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Sedentarization of nomadic pastoralists and conflict with the inhabitants: Case of the forest of the 9th district of N'Djamena

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Abstract

The study focuses on the process of Sedentarization of nomads on the outskirts of the city of N'Djamena, which is spreading and modifies the way of life of the population through the monopolization of lands belonging to public domain of the State. The objective of this study is to understand how nomads settle around the city. Three years of monitoring, from October 2019 to October 2022, and a three-month survey (September to December) of 67 nomads and 90 sedentary households were conducted. The survey covered only 2 quartiers, namely Walia and Toukra. 35.8% of the nomads have settled and 64.2% continue to be nomads, while maintaining shelters under the forest to store their materials during the rainy season. 26.67% of farmers grow both market gardening and sorghum, 33.33% grow sorghum exclusively and 40% grow only market gardening. These activities are the main sources of income and food for these people. The sale of milk and small ruminants is also source of income for herders. A better understanding of the sedentary system of the nomads and an integrated management of the space around the town will allow us to envisage mechanisms to mitigate possible conflicts between farmers and herders.

Keywords: Sedentarization; Nomadic pastoralists; Urban growth; Walia forest; N'Djamena

1. Introduction

Cities concentrate people and their activities and have an impact on rural people [1]. Nomads are not left out. Nomadism is a way of life that is based on perpetual movements in search of pastoral resources. It was done without any fixed shelter at the mercy of long transhumances of several months per year and over several hundred kilometers [2]. Natural constraints such as the droughts of the late 1960s accentuated traditional mobility and disrupted the usual nomadic way of life. Indeed, in the Sahelian regions, the dry years of the 1970s led nomads to survival reflexes where the majority "threw away the stick" and migrated to the cities [3]. Population growth has also contributed to this phenomenon of migration and accelerated urbanization. In 2014, 54% of the world's populations already lived in urban areas and this figure is expected to reach 66% by 2050 [4]. As a result, nomads have begun to settle in and around some urban areas. Faced with the depreciation of the old nomadic way of life, the policy of Sedentarization became a slogan of policy makers in response to the drought of the 1970s [5].

The world is thus becoming more urban. The assumption that the growing majority of humanity will feed urban areas with a crucial impact on rural land is now an insistent debate among scientists and city managers [6]. High population rates in Africa are leading to a strong migration of people from rural to urban areas [7] where land is being grabbed in an anarchic way. The control of urbanization is beyond the control of public authorities [8] due to an ineffective land

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policy [9] around the cities. In Saharan countries, 60 to 65% of urban land is occupied in ignorance or disregard of the abundance of urban planning and land legislation [10].

For a long time, the Republic of Chad was the least urbanized country in Africa. But since the 1990s, its urbanization has accelerated considerably [11]. The general migration of the population is generating a positive balance in urban areas [12]. Nomadic pastoralist also participates in the expansion and creation of cities. This is due to the growth of the population of N'Djamena. The predominance of horizontal housing on flat topography has led to considerable spatial expansion [13]. In addition to the flat topography and the *laissez-faire* attitude of the public authorities, an anarchic occupation of building land has developed around the city [14]. This is because several categories of people are implementing offensive land occupation strategies [15].

The area south of N'Djamena is considered a *non aedificandi* zone. A forest has been created there on hydromorphic soil. It is a favorable area to shelter nomadic camel herders during the dry season [16]. The land is also favorable for farmers to practice agricultural activities. With the increase in population and the droughts, this area has been completely overrun. The increasing number of farmers has had a crucial impact on the natural resources. The forest is almost annexed and occupied. The objective of this study is to understand the process of sedentarization of nomads on the suburbs of N'Djamena, which is spreading and changing lifestyles through a conflicting monopolization of the State's public domain. How do the camel-breeding nomads settle under the Walia forest? Do they all settle permanently or will some of them continue the transhumance as usual? What are the relationships between these nomads and the local inhabitants? How can the public authorities accompany these people to integrate them into a modern and evolving society? These are necessary questions that guide and drive the study.

