



THE ECOLOGICAL, SOCIO-ECONOMIC AND POLITICAL CONSTRAINTS ON PASTORALISTS'
ACCESS TO WATER, BLUE NILE STATE (SUDAN)

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THE ECOLOGICAL, SOCIO-ECONOMIC AND POLITICAL CONSTRAINTS ON PASTORALISTS' ACCESS TO WATER, BLUE NILE STATE (SUDAN)

Ibrahim Mustafa Mohammed Ali

Abstract

This article addresses the ecological, socio-economic and political constraints facing pastoralists' water access rights in Blue Nile State, south-eastern Sudan, over the last five decades. It examines the main constraints on pastoralists' access to water and looks at such issues as climate change, increasing human population, the expansion of agriculture, the expansion of Dinder National Park, civil war and the new international border created after the secession of South Sudan in 2011.

KEYWORDS: water access, pastoralists, new international borders, Blue Nile State, Sudan

Introduction

The aim of this article is to analyse different kinds of constraints (ecological, socio-economic and political) and their impact on water accessibility for pastoralists in Blue Nile State, south-east Sudan. Although these constraints are various and longstanding, the article aims to stress one particular aspect of the current configuration: the critical situation that followed the 2011 secession of South Sudan, when pastoralists in this 'transitional area' started to face a drastic need to cope with the presence of a new international border and the consequences of armed conflict in the region.¹

After a look at the wider context, particularly the problems facing pastoralists in Sudan generally regarding land access, the article focuses on two issues. First, the practices of pastoralists regarding the use of available water resources in Blue Nile State are examined; and second, in the context of an examination

- ¹ This article is based on both recent fieldwork in the study area (2017) and previous long-term fieldwork for the researcher's Ph.D. thesis (2010). Both primary and secondary, qualitative and quantitative, data were used. Primary data rely on different methods (observation, individual interview, focus group discussion with household heads from Rufaa al Hoi, Kenana and Fulani pastoralists) and were collected during the fieldwork survey in August 2017 in the localities of Damazin, Tadamon and Roseires. They are supported by previous data on pastoral communities in Blue Nile State, collected during fieldwork for the researcher's Ph.D. thesis (Ali 2010).

of pastoralists' various livelihood strategies, stress is placed on political (non-ecological) drivers, such as the recent creation of an international border. The critical issue of access to water (an essential resource for pastoralists and their herds) needs to be recognised, and to be examined not just in terms of ecological factors, but also in relation to economic competition and the political and violent conflicts that affect the area.

Socioeconomic importance of pastoralism in Sudan and the issue of land tenure

In Sudan, livestock resources accounted for 18.1 per cent of the GDP in 2016 (Central Bank of Sudan 2016: 112). Pastoralists accounted for 7.6 per cent of the population of Sudan, and they own more than ninety per cent of large livestock, estimated in 2017 to be about 108.2 million head including 30.9 million cattle, 40.8 million sheep, 31.7 million goats and 4.8 million camels (Central Bank of Sudan 2017: 134).² In addition to its monetary and commercial value, livestock is of high value in social and cultural interactions for some tribes in the country, signalling wealth, social prestige, self-identification; important in marriages, ceremonies, rituals, exchanges of gifts, loans and settlement of disputes; and often hoarded to build a system of human bonds aimed at increasing individual and group security.

As availability and access to water resources (for herds and household needs) constitutes a crucial element for the production and reproduction of pastoral socio-economic systems, it is important to have an insight into the general situation of land tenure and its evolution in the country. In Sudan, land is a central issue for both urban and rural communities: being the means of livelihood and basic survival, land is also the basis of social reproduction and a source of individual and tribal group pride, with profound cultural and socio-political dimensions (Ali 2010: 46). The concept of customary tribal homeland, intimately related to the principle of Native Administration, is an important constituent of traditional land tenure in Sudan, even if not fully recognised in government courts (Babiker 2018). In the relatively densely-populated northern riverain regions of Sudan, individual land ownership took root over the span of several centuries, while the rain lands of Sudan, in general associated with pastoralist activities, had communal forms of land ownership (Ali 2014: 21). During the Funj era (1506–1821) land titles were regulated by

2 The sector is also the main source of animal protein in the country, producing about 1.5 million tons of red meat and 4.6 million tons of milk annually (Central Bank of Sudan 2017: 130).

the charter (*wathiga*), while in Darfur (western Sudan) the Keira Kings granted land concession or monopoly (*hakura*) (Shazali and Ahmed 1999: 4; UNDP 2006: 8). During the Turco-Egyptian era (1821–1885), the system was further consolidated through superimposed administrative separation between sedentary people and pastoralists (Ali 2014: 21; Shazali and Ahmed 1999: 4; UNDP 2006: 8). During Mahdist rule (1885–1898), no changes were introduced to the basic structure of the land tenure system (Shazali and Ahmed 1999: 4).

The Anglo-Egyptian colonial administration (1898–1956) paid particular attention to the system of land tenure and introduced the principle that land not registered by groups or individuals is owned by the state unless proven otherwise. Early in 1899, the colonial power announced its first Titles to Land Ordinance, by which it recognised and commenced registering the cultivated lands in northern and central riverain Sudan as private property (Ali 2010: 54). The rain-lands of central, western and eastern Sudan, as well as all the lands in southern Sudan were excluded from the ordinance and, as such, from land settlement and registration. The colonial administration did not recognise individual, personal ownership of any land in these regions. The ‘unsettled’ areas were categorically classified as government owned.

