figure 3 shows what the daily routine used to be before land appropriation took place along the corridors, as well as the current situation. The Lahaween are now forced to follow a very intensive daily routine especially in the northern part of the corridor before they reach the city of Gadarif. Before entering the corridor, pastoralists have to take important decisions including transporting their families, together with small animals, in advance to the nearest rest place, and separating of camels from sheep and goats.

The Lahaween move back to Butana in the rainy season around the last week of July and the first week of August. Typically, this migration starts with

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(a)	Activity	Milking/tea/breakfast				Movement				Rest/lunch				Movement				Milking/Dinner				Overnight			
	Time of the day	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	1	2	3	4	5
(b)	Activity	Movement						Milking/Tea		Movement										Milking/Tea			Movement		
	Time of the day	17	18	19	20	21	22	23	24	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Figure 3 Comparison of the daily routine of movements during the southward journey along the livestock migration corridors by a Lahaween pastoralist (a) before the establishment of large-scale mechanised agriculture in the areas surrounding corridors and (b) after such establishment [Colour figure can be viewed at wileyonlinelibrary.com]

the beginning of the rains, and this northward journey is relatively relaxed and not restricted to the corridor because cultivation starts relatively late, especially in the northern parts of the corridors. Animals graze while they are on the move.

Mobility in summer camping areas

The natural vegetation cover along the banks of Atbara River and Rahad River represents the most favourable summer camping areas for the Lahaween. However, due to the expansion of horticultural gardens along the river banks, access to areas along the river is becoming more difficult. Alternatively the Lahaween currently stay for most of the summer inside the large-scale agricultural schemes grazing on crop residue which they buy. Other alternatives are entering the Dinder National Park or crossing the border into Ethiopia, both of which present security hazards.

Camping in mechanised agricultural land Crop residues from the agricultural schemes are indispensable livestock diets for pastoralists during summer. According to SKAP (1992), crop residues (mainly from sorghum), fallow fields and failed crops provided four-fifths of the available grazing and forage sources of the area. Pastoralists need to pay in order to get access to the crop residues. Previously, until the mid-1980s, local orders were annually issued which stipulated the latest date for harvest, after which pastoralists were free to enter the cultivated area and graze. In the current situation, grazing rights have been transformed firmly into an expensive economic good to the extent that in some seasons and locations the benefit to cultivators from crop residues may exceed the harvest (Sulieman 2015). The access price has risen steadily in recent years. In 2014 the price ranged between SDG 20 000 and 28 000 (SDG 1 = \$0.6) for an agricultural scheme of 1000 feddan (1 feddan = 0.42 ha). As prices increase, pastoralists are forced to sell more head of livestock to pay for access rights.

Grazing in game reserve The main attractive factors for entering the Dinder National Park (DNP) are the availability of fodder and water. The park is dominated by evergreen tree cover and dense grass cover. Water is available from a series of permanent and seasonal wetlands, which are linked to streams running off the Ethiopian highlands to the east (Sulieman and Mohammed 2014).

As shown in Figure 1, three of the eight corridors end at the northern frontier of the DNP. Normally the Lahaween enter the DNP during the period from January to June. They then have to pull out in early June before the flooding of the River Rahad. They spend most of their time in the northern and north-eastern parts of the reserve, which were not part of the reserve until 1983 when the government decided to expand the protected area as far as the River Rahad. This expansion was carried out without consultation with local settled communities and pastoralists occupying the area.

Nevertheless, entering DNP is not free of charge. Pastoralists agree that the price to enter the DNP is high as they have to hand over 50% of the herd in case they are arrested by the Wildlife Police Force. However, they argue that if they do not enter the park, the price is 100% in the sense that all their animals will then die due to hunger and thirst. Those entering the park are owners of small and medium size herds with young male members of the family, who leave the rest of their family outside the park. In case of multi-species herds, owners prefer to take the camels with them. Camels can escape quickly when there is risk of being caught by the authorities whereas sheep and goats are more vulnerable. Moreover, the nature of the vegetation of the park is more suitable for browsers.

National parks in Sudan have been managed with a strong emphasis on patrolling programmes and enforcement (Hussein *et al.* 2012). Such treatment has created a long history of hostility and a fertile conflict environment between the DNP authorities and pastoralist groups with losses of life on both sides (HCENRM 2004).

In some neighbouring countries of Sudan, such as Kenya and Tanzania, regulations that benefit local communities have been adopted. Thus in Kenya the regulations were shifted from total prevention of livestock to tolerating livestock grazing in the reserves, including attempts to establish corridors to enable passage of livestock following an integrated livestock

wildlife management approaches (Doetinchem and Crepin 2004). According to Niamir-Fuller *et al.* (2012) countries like Kenya and Tanzania look to wildlife conservation as a means to increase foreign exchange earnings from tourism, to provide public amenities and to promote economic gains for local communities.