2. Material and methods

The study is based on the 9th district of the city of N'Djamena. In 2009, this district had a population of 76,649 inhabitants [17] and is estimated to have 161,334 inhabitants in 2022. It is located at the interfluve of the Chari and Logone rivers. The Walia Forest is the main area around which the study is done. It is an anthropic ecosystem that is now so degraded. But with the accelerated demographic growth of N'Djamena, where housing on the outskirts is done in an anarchic and illegal ways, the forest is mostly invaded by sorghum fields and houses of nomadic camel breeders. The study was conducted between 2019 and 2022 in Walia and Toukra quartiers. In these two quartiers live nomads who stay during the dry season (Walia) and nomads who are already settled (Toukra). In 2009, the two quartiers had a total population of 23,979 inhabitants, of which 20,196 were in Walia and 3,783 in Toukra [18]. In 2022, they will have a total of 88,851 inhabitants, of which 40,678 inhabitants for Walia and 48,173 inhabitants for Toukra.

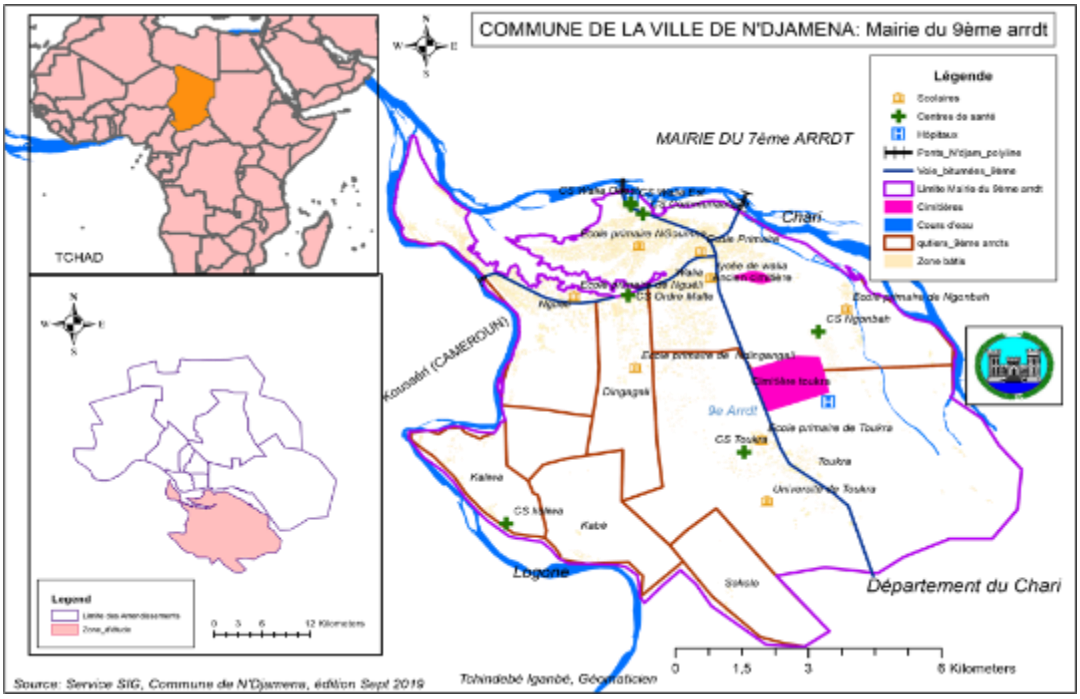

Figure 1 Map of the 9th district

Information was collected among nomadic families living in the Walia forest during the dry season and from former nomads living in Toukra. 67 families were interviewed, of which 23 sedentary and 43 semi-nomads. Further interviews were conducted with 5 forestry officers and 8 retired forestry officers; and 90 sedentary people, 45 of whom live on Walia forest lands (now urbanized and allocated to individuals) and 45 of whom farm under that forest.

Table 1 Category and number of people interviewed

Categories	**Herders settled**	**Herders practising nomadism**	**Total**
Number	24	43	67
Categories	**Forestry officers**	**Retired forestry officers**	
Number	5	8	13
Categories	**Sedentary on the land of the forest**	**Sedentary farming under the forest**	
Number	45	45	90

3. Results

3.1. Factors of the sedentarization of nomads

Three main factors have enabled nomadic herders to explore and settle in the Walia Forest: The climate change, the research for pastoral resources and exploitation of forest resources by the populations.