After the independence process of Sudan from 1956 to 1970, national governments kept virtually intact all colonial legislation on natural resources and land tenure (UNDP 2006: 19). The first substantive national legislation on natural resources was the Unregistered Land Act 1970, which nationalised all unregistered lands in the country. The state retained land ownership and could grant leasehold interests to individuals and groups, in effect allocating land for commercial development without regard for customary rights to land use. The Act did not recognise customary land arrangements, and groups of pastoralists were left disenfranchised from their traditional homelands, and practically prevented from user access rights to water and land for grazing (UNEP 2012: 13). The Act even entitled the Government to use force in safeguarding its land (Ahmed 2008: 3). Furthermore, the abolition of Native Administration in 1971 resulted in the absence of a credible institution capable of articulating and pursuing the interests of pastoralists in dialogue with government institutions. This is particularly reflected in the general deterioration of water points, which either lack maintenance and spare parts or have become incorporated within rain-fed mechanised farming. (Shazali and Ahmed 1999: 12).

In the following decades, the Civil Transaction Act 1984 repealed the Unregistered Land Act, but retained the principle of state ownership of land (Ali 2014: 23). The Act provides the framework for transactions in land, including leases and easements, transfer and inheritance of rights, and conditions for obtaining usufruct rights. The Act affirms the government’s authority to administer rights over land and provides that registered usufruct rights to land are equal to

registered ownership rights. It also introduces Sharia law into the formal legal framework and includes a requirement that the government provide compensation when it appropriates land (De Wit 2001: 8). In 1990, the government amended the Civil Transactions Act to reinforce state ownership of non-registered land, and to prohibit appeals against land decisions made by the government; all cases that were before the courts at the time were subsequently dismissed (Ahmed 2008: 6). Later on, the Local Government Act 1998 identified land management and administration responsibilities of local authorities. The Act was adopted in an effort to fill the void left by the Government's elimination of Native Administration in the 1970s. The Act confers on local authorities responsibility over (1) establishment and function of local land management committees; (2) development of local laws regulating land management; (3) involvement of customary authorities in land management; and (4) accountability mechanisms for land.

The Comprehensive Peace Agreement (CPA 2005) and the Interim National Constitution in Sudan provided an impetus for a more socially informed land tenure policy and appropriate changes to legislation. Specifically, the CPA calls for the incorporation of customary laws and the establishment of four Land Commissions (a national commission, and three for Southern Sudan, South Kordofan and Blue Nile States) to arbitrate claims, offer compensation and recommend land reform policies. This overview confirms that land legislation in Sudan is a grave encroachment on customary land tenure,³ which had been smoothly functioning for over a century in rural Sudan through tribal leaders and Native Administration. Pastoralists in Sudan are particularly affected by this marginalisation of customary land tenure and by land grabbing, which have been occurring since the colonial era through seizure of grazing lands for large-scale agricultural schemes and conservation, the main factors in pastoralist livelihood insecurity (Ahmed 2008: 3), which impose obstacles to access to water resources. Moreover, in Sudan, the government has been calling since the 1960s for the settlement of nomadic pastoralists at both federal and state level, while pastoralists have been neglected in development plans for the country and are not given a chance to express their views, nor a choice in suggested plans for their regions (Abdul Jalil 2018: 3).

- 3 According to Egemi (2006), the general features of customary land tenure are: (1) occupied lands for cultivation, pasture, woodcutting are not formally registered; (2) usufruct rights, not ownership rights, are the predominant forms; (3) rights are liable to be revised after the elapse of a certain period of time during which such rights are not exercised; (4) there are rights to exclude non-tribe members from the use of land; (5) land is deemed to be the property of a tribe or a clan and dealings in land are an exception rather than the rule; (6) allocation of land rights is vested in the village's headman (*sheikh*) who has the right to divide the land within his domain among his villagers as well as to allot land to outsiders or to settle a dispute; (7) women have restricted access to land rights in most cases; they do not possess the land, unless inherited from fathers or husbands.

The study area's context and the situation of pastoral groups in Blue Nile

Geographical and social background

The study area is located in the south-eastern part of Sudan, between latitudes 9° 30'N and 12° 34'N, and longitudes 33° 30' E and 35° 15' E, covering an area of approximately 38,500 square kilometres (Ali 2014: 20). It borders Ethiopia to the east, South Sudan to the west and south, and Sinnar State in the north (Figure 1). The area is divided administratively into six localities (Damazin, Rosseres, Tadamon, Bau, Kurmuk, and Qeissan) with Damazin town as its capital.

The topography of the area is semi-flat plain sloping towards the north with the Blue Nile River and many *khors* (seasonal catchments), which are of paramount importance as sources of water for both human and livestock, and a superficially monotonous alluvial plain punctuated by some pockets of small hills and escarpments in the central, south and south eastern parts. Climatically, the area lies in the tropical zone, with mean daily temperatures ranging from 43°C during (April–November) to 20°C in (December–January). The rainy season usually starts in May and finishes in November with annual rainfall of about 707 mm. Over the period 1951–2016, the rainfall decreases from south/east (970 mm) to north/west (650 mm) (Damazin Meteorology Station 2017).