Crossing the border to Ethiopia Gadarif State shares a border of 212 km with Amhara and Tigray regions of Ethiopia. Considerable numbers of pastoralists cross the border to Ethiopia to access pasture, especially when there is insufficient pasture in Butana and along the permitted grazing zone of the Atbara River in dry years. Before deciding to cross the border, pastoralists need to obtain some sort of agreement with local tribal leaders on the Ethiopian side. Such agreements depend on many factors, such as the changing relations between the Ethiopian and the Sudanese governments. Another factor is ethnicity, as this kind of agreement is not open for all ethnic groups from the Sudan side of the border. For example, while the Lahaween have chance of crossing the border from Sudan to Ethiopia, this is not possible for other groups like the Beni Amer. According to Ahmed (2010), crossing the border has traditionally been done not only in search of grazing but also to avoid taxation, and to trade in camels and slaves. Currently many sections of the border in Gadarif State are prone to insecurity and are dominated by armed groups (Sulieman *et al.* 2011). On entering Ethiopia each herder is expected to pay the local militia a fee. The amount of this fee depends on many factors such as the size of the herd, and the existence of cross-border social networks. The accelerating rate of conflict over agricultural land between famers from both countries negatively affects cross-border pastoralism by the Lahaween. Therefore, crossing the border is becoming the least favoured option, due to the high losses of livestock and lives. According to Bascom (1990) better pastures are located farther inside Ethiopia, but access to them carries the likelihood of attack by bandits.

Case studies

The cases recorded here illustrate the movement of individuals and their herds during their annual movement from October 2013 to November 2014 using three examples. Like most Lahaween, these individuals own herds of camels, sheep and goats. Such multi-species livestock herds require different herding regime and management approach, which means that pastoralists need to separate the animals during specific seasons and at different locations. Technically the term herd refers to a group of animals having their own arrangements for breeding, grazing and watering, usually in the care of two to three herders (Asad 1976). The size of the herds among the Lahaween varies considerably. The maximum number in a single herd of camels might reach about 140, and for sheep about 180. Goats are normally herded together with sheep and do not exceed a few dozen. According to Niamir (1991) the idea of rearing multi-species stock is common in Africa. Reasons vary and range from efficient use of resources to climatic factors; they also providing pastoralists with a wider array of products (Al-Najim 1991; Roderick *et al.* 1998). Niamir (1991) mentions that pastoralists always try to maintain a diverse portfolio of livestock designed to meet their needs and to fit the environment, and this is the aim of the Lahaween.

Case 1 Figure 4 depicts the one-year pastoral migratory cycle of case 1. This pastoralist owns one herd of camels, two flocks of sheep and around two dozen goats. In 2013, he spent 39 days in Butana from 15 August to 24 October. Most of his time in Butana was spent in areas facing corridor number 7, which is the corridor he uses to migrate southwards. His entry point to the corridor is at Jebal Elnawasil. The entry time is in the late evening to avoid high temperatures. The same day early in the morning he sends his family to Saref Saed forest which is a major summer camping place along the corridor. Together with his family he also transports the small animals. He rents a large truck to accomplish this. Before entering the corridor he also separates his sheep and goats from the camel herd and divides his herding staff between the two herds. The sheep and goat herder covers the distance to Um Senebra Village which is around 79 km in 20 hours of movement without watering or stopping for grazing. In Um Senebra pastoralists have the chance to purchase water for the herd from a water yard. Limited pasture is also available in the surrounding hilly areas. However, they have to watch their animals very carefully to ensure they do not trespass into cropfields. The day after, pastoralists have to proceed carefully with their sheep flocks to cross the area surrounding Gadarif, the biggest settlement and the capital of the state. Since the late 1980s, due to the expansion of the city, corridor 7 has become part of the city and pastoralists have to find an alternative passage to cross the city in order to join the corridor once again south of the city (Figure 4, Insert 1). Nevertheless, the area around Gadarif is covered with a number of villages and agricultural land. After successfully crossing Gadarif and its surrounding villages, he rejoins corridor 7 at Elkanara on the third day. He relies on water yards to water his animals. This is the place where he brings his two herds together and proceeds along the corridor to meet his family in the Saref Saed forest. The distance covered in three days by his sheep and goat herd is travelled in two days by the camels.