3.1.1. Climate changes and extension of the transhumance period for camel breeders

Droughts in the Sahel due to rainfall deficits are becoming more and more intense. These natural disasters are degrading the quality of fodder resources that are essential to cattle and disrupt the usual movement of nomads [19]. The decade 1980-1990 is considered as a deficit in the city of N'Djamena, as shown in the following figure 2.

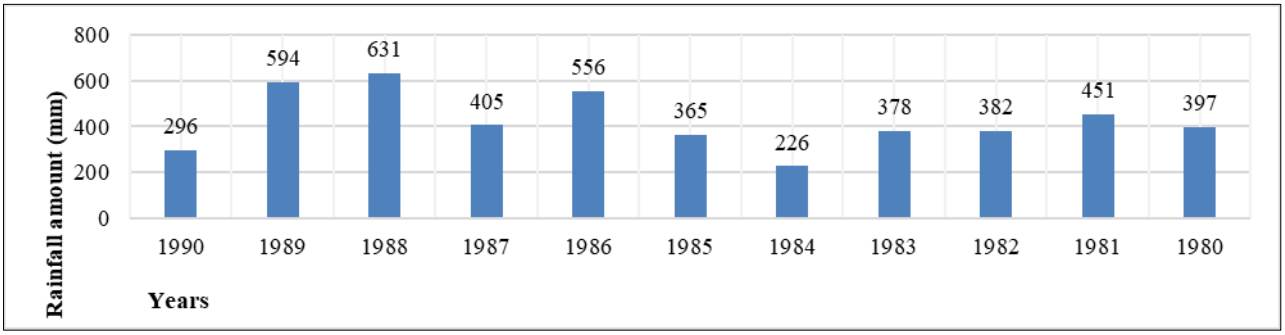

Figure 2 Rainfall in the city of N'Djamena during the period 1980 to 1990

Figure 2 shows that between 1980 to 1990, rainfall amount ranged from 226 mm to 631 mm. In 11 years, only three years exceeded the 500 mm mark. They were 1986 (556 mm), 1988 (631 mm) and 1989 (594 mm). The other years have rainfall amounts below 500 mm. The minimum was 226 mm in 1984. The average over this period is 425.5 mm.

Located in the Sahelian domain of the country, the city of N'Djamena is part of a very dry climate, with often very low and irregular rainfall and high temperatures [20]. These dry years have led nomads to extend their transhumance and migrate to N'Djamena. Before the 1970s, transhumance was limited to the north of N'Djamena around Massakori [21]. The depletion of natural resources in Sahel has altered the routes and periods of livestock transhumance.

3.1.2. Research of favorable conditions for camel herds by pastoralists

The search for pastoral resources is the aim of a perpetual movement of nomadic herders. They regularly travel between the north and N'Djamena in search for food for their cattle. The figure 3 below shows the reasons why pastoralists move.