The dominant soils are the dark, heavy, deep clay, which cracks when dry and becomes impervious when wet, with low infiltration capacity. Along the Blue Nile River and *khors* are found alluvial soils. Eroded soil (*kerrib*) is spread over both banks of Blue Nile River (Ali 2010: 62). The natural vegetation is classified as low savanna woodland in the north and high savanna woodland in the south (Harrison 1955, Harrison and Jackson 1958, Lebon 1965). The total population of the Blue Nile State was 832,112 in 2008 (DoS 2009). Approximately 597,858 (72 per cent) live in rural areas, with 202,353 (24 per cent) settled in urban centres, and the rest 13,901 (four per cent) living as pastoralists. The Blue Nile State can be considered a 'microcosm of Sudan', inhabited by an array of communities and characterised by different ethnic and cultural groups due to the influx of immigrants from all parts of Sudan, including Ingessana, Kadalo, Berta, Buron, Funj, several Arab tribes (Rufaa al Hoi, Kenana, Arakeen), Dinka and Maban. The main human activities are agriculture (irrigated, rain-fed mechanised farming, traditional rain-fed farming), livestock grazing, mining and fishing. The main pastoral communities are Rufaa al Hoi, Fulani and Kenana. The area has about 6,562,696 head of livestock representing nine per cent of Sudan's livestock population (Ministry of Animal Resource and Fishes 2015).

Livestock constitutes a strategic element in food security, a long-term

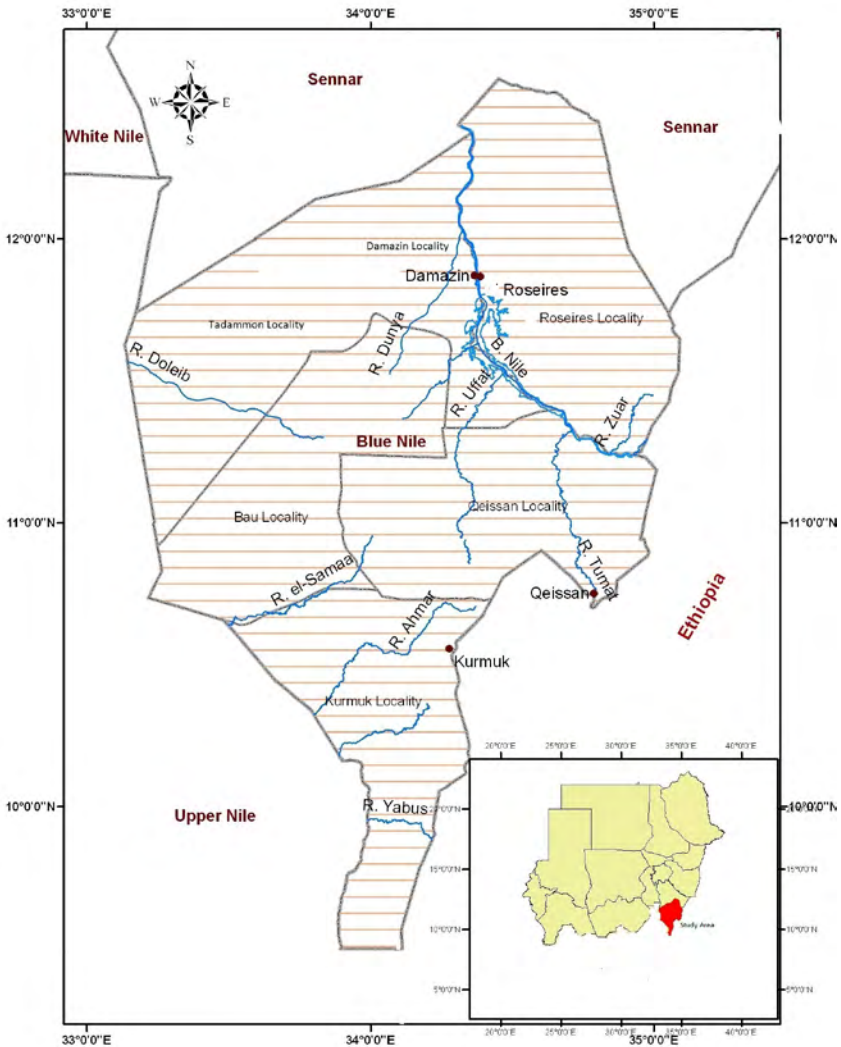


Figure 1. Location of study area. *Source:* Ali 2010: 3

wealth reserve and a source of capital. Livestock is the most critical component of the socioeconomic structure of the pastoral community; it provides

milk and meat, the principal diet of most pastoral nomadic families. Livestock also provides transport and traction for farm activities, and its urine and faeces can serve as fertiliser or as sources of fuel. Skins and hides serve a variety of uses as well. Pastoralists utilise about 110,000 hectares of rangelands in Sudan in both the semi-desert and savanna zones (Ali 2010: 52). In addition to its material value, livestock has high value in social and cultural interactions for some tribes (in the country more generally and in the study area) who use it as a sign of wealth, social prestige, self-identification, in marriages, ceremonies, rituals, exchange of gifts, loans and to settle disputes, as the vector of a wider system of human bonds, increasing individual and group security (Ali 2010: 52, Ahmed 2014: 5).

Historical strategies of adaptation by pastoralists in the Blue Nile State

Historically, pastoralism is the most important and widespread land use system in these dry lands, which are characterised by weak ecological balance and the scarcity of natural resources, especially water. Pastoralists in the Blue Nile State breed goats, sheep, cattle and camels in different combinations, but the main livestock are cattle and sheep. The basic unit of pastoralist organisation is the camp (*fariq*) which gathers a number of households headed by a *sheikh* (native leader). As in other pastoralist communities in central Sudan, the *fariq* is here considered a vital source of information for pastoralists (Ahmed 1974: 38).