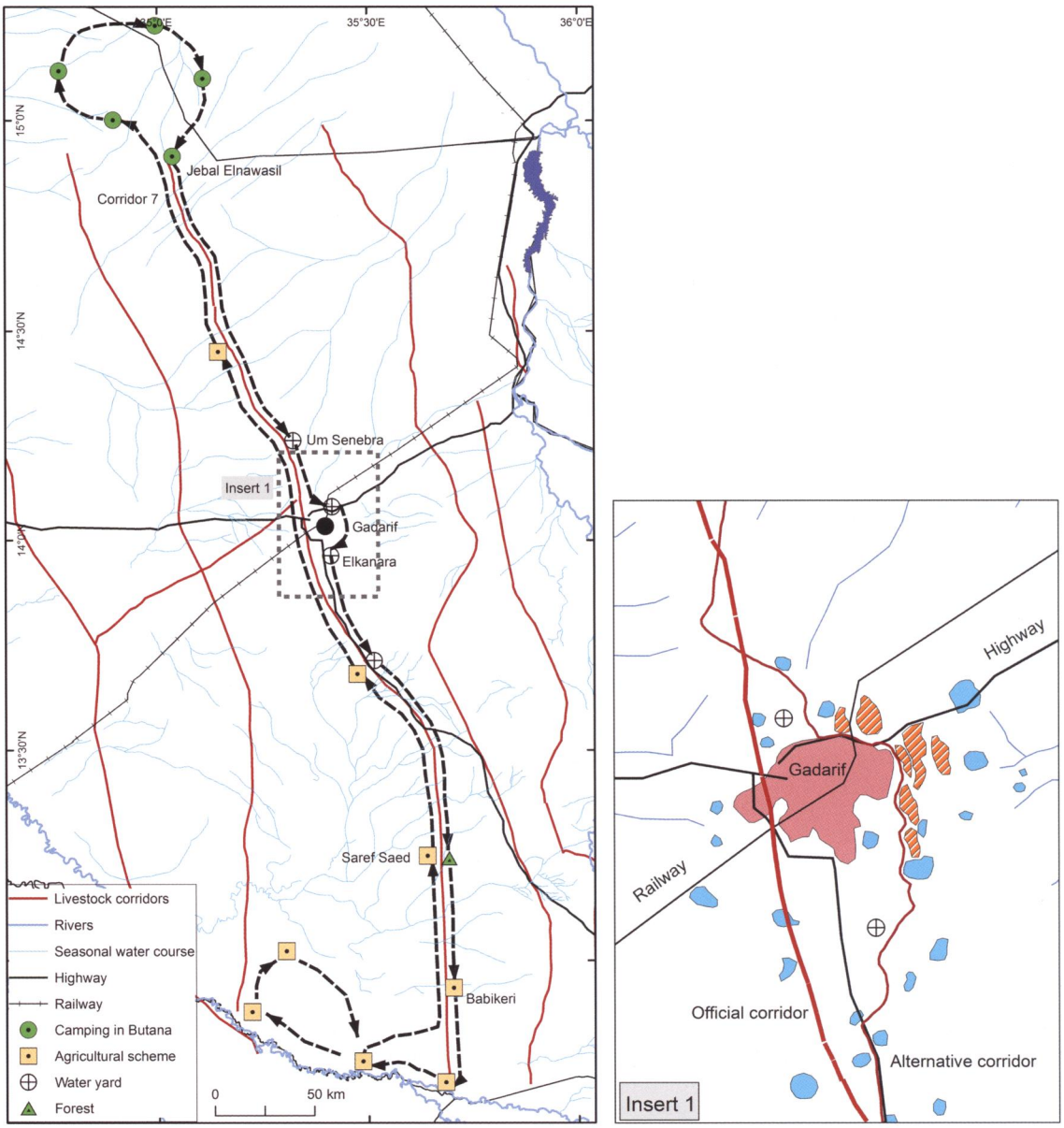

Figure 4 Patterns of one-year cycle of movement of case 1 during the period from October 2013 to November 2014. Insert 1: pattern of movement in highly populated area in the vicinity of the city of Gadarif where pastoralists have to initiate alternative routes

After spending two weeks at Sared Saed, he proceeds southwards and together with other relatives he rents an agricultural scheme where he spends the time from mid-November to early February. Thereafter, he proceeds to another agricultural scheme near Babikeri where he spends the time from early February to late April. The last point where he stays until early rainy season of 2014 is at an agricultural scheme in the vicinity of Um Kuraa along the Rahad River. He can access water from the river. In mid-July he starts to proceed carefully to Butana. He uses the same corridor, however his movement is not restricted and is reasonably free as long as most areas are not yet

cultivated or in early growing stages. The main fodder sources are newly emerged plants on agricultural land. For watering he relies on surface water on depressions and on seasonal water courses. On 20 August he reached the Butana communal rangeland.

Case 2 The annual migratory patterns of case 2 appear in Figure 5. This owner has two herds of camel, one flock of sheep and a few goats. In order to facilitate his management activities he has bought two vehicles. He reached Butana in the last week of August and left the area around mid-October 2013 after spending about 52 days there. During this period he moved his camp seven times. Using both vehicles, it is easy for him to move his camp from one place to another to let his animals enjoy fresh fodder even in places where water might be scarce. During mid-October he began to enter corridor number 5. Like others he entered the corridor in the late evening after transporting his family and small animals to Rawashda forest, which is a major rest place along this corridor. He also separated camels from sheep, joining them again at the rest place. Before he reached Rawashda forest, he made a one-day stop at Kerkora forest for his sheep flock. In the rest place he spent 15 days.