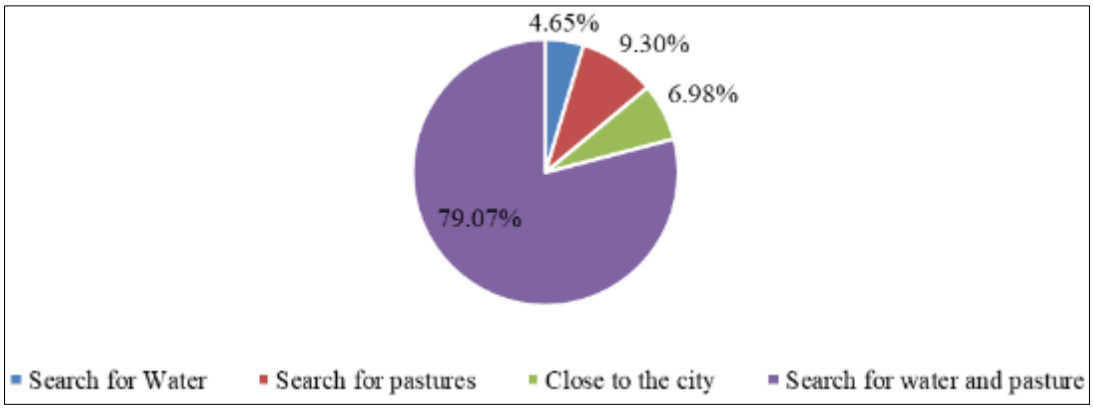

Figure 3 Reasons for nomads to move

The figure 3 shows the different reasons for nomads' trips and stays in the 9th district. 79% of the nomads interviewed travel in search of water and pasture, 9.3% in search of pasture, 6.98% to take advantage of the proximity of the town, and 4.65% in search of water. Discussions with members of herders' households reveal that the staying in the area is justified by the presence of grazing land under the forest and the waters of the Chari and Logone rivers. This strategy of adaptation to the spatial and temporal inequality of natural resources (pasture and water) [22] has led the nomads to enter and remain for a long moment during a year under the Walia forest. This is an effective adaptation strategy to climate changes [23]. The relationship that exists between climate change and nomadic movement [24] depends on the availability of pasture [25]. Nomads move between the Batha and Kanem regions and have discovered the forest since 1985. Initially, pastures in the peripheral areas of the forest were explored and exploited by pastoralists upon arrival.

The nomads continue this cyclical movement back and forth between the North and the forest. The dromedary, best adapted to the desert, is known to have difficulty living in a rainy climate [26]. Therefore, as soon as the first rains arrive, the nomads are forced to leave the forest and return to the northern areas. In the Sahel, the arrival of the rainy season varies from year to year. So, the departure of the nomads for the north depends on the start of the rainy season. According to the interviews, the departure to the north varies between June and July and the return to the south between September and October.

3.1.3. Exploitation of forest resources and sale of land by the Bulama

Bulama is the name of the village chief in Local Arabic

The growth of N'Djamena's population leading to its spatial extension has had a significant impact on Walia Forest. The results of the surveys are presented in Figure 4 below.

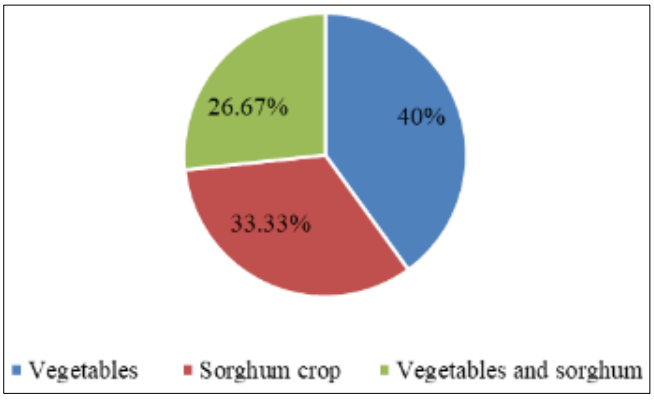

Figure 4 Proportion of farmers using forest resources

The figure 4 shows that 26.6% of the inhabitants cultivate both sorghum and legumes, 33.3% cultivate only sorghum during the rainy season and 40% cultivate legumes. The cultivated areas are located under the Walia forest. Production is also favorable due to the animal manure that accompanies herders [27]. As a result, the Walia forest is exploited both by farmers, who also obtain firewood when clearing the forest, and by herders, who exploit the fodder resources (tree

leaves, young plants, grasses). These human activities disturb the proper functioning of the ecosystem and destroy the vegetation cover. As a result, the Walia forest can be seen as an area of rise in tensions between pastoralists and farmers, as the two groups compete for the same land.

Traditional authorities (e.g., *Bulama*) started selling lands situated from the margins of their villages until reaching the forest. The following figure 5 sheds some light on this situation.

