

ID: 143

## Climate Change, demographic Pressure and Adaptation of Agropastoralism in the Tandjilé province Southern Chad

Keiba Dar<sup>1\*</sup>, I.R. Muhammad<sup>1</sup>, Yusuf Garba<sup>1</sup>, Kabe Hinlibe Karka<sup>2</sup>,  
Ousseini Moumouni<sup>2</sup>, Dassidi Lucien<sup>2</sup>, Madji Magloire<sup>2</sup>

<sup>1</sup>Higher National Institute of Agronomic Sciences and Agri-Food Technologies of Lai Department of Agronomic Sciences, Bayero University, Kano, Nigeria

<sup>2</sup>CDA Bayero University Kano Department of Animal Sciences – livestock production and range management in Africa dryland, Kano, Nigeria

### Abstract

This work set out to examine the link between Soil pressure, The Forage Deficit, Impact of climate change on agropastoral households, Relation between users of agro-pastoral resources misunderstandings between users and some reasons mentioned, Change in transhumance mode and Adaptation in the Tandjilé. The climate by its variability has affected several agro-pastoral sectors in the Province of Tandjilé. Pastoralism has been in crisis in Tandjilé province. Several (negative) factors contribute to the weakening of animal production and pasture: pressure on pastoral resources, period of flooding, period of low rainfall and the galloping demography. Another solution to the crisis of pastoralism consist to engage in agriculture, alongside livestock breeding. In ten years land pressure was increase to 81.92%. The changes have impacted several agro-pastoral sectors through fodder deficits, declines in agricultural and livestock production, poor distribution of rains and floods. Misunderstanding between the users of agro-pastoral goods often leads to conflicts marked by the deaths of men in the province of Tandjilé.

**Keywords:** *Climate Change, Pressure, Adaptation, agropastoralism, Tandjilé province, ferrick.*

### Introduction

The expansion of pastoralism in the Tandjilé savannah is a recent phenomenon and has gained momentum over the past 30 years.

Faced with a crisis situation, herders reacted by mobility, seeking above all an outlet in this part of Tandjilean savannahs where resources are available and whose seasonal alternation is the opposite of North zone. They manage new relationships in the new environment and have invented another pastoralism: agropastoralism. Adapt to this new context, once installed, breeders are rebuilding the herd, despite the fact that the pastoral system remains fragile: they have to fight with nature caprice, new pathologies in the area, a relatively limited number of animals, the difficulties in relationship with farmers, a precarious land status on the new pastures occupied by agricultural activities and city pressure make most of those pastoralists vulnerable.

### Materials and Methods

Samples were collected from Tandjilé Province Fig.1. (GPS coordinates: 9° 24'N latitude and 16° 18' E longitude). It is characterized by a Sudanese tropical climate with a long dry season (7 months) and a short rainy season (5 months).

Tandjilé has a population of 661 906 inhabitants (INSEED, 2014). This population is estimated in 2018 at 895042 inhabitants (ANADER/CHAD, quoted by Nang-yana 2018), of whom 52.3% are women. The growth rate is 3.5%. However, over 80% of this population lives in rural areas. The density of the population is about 42.09 inhabitants per square kilometre.

The thermal regime is marked by a relatively cold period from December to February (from 11 ° to 22 ° C) and a hot period from March to June (from 39 to 45 ° C).

The sampling of the population investigated was extracted on the basis of the formula of Anderson et al., (2015). Initial sampling was targeted agropastoral settlement or villages with more than 30 years of existence. A settlement not subjected to season flood and of neighbourhood to crop-farmers was selected for the survey. The agropastoralists who had more than 50 cattle has selected for the interview. A comprehensive list of agropastoral herders and crop-farmers that close to one another was make.

$$\text{Anderson's formula: } X = \frac{(Z_{\alpha/2})^2 P(1-P)N}{(Z_{\alpha/2})^2 P(1-P) + (N-1)E^2}$$

X = sample size; N = size of the grand population; P = Proportion (50%); E = Margin of error (5%); 95% confidence interval and  $Z_{\alpha/2} = 1.96$ .



Out a total of 140,366 households, a sample of 196 was interviewed and the interviewees were the head of household. The stratified sampling at two levels was investigated 50% agropastoralists (98); 40% crop-farmers (78) and 10% authorities and heads of agriculture and livestock service (20). The first level involved the agropastoralists village and ferrick, the second concern household.

The survey on impact of climate change (rain fall and temperature) and demographic pressure was conducted to capture agro pastoralist's adaptation capacity for climate change, demographic pressure.