Once again he joined corridor number 5 to proceed to the south with both herds and he reached Shashena forest in three days with all of the herds, while his family was waiting in Saref Saed forest. He spent 12 days in Shashena forest. After that he crossed to corridor number 7 to access Saref Saed forest on his way to his main summer camp around Babikeri and Taya. In Saref Saed forest he spent about 5 weeks. Using his pickup vehicle he started to scout and negotiated with farmers to rent their agricultural scheme. He spent late January up to June roaming across different agricultural schemes that he rented at comparably reasonable prices; these were far from water sources so he used his lorry to transport water needed for his animals. Once again he returned to Saref Saed forest which started to become green and he spent the whole month of July there. At the beginning of August, with the stability of the rainy season, he started to move towards Butana, but this time via corridor number 7, and he made four stops before reaching Butana around the last week of August.

Owning vehicles is a new trend among the Lahaween. Also, the use of mobile phones is becoming indispensable for communications (Figure 6). In 2008 he bought a Bedford lorry and then a Toyota pickup in 2014. While his elder son is driving the pickup, he employs a driver for the lorry. He paid 170 head of sheep for the Toyota. Vehicles facilitate access to pasture and water can easily be brought to animals. While Lahaween only started recently to use vehicles to manage their herds, other groups in East Sudan like the Rashayda have used vehicles since the 1970s.

Case 3: pastoralists crossing the border into Ethiopia[2]
The migratory pattern of this group is presented in Figure 7. Normally this group is classified among Lahaween as medium to small owners of livestock. They do not have the financial capability to rent agricultural schemes or purchase water for their livestock during summer time. Therefore, they mainly rely on natural vegetation cover and free or cheap water sources. Pastoralists who decide to migrate to Ethiopia arrive at the border around early January after spending a few weeks in the Rawashda forest on their way back from Butana. They start to collect information about the security situation in the border area and the possible entry points to Ethiopia. They prefer to stay in places where they have relations and networks with Ethiopian tribal leaders. Although the decision is personal, they enter as a group, normally from one clan. The time they spend in Ethiopia extends from January to March. The entry points are along the area between Tamergo and Sefawa at the junction of the Atbara River and the Basalam River. Only young men cross the border with the animals. By the end of March the natural fodder and water become scarce in Ethiopia, and they start to move back home. In the area along the Atbara River they spend the whole of April and part of May. Once again they return to Ethiopia to capture the early showers of rain that begin earlier than in Sudan. The second journey is normally shorter from mid-May to mid-June. Now the entry point will be further south, in the area between Galabat and Fezra. Following the greening of the vegetation they return back to Sudan and arrive in Butana earlier than others. Recently this type of movement has been less common due to insecurity on the border.

Conclusions

In recent decades conflicts over land-based resources have shaped contemporary Sudan. Increasing pressure on land, the main economic resource for the population of East Sudan, has been in progress in many parts of the region since the introduction of mechanised agriculture in the 1940s. The state has contributed by adopting policies favouring agricultural production systems rather than livestock rearing (Ahmed 1973; Sulieman 2015). Under such conditions, there are many initiatives and coping mechanisms adopted by local land users to maintain their livelihoods, particularly among pastoralists. Pastoral restructuring due to an ongoing process of marginalisation is also occurring elsewhere in East Africa under similar conditions (Little 1985; Nori *et al.* 2008; Oxfam 2008; Korf *et al.* 2015).