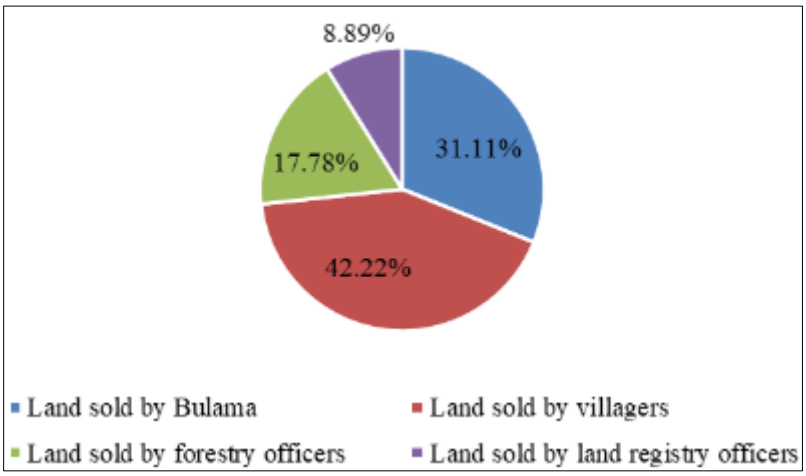

Figure 5 Lands sold by people

The figure 5 shows that 42.22% of the sedentary population's land around the forest was sold by the villagers, 31.11% by the *Bulama*, 17.78% by forestry officers and 8.89% by land registry officers.

3.2. Process of permanent settlement of nomads in the 9th district of N'Djamena

Nomadic camel breeders camp under the Walia forest during the dry season. They no longer practice transhumance as the only way to find pasture for their livestock. They have modified their ancient practice according to the situation which is imposed on them by demographic and climatic changes.

3.2.1. Maintaining of nomadic habitats under the Walia forest

Nomadic camel herders no longer practice traditional nomadism. Not all of them move behind the herd anymore. The following figure 6 reflects the realities on the ground.

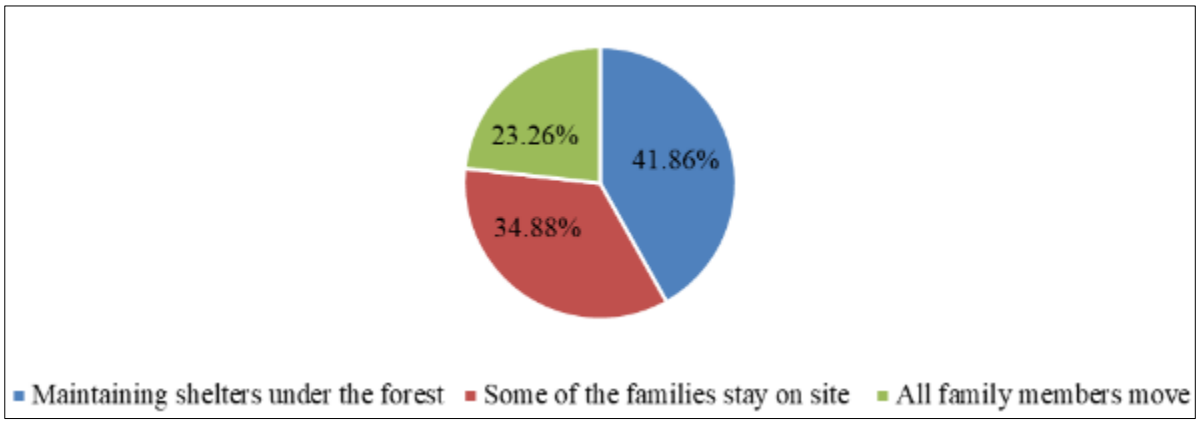

Figure 6 The proportion of farmers who have changed their lifestyle

The figure 6 shows that 23% of nomads move with all their family members, 35% keep part of their families under the forest and 42% maintain shelters containing their belongings. Consequently, the situation of nomads is slowly evolving towards settlement, as the proportion of their presence under the forest rises to a percentage of 77% (35% + 42%).

Some huts store materials such as natron for feeding livestock and utensils which they prefer to leave in place. The image 7 below shows the nomads' shelters maintained under the Walia forest during the rainy season.

Figure 7 Nomadic shelters under Walia forest in the rainy season

Figure 7 shows the image of the nomads' shelters under the Walia forest. These shelters are well constructed because they store their materials during the rainy season. This is an indication of land use to discourage farmers from cultivating this land during the rainy season. To settle, nomads maintain some of their mobile houses in place, occupied not only by materials but also by women, the elderly, and children.