Blue Nile State pastoralists engage in extensive seasonal movements in search of water and pastures, normally between the neighborhoods of Manaqil in the north and Khor Yabus, a distance of 560 kilometres (350 miles), some further south, to the Machar marches area in the Upper Nile and Sobat River, about 720 km from Managil (Lebon 1965: 56). Movements also occur between the eastern bank of the White Nile River and Khor Al-Aqalliyyin on the eastern side of the Blue Nile River, in areas of Um Barid to Menza eastwards and Yarda southwards (Ali 2010: 113, Khogali 1980: 111) and to Dinder National Park to the east (Figure 2). Eight livestock routes (*marahel* or *massarat*) with a width of two kilometres have been identified by local administrations since the colonial era and were first demarcated in the mid-1950s (Ali 2010: 57). In the rainy season (*kharif*) (August–October), pastoralist camps are concentrated in the area west of Mazmum, Jebel Dali, Abu Huggar, Agadi and Garabin in the northern part of the area and near Rabak and Jebelein on the eastern bank of the White Nile River. During the dry season (*seif*) (January–June), camps are pitched south of Khor Tumbak, Babarus and Yabus, while the herds graze north of the Machar marshes and south of Khor Yabus between March and May (Ahmed 1974: 21, Khogali 1980: 113).

Other pastoralists, such as the Kenana tribe, spend the dry season on the eastern bank of the Blue Nile River between the Azaza and Hamada areas and Dinder

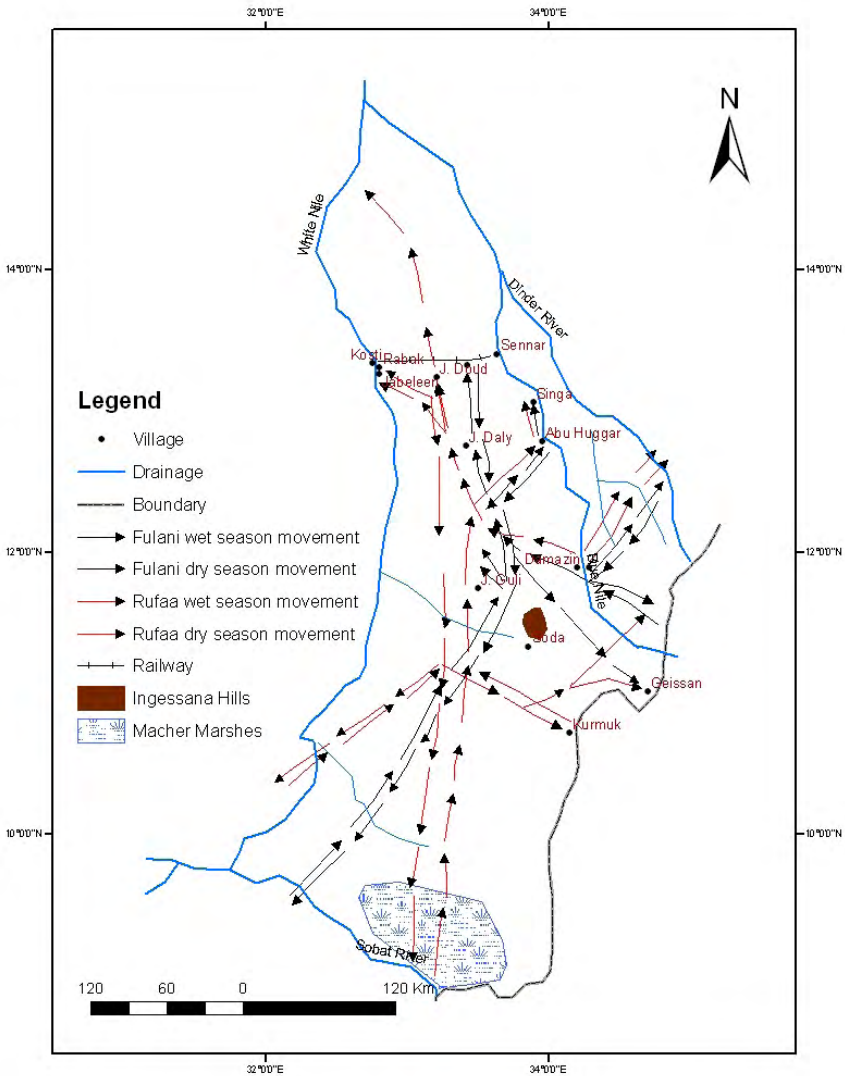


Figure 2. Seasonal livestock movement routes in the Blue Nile State during the 1970s.

Source: Ali 2010: 111.

National Park; meanwhile, other nomads enter Ethiopian lands for grazing in drought years. Pastoralists use specified crossing places (*mushraa*) on the Blue Nile River for livestock watering, such as Serio, Um Kud, Regiba, Abu Hashim, Saoi El Liel, Hamada, Badous and Um Barid. Pastoral communities in the area build good relations with sedentary people living in villages – such as the Burun, Jum Jum, Maban, Uduk and people in the Sobat and Upper Nile areas in South Sudan – to access pastures, agricultural residues and water sources (Ali 2010: 59).

Pastoralists' water sources in the study area

Water is the determinant factor of rangeland use in Sudan, leaving some areas under-utilised due to lack of water, while others are overgrazed due to water availability, especially around permanent water sources. Rains are the main source of water during the rainy season for pastoralists. In the dry season, some pastoralists may go to riverbanks, streams and water yards, while others may use wells, *khors* or *wadis* and *hafirs* (man-made water pools) (Gaiballa 2011: 4). Water sources for livestock and human consumption in the Blue Nile State include the Blue Nile River, *hafirs*, wells and *khors* or *wadis* (Ministry of Agriculture and Animal Resources, Blue Nile State 2017). Until its dismantling in 1971, the system of Native Administration constituted the most effective mechanism to regulate and control the activities of pastoralists and thus the access to natural resources.