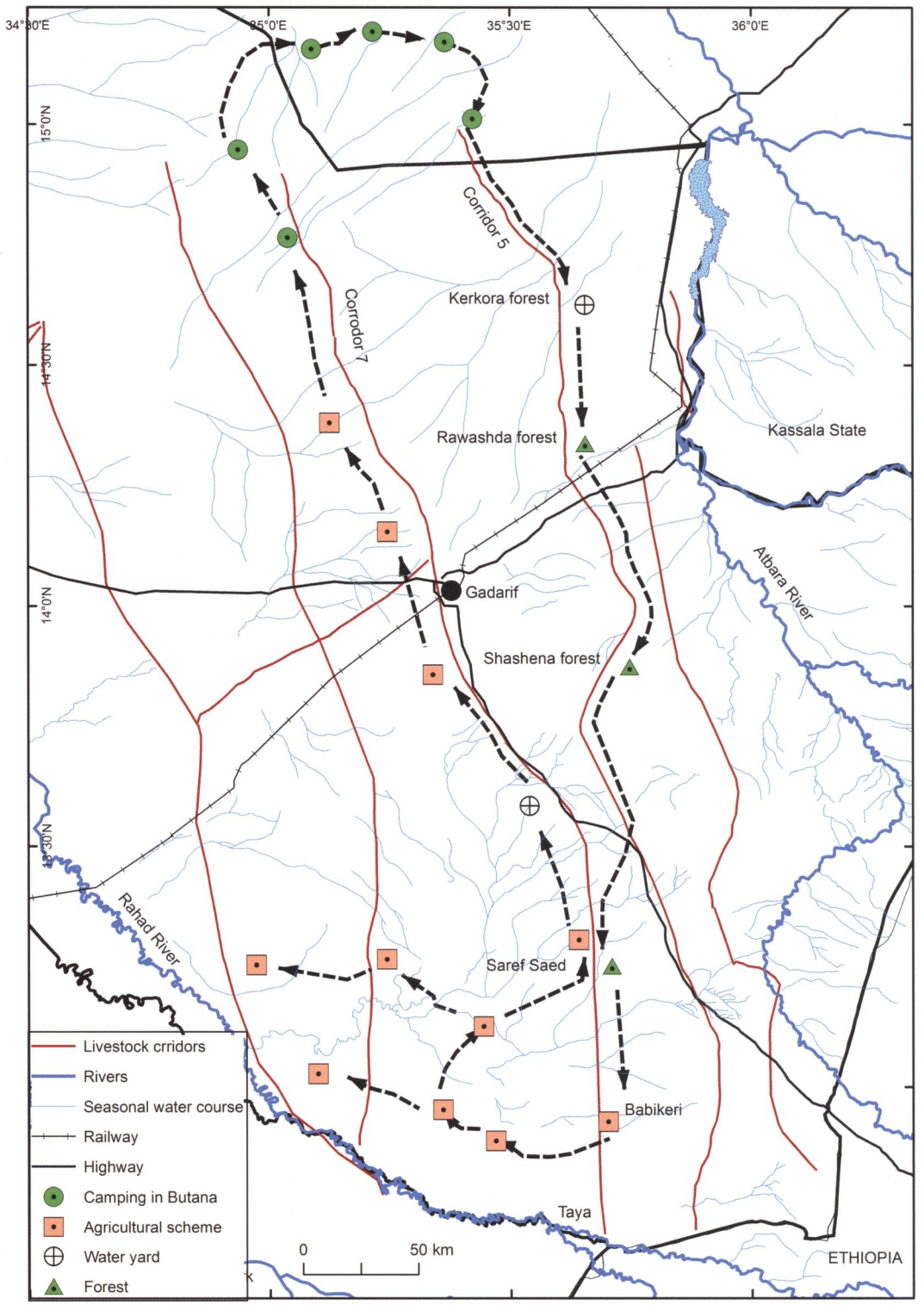

Figure 5 Patterns of one-year cycle of movement of case 2 during the period from October 2013 to November 2014

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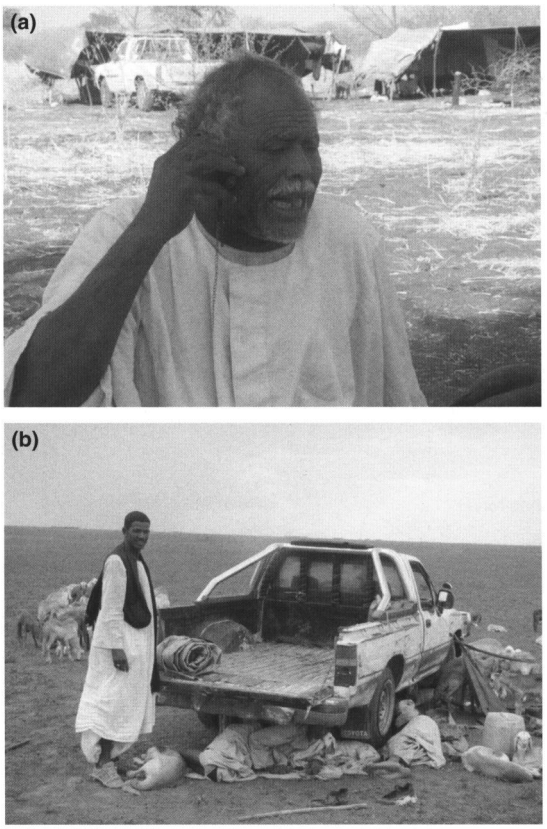

Figure 6 Mobile phones and vehicles are becoming an integrated part of herd management tools among Lahaween pastoralists [Colour figure can be viewed at wileyonlinelibrary.com]

The survival strategies adopted by pastoralists in East Sudan in order to maintain their livelihood systems today include many radical changes. Changes in the pattern of movement represent the most prominent feature. There are many profound implications for pastoralists and their livestock due to these new patterns of movement. The flexible and balanced mode of movement formerly practiced by pastoralists is no longer possible. Currently pastoralists spend about 77% of their annual cycle in their summer area, most of this time on rented agricultural schemes and using purchased water. Pastoralists are forced to sell more livestock to secure the viability of their herds.