3.2.2. Diversification of nomad's activities under the Walia forest

The maintenance of shelters and individuals under the forest during the rainy season is not only the indication that nomads are settling down. Diversification of income-generating activities such as the sale of milk and cattle is also practiced. Figure 8 below illustrates the situation.

Figure 8 Proportion of activities carried out by herders

The figure 8 shows that 58.14% of nomads sell dairy products and 41.86% trade in goats and sheep to improve their income. In fact, in addition to camels, nomads keep some backyard animals, usually goats and sheep. In Chad, sheep are raised mainly for their meat [28]. But the sale of camel milk is the main activity in the case of nomads of Walia forest. This milk, appreciated by the town people because of its alleged virtues, is sold along the road between Toukra and Walia. The income generated help the pastoralists to access the agricultural products [29] they need for their food.

The best times to trade backyard livestock are during certain months of the year. The following table 2 shows the periods when trade brings more income to the farmers.

According to the Table 2, 38.89% of herders report that trade in animals is favorable during the Ramadan holiday, 44.44% during îd Al Adah holiday and 16.67% during the end of year holidays. This trade partly explains the presence of some herders under the forest during the rainy season. They buy their supplies from markets in the neighboring province, particularly the Chari-Baguirmi province.

Table 2 Right time for the sale of livestock

Holidays	Ramadan holiday	Aïd Al Adah Holiday	End of years holidays
Number	7	8	3
Percentage	38,89%	44,44%	16,67%

3.2.3. Final installation of nomads in the 9th district with the status of semi-breeder

Some nomads have settled in the Toukra quartier. This is because their contact with the city has enabled them to develop some relationships with the inhabitants of the surrounding villages. Figure 9 shows the distribution of settled herders by year.

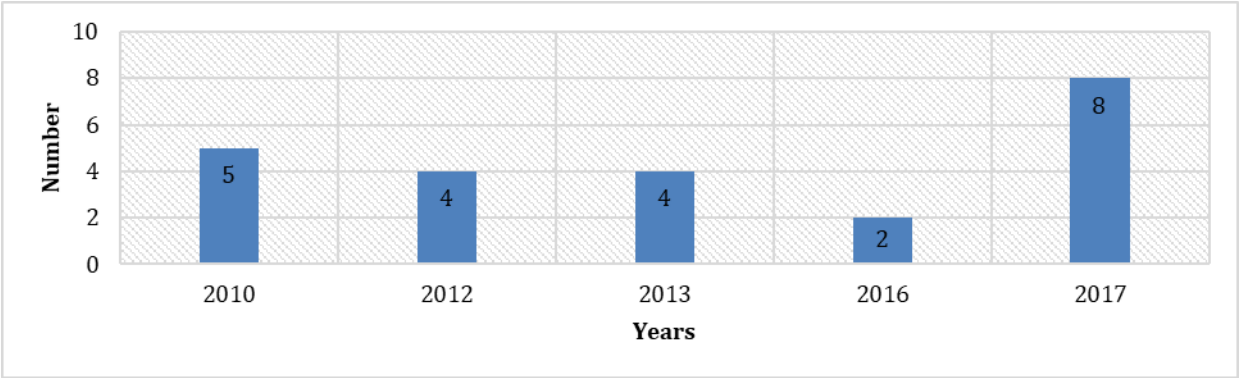

Figure 9 The distribution of sedentary households between 2010 and 2017

The figure 9 shows that 5 nomadic families settled in Toukra in 2010, 4 families in 2012, 4 families in 2013, 2 families in 2016 and 8 families in 2018. The first ones acquired their lands from the *Bulama* of the Arab community. These herders have entrusted their camels to the families who continue the transhumance movement. Their presence in the region has also enabled them to establish relationships with soldiers (e.g., generals), whether they are member of their communities, who entrust them their livestock. This is because the spatial dynamics linked to desertification are leading to the sedentarization of nomads [30].

3.2.4. Process of maintaining nomads through infrastructures by the public power

Under the Walia forest, two main infrastructures have been created: a borehole equipped with a hand pump and a primary school. During the floods of 2020, the victims of the Walia, Gardolé-Djedid and Toukra quartiers were reinstalled to a site in the west of the forest. Sanitation and water facilities such as latrines, showers and boreholes were built by humanitarian organizations. However, alongside the victims, there are nomads who have difficulties with water, sanitation, and schooling. For that reason, a borehole for drinking water and a school have been built under the Walia forest for nomads. Figure 10 below shows the borehole.