The Blue Nile River is the most important source of drinking water in the study area for both livestock and humans. All the villages located on the riverbanks depend on the Blue Nile River. *Hafirs* are usually used after the end of the rainy season in the areas located far from the river. In the study area there are 99 *hafirs* with a total capacity of 2,589,000 cubic metres (Table 1) for livestock and human watering. *Hafir* water is used for eight months, between July and February.

Table 1. Distribution and capacity of *Hafirs* in Blue Nile State localities.

Locality	Number of hafirs	Capacity in (000 m ³)
Kurmuk and Qeissan	16	403
Roseires	06	151
Bau	39	1,321
Damazin and Tadamon	38	714
Blue Nile State	99	2,589

Source: Ministry of Agriculture and Animal Resources, Blue Nile State 2017.

Khors and *wadis* are one of the main sources of water for livestock and human consumption in rural areas of the Blue Nile State such as Khor Donia, Doleib, El Sumaa, Yabus, Uffut, Wadaka and Timsah (Ahmed 2002:14). The estimated total drainage of khors within the Blue Nile State is 700 million cubic metres (Ministry of Agriculture and Animal Resources, Blue Nile State 2017). Underground well water is scarce because most of the area is covered by basement complex rocks, which are impervious and hence have poor water bearing capacity. Among 126 underground wells at a depth range from twelve to 75 metres; most are located in rural areas, providing an annual amount of twenty million cubic metres (ibid.). Recently, some pastoralists have started utilising mobile water facilities. They use tankers to transport water from the river to enable use of pasture in water deficit areas ten to thirty kilometres away (Egemi 2012: 16). Pastoralists in the area used all these sources of water freely during their movements until the 1970s, but at the present time they face multiple constraints in accessing water sources which will be discussed below.

Multiple constraints facing pastoralists in accessing water

Various factors have constrained pastoralists' access to water sources in the study area, and have thus affected their ability to use water resources efficiently; these constraints include climate change and droughts, demographic growth, agricultural project expansion, civil wars, the expansion of Dinder National Park and international borders.

Climate change constraints are expressed in rainfall shortage, which leads to drought phenomena. In Sudan, drought is recurrent and is considered one of the main environmental pressures on pastoralists. Sudan experienced prolonged droughts in the 1970s, 1980s and 1990s. In the study area, according to annual rainfall average records from Damazin Meteorological Station during the period 1970–2017, one can distinguish important periods of reduction in rainfall significantly below the average recorded, which include the years 1983–84, 2001, 2005 (Figure 3), but the 1983–84 drought was considered one of the severest to hit the study area.

In fieldwork, 36 (72 per cent) of respondents mentioned drought as one of the main constraints in accessibility of water sources to pastoralists. According to the study, the consequences of drought include low amounts of water, degradation of pasturelands and migrating long distances to access water (Table 2).

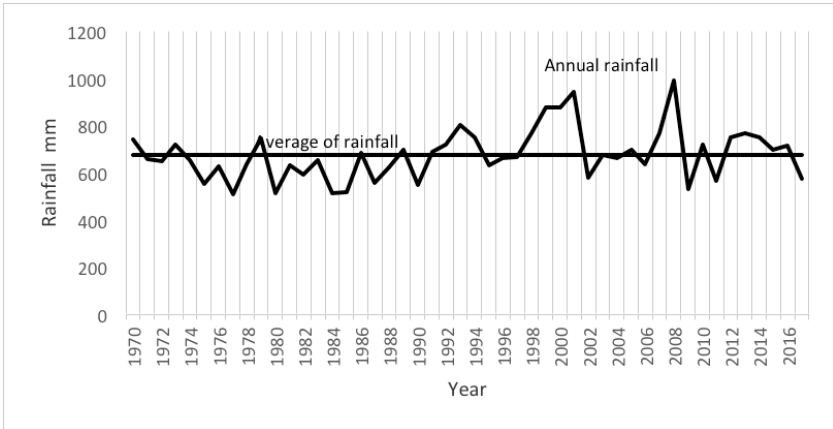


Figure 3. Annual rainfall in the Blue Nile State, 1970 to 2017.
Source: Damazin Meteorology Station 2017.

Table 2. Impacts of Drought on Pastoralists in Blue Nile State.

Consequences	No. of Respondents	Respondents %
Lack of water	36	72
Degradation of pasture lands	11	22
Others	3	6
Total	50	100

Source: Author’s fieldwork 2017.

Table 3. Population in the study area, 1955/56 to 2008.

Census Year	Population	% Change
1955/56	297,918	-
1973	221,844	-25.5
1993	512,845	131.2
2008	832,112	62.3
Average 1955/56–2008	---	179.3

Source: Sudan Population Census for the Years 1955/56, 1973, 1993 and 2008

The most direct impact of the shortage in rainfall on pastoralists is the drying up of water sources (*hafirs*, *khors*, wells) and declining water resources for herding activities. A number of informants mentioned that during the droughts of the year 1983–84, some *hafirs* in the area (Agadi and Guli), and some *khors* (Khor Tumbak, Khor Uffat and Khor Daleib) dried up. Currently, the only perennial water sources are the Blue Nile River and Khor Yabous in the southern part of the study area, while most of the other *khors* dry up within one or two months of the end of the rainfall (Daleib, Ahmar, Mesfa, Meganza, Affut, Tumat, Dahab, Tebilab, Um Garin and Gana). This shortage in amount of water has led pastoralists to migrate long distances, as far as South Sudan, to the Upper Nile River, Marches of Mashar and Sobat River areas in the dry season in search of pasture and water.