Moreover, the rapid movements during day-time and night-time along corridors, as currently practised by pastoralists in order to avoid causing damage to agricultural schemes have serious consequences on pastoralists and their livestock. In order to achieve a quick passage through the corridors, pastoralists have to pay additional costs of transportation for their families and small animals. The splitting of camel herds from sheep and goats, because each has its own different speed of movement, means that more herders are needed. Fast movement along corridors also has a negative impact on the health of sheep and goats, particularly when water is scarce. The practice of the separation of herds from households, which is the primary unit of production, is becoming common, in many cases for most of the year. This situation has not only complicated the roles played by the head of the household and adult men but also has its social and economic consequences for the whole household. Normally pastoralist households subsist mainly on livestock products. Therefore, separation deprived them of one of their main sources of nutrition, which is likely to have negative impacts on their health. In particular, children and pregnant women are expected to suffer more.

The use of vehicles and mobile phones is becoming an integral part of livestock management tools among the Lahaween. These modern tools facilitate rapid movement as well as communication among fragmented households. The everyday reliance on mobile phones among rural livestock communities fundamentally influences the way that different pastoralist groups interact with each other. Sending scouts to look for suitable fodder sites is no longer needed and this situation creates a strong degree of information sharing about forage resources.

Increased scarcity of pastoral resources during the summer time pushes considerable groups of the Lahaween into hard and sometime illegal options such as entering game reserves or transboundary migration. Natural reserve regulations in Sudan have a longstanding history with rules and regulations that totally prohibit grazing inside reserve areas. There is a need for new policies recasting pastoralism into becoming a key partner in conservation rather than being a threat to wildlife. Due to the current ongoing dispute over agricultural lands on the border between Sudan and Ethiopia, cross-border pastoralism is diminishing. When the governments from both sides are not involved in this activity, local agreements remain as one of the only mechanisms to resolve disputes between beneficiaries on both sides of the border.

Not surprisingly, a situation of competition arises because of the support of the government for dominance of one type of land use – that is, large-scale mechanised farming – at the expense of others, particularly pastoralism. Until now, politicians and planners have continued to neglect the high tension that occurs between pastoralists and farmers in Gadarif State. Under such conditions, mapping and analysis of the current movements of pastoral groups are necessary in order to document the dramatic changes and to offer lessons and tools for what will hopefully be a better and more just future.