Figure 10 The nomads 'Borehole equipped with hand pump

The figure 10 shows a borehole: in the foreground is the borehole and the background there are trees and nomadic herders' shelters (tents). The borehole was built with the humanitarian NGOs aid to provide the herders with drinking water.

3.3. Contentious cohabitation between nomads and resident farmers under Walia forest

The Walia forest is exploited by two (2) main communities: herders and farmers. They compete for the public domain of the State. In normal circumstances, they take over the space one after the other. This succession is a source of conflict between the two (2) communities.

3.3.1. Devastation of fields by cattle and occupation of the forest lands by farmers

The use of the forest by both farmers and herders is not without consequences. In recent years, conflicts have occurred. The following figure 11 shows the proportion of the conflicts.

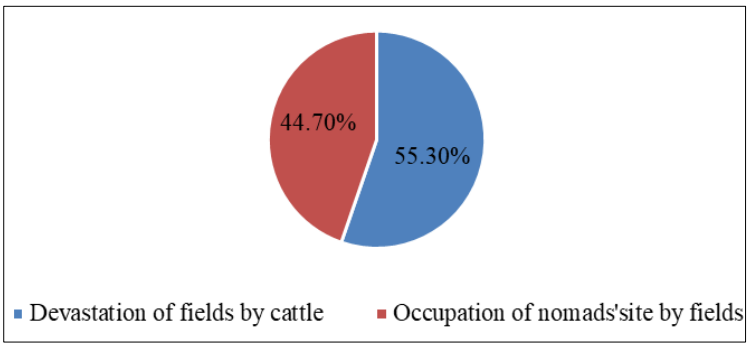

Figure 11 Proportion of conflicts due to the occupation of herders' sites by fields or the devastation of these fields by livestock

Figure 11 shows that 55.3% of the conflicts between farmers and herders are due to the occupation of the nomads' usual space by the farmers' fields (when the herders want to move in) and 44,7% are due to the devastation of the farmer's crops by livestock (when the herders leave or return). According to testimonies, the conflicts are characterized by verbal disputes. Nomads also reveal that at the beginning of the rainy season, their shelters are surrounded by the farmers' seedlings. This evokes an unspoken language of farmers which asks the nomads to leave the area quickly. Without any resistance, the herders pack up and abandon the area during the rainy season. On the other hand, at the beginning of the dry season, farmers are harassed to harvest for fear that the cattle would destroy their products. The slightest delay in harvesting leads to the devastation of the fields by the herds.

3.3.2. Subdivision of the Walia forest and the integration conflict between nomads and farmers

In 2008, the villages of Walia and Toukra as well as Ngoumna, Nguéli, Digangali Toukra, and Kabé were integrated into the city of N'Djamena and constituted the 9th district of that city. Since then, the situation has completely changed with the subdivision of part of the forest by public authorities. The land potions are allocated to applicants for building land. As a result, former forest users, especially nomads and farmers, are trying to position themselves to access some of the land for housing [31]. Indeed, in 2022, 24 nomadic households remained in place during the rainy season, preventing farmers from cultivating their fields. Nevertheless, sorghum fields and rice paddies located far from nomads' houses are being exploited. Due to the flooding of the Chari and Logone rivers that affected the entire Forest in 2022, these households were relocated to disaster sites by the authorities and field are flooded.

4. Discussion

The Walia artificial forest, which is a suitable ecosystem for livestock breeding in times of drought and for agricultural activities, attracts nomads. The expansion of the city of N'Djamena by including peripheral villages in the urban area has prompted the inhabitants to annex the forest. As a result, people's lifestyles are changing, and the land is spontaneously occupied or sold by the traditional chiefs.