Human population growth also constitutes a main constraint: according to the Sudan population census for the years 1955/56, 1973, 1993 and 2008, the population of the Blue Nile State has increased from 297,918 in 1955/56 to about 832,112 in 2008, a percentage increase of 179.3 per cent over the period (Table 3).

The population density of the study area has increased from 7.7 persons per square kilometre in 1955/56 to 21.6 in 2008, a very high density when compared with the overall Sudanese population density for 2008, which reached about sixteen persons per square kilometre on average. Most of the Blue Nile State population lives in rural areas (71.8 per cent), while the urban population is 24.4 per cent, and pastoralists account for 3.8 per cent. According to the fieldwork, the increasing population of the Blue Nile State has led to higher demand for food, which in turn has led to the expansion of areas of traditional cultivation at the expense of pastoralists' lands (pastures and water). The increasing human population has led to growth in the size of some villages such as Agadi, Buk, Kukur, El Room, Tounja, Malkan, Balamt, Magja, Um Shahwan, Roro, Bout, Wad Dabouk and Guli. These villages were the main water points through *hafirs* for pastoralists during their movement between dry and wet season areas (Ali 2014: 23). Recently, due to the increase in population of these villages, pastoralists have lost access to *hafir* waters, which are located in the vicinity of these villages and have been shifted to be used by sedentary populations only.

Another important local constraint is the expansion of agriculture, both rain-fed mechanised farming and irrigated schemes. In the Blue Nile State, rain-fed mechanised farming started in 1969–70, with the development of the Agadi State Farm demarcated for mechanised farming on an area of 210,000 feddans (88,200 ha), as part of the implementation of the government policy which aimed at that time to make Sudan the breadbasket of the Arab world (Ali 2014: 24; Ahmed 1974: 30). Since the 1970s, the government of Sudan, in line with its development policy, has emphasised the increase and expansion

of rain-fed mechanised farming in the area, motivated by the availability of external finance loans and technical funds, from the World Bank and oil-rich Arab states (Ali 2014: 24; Egemi 2012:10–11). The areas under rain-fed mechanised farming (demarcated and undemarcated schemes) have continued to expand during the 1980s and the 1990s up to now. The demarcated schemes were leased by the government to farmers for periods of 25 years, the farm sizes varying from 1,000 to 2,000 feddans (420 to 840 hectares); while undemarcated farms were created by local people as well as by outsiders without government permission.

Consequently, thousands of hectares of grazing lands were distributed to retired government officials; the wealthy; traditional chiefs; and Arab commercial companies such as the Arab Sudanese Agriculture Company, Sudanese Egyptian Company and Sheikh Mustafa el Amin Company (Ali 2010: 81). The area of land given over to rain-fed mechanised farming in the Blue Nile State increased from 281,792 feddans (118,354 hectares) in the 1970s to about 1,620,304 feddans (680,528 hectares) in the 1980s, and expanded to about 4,997,524 feddans (2,098,960 hectares) by 2014 (Ali 2016: 20) at the expense of pastoralists' traditional grazing lands.

Expansion of rain-fed mechanised farming led to difficulty in accessing *hafirs*, on which pastoralists and their livestock depend for water during their movement from the wet season grazing areas (Bau, Agadi, Garabeen Wadabuk and south Damazin) to the dry season areas (Azaza, Garri, Dewa, Badoos, Hamada, Umdarfa, Kiram, and Fazagholi), located between the eastern bank of the Blue Nile River and Dinder National Park (Ali 2014: 28; Ahmed 2001:178). As a result, hard competition and tension over pasture and water sources appeared between pastoral groups and between pastoralists and other land users in the same area. The expansion of rain-fed mechanised farming led to inaccessibility of *hafirs*, the Blue Nile River, *khors*, pools and wells, which had been used as main sources of water since the late 1960s (Ahmed 1974: 30; Ali 2014: 29).

Table 4. Main water sources used by pastoralist households.

Source of water	1960s		2017	
	No. of Respondents	%	No. of Respondents	%
Blue Nile River	8	16	7	14
<i>Khor</i> ; Pools and <i>Jamman</i>	10	20	38	76
<i>Hafirs</i>	20	40	3	6
All the above	12	24	2	4
Total	50	100	50	100

Source: Author's fieldwork 2017.

The fieldwork reveals that forty per cent of pastoralists used *hafirs* as main sources of water provision for livestock but currently, due to the constraints mentioned, only six per cent use them. The diminished dependence on *hafirs* is due to the expansion of rain-fed mechanised farming schemes (Ahmed 2001: 178). Many *hafirs* fall inside the schemes and in the vicinity of the schemes, and some *hafirs* along animal routes are blocked by rain-fed mechanised farming schemes (Ahmed 1974: 30; Ahmed 2001: 184). Recently, pastoralists have started to depend on *khors*, pools and wells as the main sources of water for livestock in areas far from Blue Nile River, after losing access to *hafirs*.