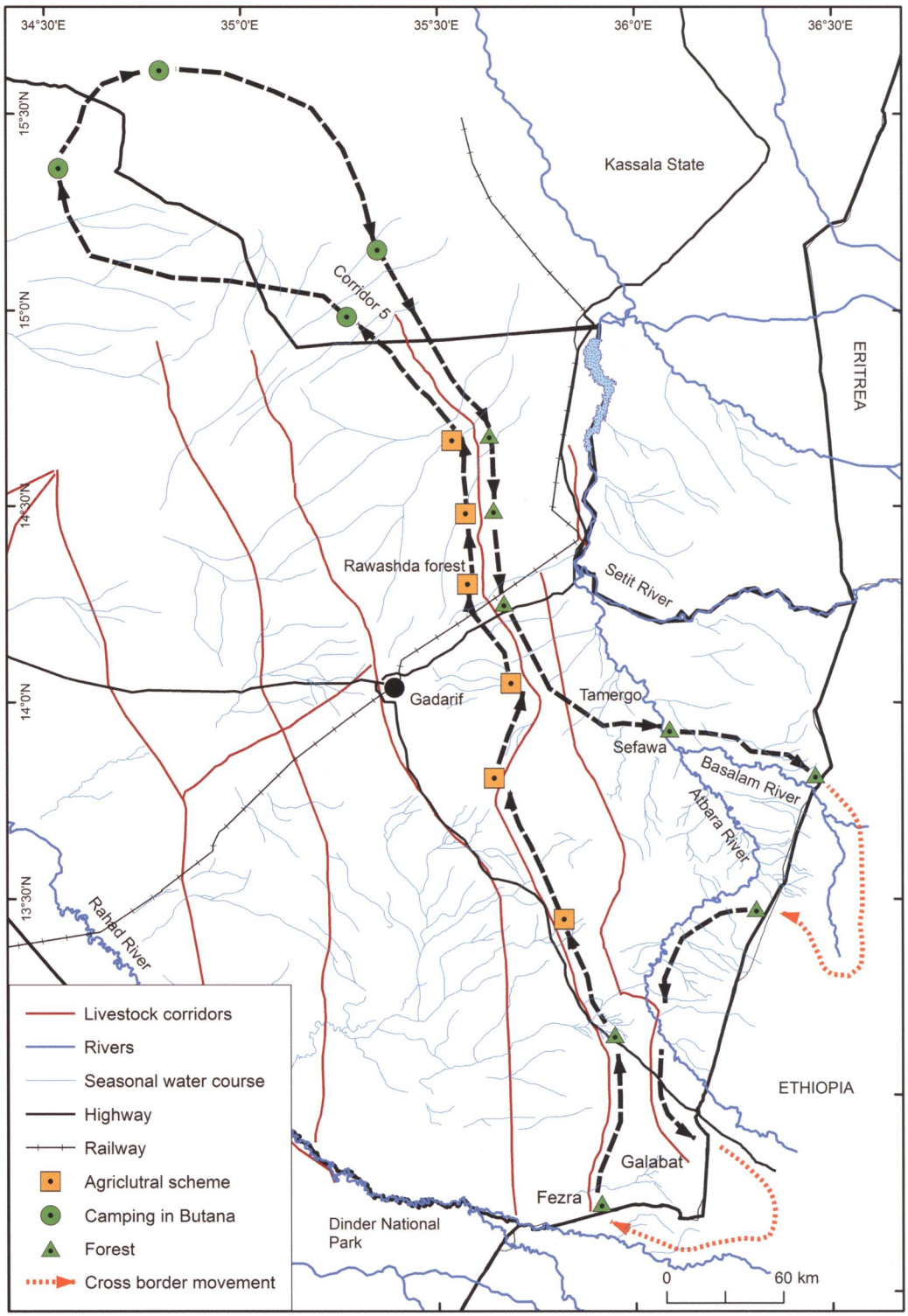

Figure 7 Patterns of cross-border movement by Lahaween pastoralists to Ethiopia

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Notes

1 For more background on identity and history of the Lahween, see Ahmed (2010).

2 The mapping of the cross-border migratory patterns is based on exercises carried out with rangeland experts and Lahaween tribal leaders.

References

Abbink J, Askew K, Dori D F, Fratkin E, Gabbert E C, Galaty J, LaTosky S, Lydall J, Mahmoud H A, Markakis J, Schlee G, Strecker I and Turton D 2014 Lands of the future: transforming pastoral lands and livelihoods in eastern Africa Max Planck Institute for Social Anthropology Working Papers, Working Paper No. 154

Ahmed A G M 1973 Nomadic competition in the Funj area *Sudan Notes and Records* 45 43–56

Ahmed A G M 2014 The social uses of livestock among pastoralists in Sudan: food systems, stores of value, wealth, power, and authority *SWP* 2014 2 CMI (Chr. Michelsen Institute)

Ahmed T K A 2010 The Lahawiyin: identity and history in a Sudanese Arab tribe Durham theses, Durham University (http://etheses.dur.ac.uk/707/) Accessed 11 April 2016

Al-Najim N M 1991 Changes in the species composition of pastoral herds in Bay Region, Somalia Pastoral Development Network Papers, ODI (www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/5375.pdf) Accessed 11 April 2016

Asad T 1976 Seasonal movement of the Kababish Arab of Northern Sudan in **Ahmed A G M** ed *Some aspects of pastoral Nomadism in the Sudan* Sudan National Population Committee and The Economic and Social Research Council, Khartoum 22–41

Babiker M 2012 Mobile pastoralism and land grabbing in Sudan: impacts and responses in **Catley A, Lind J and Scoones I** eds *Pastoralism and development in Africa: dynamic change at the margins* Routledge, London 177–85

Bascom J B 1990 Border pastoralism in Eastern Sudan *Geographical Review* 80 416–30

Bassett T M and Turner M D 2007 Sudden shift or migratory drift? Fulbe herd movements to the Sudano-Guinean region of West Africa *Human Ecology* 35 33–49

Behnke R H, Fernandez-Gimenez M E, Turner M D and Stammler F 2011 Pastoral migration: mobile systems of livestock husbandry in **Milner-Gulland E J, Fryxell J M and Sinclair A R E** eds *Animal migration: a synthesis* Oxford University Press, Oxford 145–60

Doetinchem N and Crepin C 2004 *Integrated livestock-wildlife management* Agriculture Investment Note, Agriculture Investment Source Book Module 05, The World Bank

Elhadary Y A E 2010 Challenges facing land tenure system in relation to pastoral livelihood security in Gedarif State, Eastern Sudan *Journal of Geography and Regional Planning* 3 208–18

Elhadary Y A E 2014 Examining drivers and indicators of the recent changes among pastoral communities of Butana Locality, Gedarif State, Sudan *American Journal of Sociological Research* 4 88–101

El-Tayeb G 1985 *The Gedarif study area* Institute of Environmental Studies, University of Khartoum, Khartoum

Galaty J G 2013 Land grabbing in the Eastern African rangelands in **Catley A, Lind J and Scoones I** eds *Pastoralism and development in Africa: dynamic change at the margins* Routledge, Abingdon and New York NY 143–53

HCENRM (Higher Council for Environment and Natural Resources Management) 2004 *Plan for Dinder National Park, Sudan* Wildlife Conservation General Administration (WCCGA) UNDP/GEF Project SUD/98/G41 and SUD 00/014 Republic of the Sudan, Khartoum

Hussien R A Y E, Ahmed F A M and Salih R R M 2012 Evaluation of the impact of Dinder National Park Project (DNPP) on the local community in Dinder Area, Sudan *Journal of Life Sciences and Biomedicine* 2 101–4