4.1. Factors of sedentarization of nomads

The climatic variability involving extreme weather events is the main cause of adaptation of nomadic herders, which manifests itself in the perpetual movements in search of favorable ecological zones. This has led the herders to gradually

settle under the Walia forest. As noted by [23] in the Yéliminé environments of Guinea, in Sahelian area with low rainfall, households adopt short-cycle crops in their farms. Nomadic herders often accompany their herds. The purpose of the movement is to look for pasture. In this way, [25] confirms that as the availability and productivity of natural pasture varies in time and space, herders are forced to move. His results indicate that 51.2% of the herders are looking for pasture, 39% seek water point to water their herds. [25] adds that due to climate change, the economic situation in Guinea has become bleak. The decrease in pasture and water points has increased the movement of herders. Studies conducted by [26] show that it is the decrease in forage biomass and the progressive decline in the nutritional value of natural pastures in the dry season that leads to nutritional deficiencies in animals.

4.2. Process of permanent settlement of nomads in the 9th district

The activities of nomadic pastoralists in the Walia Forest are characterized by the sale of milk and the trade in livestock, particularly small ruminants. The work of [27] in Adamaoua on milk and dairy products revealed that the sale of dairy products by Mbororo women enables them to acquire agricultural products, either directly through barter or through monetary gains. In the Walia Forest, the gains are exclusively monetary. Bartering is absent. These activities are a settlement factor because of the income generated by the sale of milk. In his work on the dynamics of change in the livestock sector, [28] observes that despite their reputation as good milk producers, Sahelian sheep are raised for their meat. [28] argues that Fulani sheep have a butchery yield of about 48-50% compared to Arab sheep, which have only 39-42%. Thus, the fattening of small ruminants by nomadic herders under the Walia Forest helps fix them because of these commercial advantages. They maintain a small number of shelters for storing their materials during the rainy season.

Cities have conquered spaces by encroaching on the pastures. This leads nomads to settle permanently in urban areas. [29] states that the sedentarization of nomads is facilitated by the role played by the (re)emergence of regional and international trade and the resulting power issues concerning control of space. Studies conducted by [6] show that the rainfall deficit observed in the Sahel during the 1970s has led the States to work to sedentarize nomads. This corroborates our results, as a borehole and a school were created for the nomads. A community school, supported by NGOs during 2020 floods, was created for the schooling of the herders' children. An evaluation report of [29] showed that the pilot mobile schools for herders should operate during the dry and rainy seasons but should be discontinued during times of heavy movement/transhumance, which would become holiday periods. With this act, the local authorities of the 9th district are trying to stabilize the nomads through basic infrastructure.

4.3- Contentious cohabitation between nomads and resident farmers

The use of the same space by farmers and herders is the main source of conflict between these communities. This result was noted by [30], according to whom, beyond access to resources, there is competition between two production systems for the use of space. [30] also identifies 4 main causes: crop damage, which we also observed, access to water, which we did not identify as a source of conflict, the cultivation by farmers of natural rangelands, in our case it is the sites where nomads settle during the rainy season are cultivated, and cattle tracks where farmers tend to cultivate, which does not appear in our results because they are circumscribed under the Walia forest. In the case of the Walia forest, our results show that these conflicts occur at specific times: at the beginning of the rainy season and at the end of the rainy season.

5. Conclusion

The study was conducted to understand the process of sedentarization of nomads on the outskirts of the city of N'Djamena, which is spreading and changing lifestyles through the monopolization of public land by individuals. This leads to conflicts between nomads and farmers. It is important to note that urbanization is a global phenomenon that does not exclude anyone. This global dynamic requires policy makers to change urban policies by taking into account the general behavior of societies. In terms of land management in the periphery of cities, the State is absent and users such as farmers and herders claim land that belong to and is managed by the State. Traditional authorities, including the Bulama, are the developers and allocators of land for construction. The State must take the necessary steps to regulate land use on the outskirts of towns, considering the needs of all inhabitants to avoid any conflict between its citizens.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

This document, entitled ‘‘sedentarization of nomadic pastoralists and conflict with inhabitants: case of the forest of the 9th district of N’Djamena’’ is the original idea of Gassina Pierre. He wrote it with the help of Idriss Moussa Gaddoum. For this purpose, Mr. Gassina Pierre remains the corresponding author. All benefits related to this article belong to Gassina Pierre.

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