As a result, many pastoralists have started to pay to water livestock from *hafirs* and any sources of water falling inside the schemes for rain-fed mechanised farming owners, who may sometimes refuse to sell the water (Feyissa and Schlee 2009). In this case, livestock is forced to cross long distances searching for water leading to heavy losses of animals. Expansion of rain-fed -mechanised farming has also led to increasing tensions between different water resource users in the Blue Nile State (Ahmed 2008: 4; Osman 2008: 134; Shazali and Ahmed 1999). Most of these disputes appear seasonally during harvesting between October and December. They can be divided into two categories: (1) dispute between pastoral communities such as Rufaa al-Hoi, Kenana, Fulani and Ingessana, mainly due to crowding and competition at water points, crossing the Blue Nile River banks, a type of conflict which is very tense; (2) dispute between pastoralists and sedentary people over water sources in areas such as Geissan, Ulu, Malkan and north Kurmuk during pastoral mobility southwards in the dry season, also a highly tense dispute, even if limited.

Although the Blue Nile River is the main perennial source of water in the area, it has become inaccessible for pastoralists, due to the expansion of irrigated agriculture such as horticulture, *matarat* (farming irrigated from wells), and *jerf* (cultivation of lands covered by river flooding) on both banks of the Blue Nile. Expansion of irrigated agriculture has restricted the access of pastoralists to their traditional watering points on the river banks (*mushraa*) in areas such as Haroun, Serio, Um Kud, Regiba, Abu Rammad, Bejawi, Disa, Kharabat, Remila, Ahmer Moqi, Geshish, Surageia and Abu Hashim, on the western bank; and Abu Zougli, Abu Zour, Saoui Liel, Markub Ahmar, Hamada, Garef, Wad Afodi, Badous, Um Barid, Deiwa, Aradeeb, Abu Delief, Dewema and Khor Laban, on the eastern bank (Ali 2014: 29; Ahmed 2008: 3). There are some watering places for livestock currently used by pastoralist communities in the Blue Nile State, but their width has decreased from five kilometres to less than two (RPA 2017).

Expansion of Dinder National Park is another constraint: Dinder National Park (DNP) was established in 1935 as a biosphere reserve, following the London convention of 1933, and in 1979 it was designated as part of the UNESCO World Network of Biosphere Reserves (Yousif 2012: 28) at the expense of pastoral

nomads' grazing lands. Dinder National Park, located on the Ethiopian border, straddling Blue Nile and Kassala States, is approximately 10,300 square kilometres in size. The most important features of the park are a series of permanent and seasonal wetlands known locally as *mayas*, which are subject to floods and contain green fodder and water up to the end of the dry season (Abdel Hameed and Eljac 2003, Maghraby and Anwar 1985). The park supports about 58 species of shrubs and trees (Yousif 2012: 28). However, in 1982, the park grabbed an area of 2,630 square kilometres (263,000 ha), to the west side, at the expense of Blue Nile State pastoral lands, thereby increasing to 8,960 square kilometres (896,000 ha) (Ali 2010: 56). From 1982 to now the park has grabbed about another 1,340 square kilometres and today covers about 10,300 square kilometres (1,030,000 ha) (Yousif 2012: 29). Most of this grabbed land was pastoralist lands at Roseires locality in the Blue Nile State. The expansion of Dinder National Park from 1982 to 2016 led to loss of access to water sources and grazing lands in the dry season for pastoralists who had acquired grazing rights over a long period between Dinder and the Blue Nile river, due to its security, adequate water supply and pastures throughout the year. In addition, the Dinder National Park Administration has started to forbid livestock to enter the park for grazing, and pastoralists face confiscation of livestock, losing fifty per cent of their herds if their livestock is found inside the park. Despite the penalties, many pastoralists still enter the park for pasture and water resources: as a result exacerbated tensions between pastoralists and park administration have resulted in loss of human life on both sides, as well as in the loss of livestock.

On the political level, civil war has constituted a further constraint. The second civil war between the Government of the Sudan and the SPLA/M (Sudan People's Liberation Army/Movement) began in 1983 (Baarsen 2005; Wassara 2013:101; International Crisis Group 2013: 12), for reasons including exploitation, marginalisation, ethnic conflict and religion. In 1985, the SPLA/M entered Southern Blue Nile State from Ethiopia with the aim of capturing the strategic town of Damazin. Between 1988 and 1989 the SPLA/M again recaptured Kurmuk town but was pushed out within six months. On 17 March 1996, SPLA/M troops entered the Southern Blue Nile State from Upper Nile State through Yabus, capturing Yabus, Pachalla, Tami and Uza areas. In March 1997 SPLA captured Kurmuk and Qeissan, Menza, Yagora, Yabachar and Gadamayeb areas (Baarsen 2005). The SPLA/M's control of the Southern Blue Nile State increased during 2000 and 2001, as they expanded north to Fazugli town, west to Ulu and south to Daga. They maintained control over Kurmuk and Qeissan until May 2002, when the Government recaptured Qeissan areas. In January 2005, the government of Sudan (GoS) and the Sudan People's Liberation Movement signed a peace agreement that ended a devastating civil war lasting more than twenty years.