Korf B, Hagmann T and Emmenegger R 2015 Re-spacing African drylands: territorialization, sedentarization and indigenous commodification in the Ethiopian pastoral frontier *The Journal of Peasant Studies* DOI: 10.1080/03066150.2015.1006628

Krätli S, El Dirani O H and Young H 2013 *2013 Standing wealth: pastoralist livestock production and local livelihoods in Sudan* United Nations Environment Programme, Khartoum

Little P 1985 Absentee herd owners and part-time pastoralists: the political economy of resource use in northern Kenya *Human Ecology* 13 131–51

Manger L 2006 *Resource conflict as a factor in the Darfur crisis in Sudan* Colloque International Les Frontières de la Question Foncière – At the Frontier of Land Issues, Montpellier

Morton J 1988 *The decline of Lahawin pastoralism* Pastoral Development Network Paper 25c Overseas Development Institute. London

Niamir M 1991 *Traditional African range management techniques: implications for rangeland development* Pastoral Development Network, ODI, London

Niamir-Fuller M, Kerven C, Reid R and Milner-Gulland E 2012 Co-existence of wildlife and pastoralism on extensive rangelands: competition or compatibility? *Pastoralism: Research, Policy and Practice* 2 8 (http://www.pastoralismjournal.com/content/2/1/8) Accessed 6 March 2015

Nori M, Taylor M and Sensi A 2008 *Browsing on fences: pastoral land rights, livelihoods and adaptation to climate*

change International Land Coalition (http://pubs.iied.org/pdfs/12543IIED.pdf) Accessed 11 April 2016

Oba G 2011 Mobility and the sustainability of the pastoral production system in Africa: perspectives of contrasting paradigms Paper prepared for the Future of Pastoral Peoples in Africa organized by 'Pastoralism' in the Future Agriculture Consortium at ILRI in Addis Ababa, Ethiopia 21–23 March 2011

O'Brien J 1981 Sudan: an Arab breadbasket? MERIP Reports No. 99 Land and Labor 20–26 (www.jstor.org/stable/3011317) Accessed 20 March 2014

Oxfam 2008 Survival of the fittest. Pastoralism and climate change in East Africa Oxfam Briefing Paper 116

Roderick S, Stevenson P and Ndungu J 1998 The production parameters influencing the composition and structure of pastoral cattle herds in a semi-arid area of Kenya *Animal Science* 66 585–94

Rutten M M E M 1992 Selling wealth to buy poverty: the process of the individualization of landownership among the Maasai pastoralists of Kajiado district, Kenya, 1890–1990 *Nijmegen Studies in Development and Cultural Change* ISSN 0935-7173, Breitenbach, Saarbrücken

Scheffran J, Marmer E and Sow P 2012 Migration as a contribution to resilience and innovation in climate adaptation: social networks and co-development in Northwest Africa *Applied Geography* 33 119–27

Schlee G 2013 Why states still destroy pastoralism and how they can learn that in their own interest they should not *Nomadic People* 17 6–19

Shazali S and Ahmed A G M 1999 Pastoral land tenure and agricultural expansion: Sudan and the Horn of Africa DFID Workshop on Land rights and Sustainable Development in Sub-Saharan Africa, Sunningdale Park Conference Centre, Berkshire UK 16–19 February 1999

SKAP (Southern Kassala Agricultural Project) 1992 *Land use survey report* (main report) Government of The Sudan, Khartoum

Sulieman H M 2013 Land grabbing along livestock migration routes in Gadarif State, Sudan: impacts on pastoralism and the environment LDPI Working Paper 19 The Land Deal Politics Initiative, International Institute of Social Studies, Erasmus University Rotterdam, The Hague

Sulieman H M 2015 Grabbing of communal rangelands in Sudan: the case of large scale mechanized rain-fed agriculture *Land Use Policy* 47 439–47

Sulieman H M, Abaker I A and Elbarbari S A 2011 *Impacts of climate change and transboundary conflicts on smallholder farmers in Gadarif State: challenges and opportunities* East Sudan Research Group, University of Khartoum, Sudan

Sulieman H M and Ahmed A M 2013 Monitoring changes in pastoral resources in Eastern Sudan: a synthesis of remote sensing and local knowledge *Pastoralism: Research, Policy and Practice* 3 22

Sulieman H M and Elagib N A 2012 Implications of climate, land-use and land-cover changes for pastoralism in Eastern Sudan *Journal of Arid Environments* 85 132–41

Sulieman H M and Mohammed M H 2014 Patterns of woody plant species composition and diversity in Dinder National Park, Sudan *University of Kordofan Journal of Natural Resources and Environmental Studies* 1 26–36

Verhoeven H 2011 Climate change, conflict and development in Sudan: global neo-Malthusian narratives and local power struggles *Development and Change* 42 679–707

Young H, Sulieman H M, Behnke R and Cormack Z 2013 *Pastoralism in practice: monitoring livestock mobility in contemporary Sudan* Feinstein International Center, Tufts University, Khartoum