As mentioned above, the areas contested between GoS and SPLM were traditionally the main dry season grazing lands for pastoralists. During fieldwork, some pastoralists mentioned that the civil war and its extension to the Blue Nile State led to loss of access to water sources and pastures in dry season areas in the southern part of Blue Nile State (Concordis International 2010). The civil war also limited access to grazing lands in South Sudan. Throughout the war period, the SPLM occupied the rich dry season grazing lands in areas such as the Upper Nile, Sobat River, Khor Gerinti, Khor Adar and Gekao, which cut off important pastoralist routes and access to dry season grazing lands in South Sudan. After the secession of South Sudan, and in September 2011, fighting between the Sudan People's Liberation Army-North (SPLA-North) and Khartoum forces in South Kordofan spread to Blue Nile State. The Sudanese government immediately called a state of emergency in Blue Nile State; this conflict is ongoing. In South Sudan, the tensions between Sudanese President Salva Kiir and his sacked vice president, Riek Machar, began in December 2013 and this war is also ongoing. The continuity of tensions and conflicts in both countries made access to pastures and water resources in south Blue Nile State, the Upper Nile and Sobat areas in South Sudan more difficult. As a result, pastoralists lost access to their dry season and wet season grazing lands across two countries.

Finally, in recent times, new international borders added a last major constraint to this complex situation: after 2011, the north-south border between Sudan and South Sudan was been created through multiple socially, economically and environmentally active areas. It is the longest international border in Africa – 2,200 kilometres (Abdalla 2013: 2–4) – and hosts about twelve million human beings from both countries. The borders pass through grazing lands containing important migration routes, especially for northern pastoralist communities, such as the Blue Nile State pastoralists, enabling them to access their rich dry season grazing lands in the southern part (Cormack and Young 2012: 1). The Comprehensive Peace Agreement (CPA) signed in January 2005 between the Sudan People's Liberation Army/Movement and the National Congress Party (NCP) ended Africa's longest civil war. Although the accord inspired some Sudanese to seek a peaceful unity, the referendum of 2011 led to the secession of the southern section from Sudan on 9 July 2011, to create the world's newest nation.

Before South Sudan's independence, officials from both governments affirmed that cross-border pastoral migrations should continue and that local agreements should be reached by leadership participating in border conferences (Ali, 2010:36; Cormack and Young 2012: 1). The new international borders have affected the ability of pastoralists in the Blue Nile State to have full access to their traditional rangelands and water resources in the dry season in the Upper Nile, Jeko and Sobat River areas. Reduced access to pastures in the South led to more tensions over water sources in Sudan between pastoralist communities and

local sedentary people (Cormack and Young 2012: 5–6; Egemi 2012:14).

The new international borders are currently sites of extensive hostility, resulting in many casualties and large-scale displacement. This new situation led to the militarisation of the border in both countries. The presence of the army along the border has blocked pastoralist routes that pass to South Sudan to access pastures and water and imposed many taxes to allow pastoralists to access South Sudan's grazing lands and reach dry season pastures and water points. An agreement signed on 27 September 2012 in Addis Ababa committed Sudan and South Sudan to cooperate on border security and demarcation, economic and trade deals and citizenship rights. This agreement supported the rights of pastoralists to access seasonal grazing lands, but the actual terms of commitments by both sides are vague and the committees intended to oversee them have not yet been formed (Cormack and Young 2012: 10; Craze 2013: 45–50).

There are a number of major challenges facing pastoralists in accessing water sources due to the new international borders, which caused the ongoing conflict in South Sudan and in the Blue Nile State, with implications for regional security, as they are not clearly demarcated in all areas. This challenge has resulted in frequent cross-border communal conflict. Cross border migration is not regulated at the border as no passport and migration police are present there; the official presence is limited to customs police, National Intelligence and Security Services and Military Intelligence. The absence of trans-border management mechanisms for water resources and pastures does not adequately respond to the trans-border nature of socio-economic activities. The movement of pastoralists is not fully organised or regularised and leads to local conflict and insecurity. All these challenges have negatively affected Blue Nile State pastoralists in accessing dry season water and pastures in South Sudan. To access South Sudanese grazing lands, pastoralists build alliances with local communities through friendships, marriage (northern men marrying southern women), labour exchanges, established reconciliation procedures for solving interethnic conflicts through traditional tribal leaders (Abdul Jalil 2018:10), providing gifts to tribal leaders, paying gifts such as salt and onions to the community, or paying transit fees. Pastoralists and local communities without interference from the government agencies of the two countries carry out all these agreements.

Conclusions

Pastoralists in the Blue Nile State over the last five decades have faced challenges in accessing water linked to ecological, socio economic and political factors, affecting their ability to make efficient use of water resources. Some pastoralists mention drought as a main constraint to accessibility of water

sources, the most direct impact of rainfall shortage being the drying up of *hafirs*, *khors* and *jammam*. Population growth has increased demand for food, which in turn has led to the expansion of agricultural areas at the expense of pastoral lands. Recently, due to the increase of population in the villages, pastoralists have lost access to *hafir* waters. Expansion of rain-fed mechanised farming at the expense of grazing lands had also led to loss of access to the artificial water ponds (*hafirs*), which pastoralists and their livestock depend on during movement from wet season areas to dry season ones. Since the late 1960s, this expansion has made the main sources of water inaccessible to pastoralists, who have had to start paying money to owners to water their livestock. Dinder National Park also played a huge role in preventing pastoralists from accessing water sources in dry season pastures, where they had acquired grazing rights during a long history of ranging in the area between Dinder and the Blue Nile river, due to its security and adequate water supply all through the year. The civil war also limited access to grazing areas in South Sudan. The new international borders have affected pastoralists, denying them full access to their traditional dry season rangelands in South Sudan. The predicament of the Blue Nile pastoralists illustrates both the centrality and coordination necessary to manage multiple water sources so as to maintain sustainable livelihoods, and the interplay of ecological, economic and political factors that complex pastoral socio-productive systems strive to obtain.

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