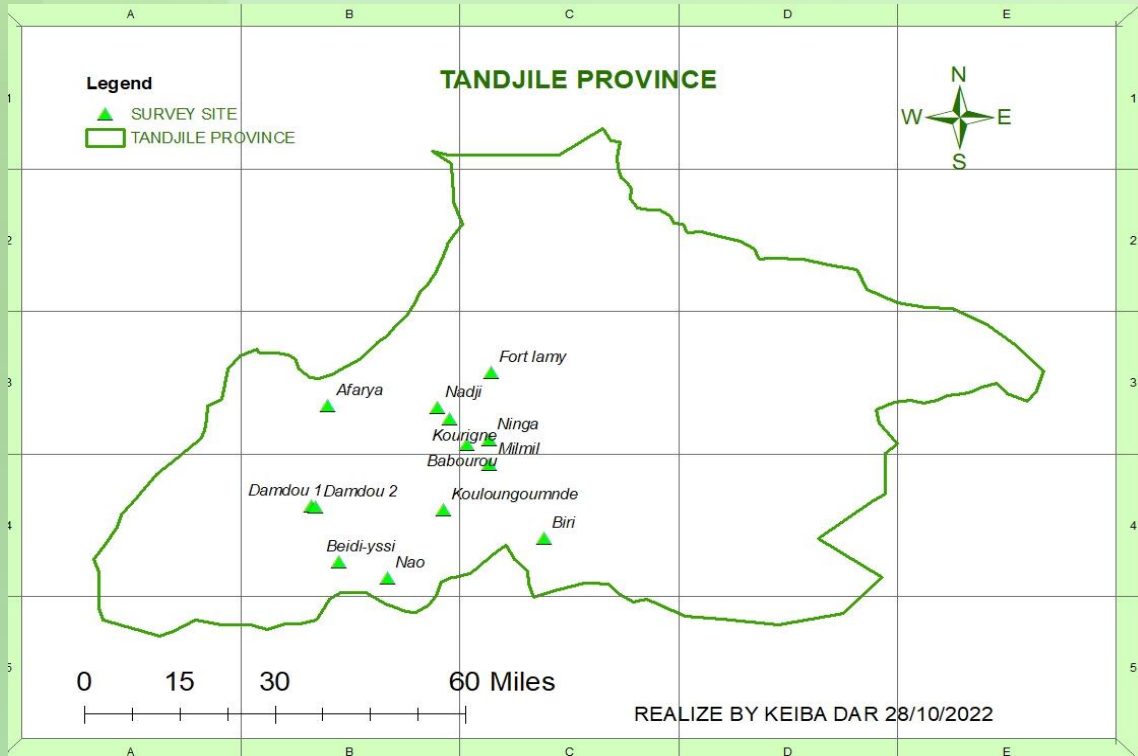


Figure 1. Tandjilé map with Agropastoralist settlement site ( )

### Study Design and Sampling

The field surveys lasted from June to October 10, 2021 in Tandjilé.

Data were collected individually from 196 heads of household ranging in age from 40 to 70 years. Most of the respondents were over 65 years old.

In each ferrick surveyed (the choice of which was based exclusively on their ages), a focus group was set up around a Chief of the Ferrick. This made it possible to carry out 6 focus groups in total of 13 ferrick we visited.

Table 1. Ferricks Names and Number of Sampling (n=196)

Province	Ferricks	Ethnic groups	Sample
Tandjilé-Est	Babourou	Arabe	13
	Fort lamy	Arabe	11
	Kourigne	Peulh	07
	Milmil	Peulh	10
	Nadji	Peulh	29
	Ninga	Peulh	10
	Biri	Arabe	11
Tandjilé-Centre	Beidi-yssi	Peulh	06
	Kouloungoumnde	Arabe	14
	Nao	Arabe	34
Tandjilé-Ouest	Afarya	Arabe	13
	Damdou 1	Arabe	28
	Damdou 2	Arabe	10
<b>Total</b>			<b>196</b>

Source: Based on field survey



## Result

### Soil pressure

According to information received from agro-pastoralists and official services such as the cadastral service of the province of Tandjilé, there were two periods of urban and peri-urban subdivision from 1962 to 2009 and 2009 to 2019. This first phase of extension of living spaces on the East side of the city concerned a distance of 1km from 1962 to 2009; approximately 1 km on the South side and also 900m on the North side. These extensions of residential areas have had an impact on agricultural areas and forced peri-urban agriculture towards open spaces considered as grazing areas.

From 2009 to 2019, the extension of the city on crop area was estimated on the East side reached 1.7km; 1.6m on the South side and 1.5km on the North side.

The west side of the department of Tandjilé East where this work took place is occupied by the Logone River which is also under threat on its borders due to climatic impacts and especially the action of men (earth taking and brick making).

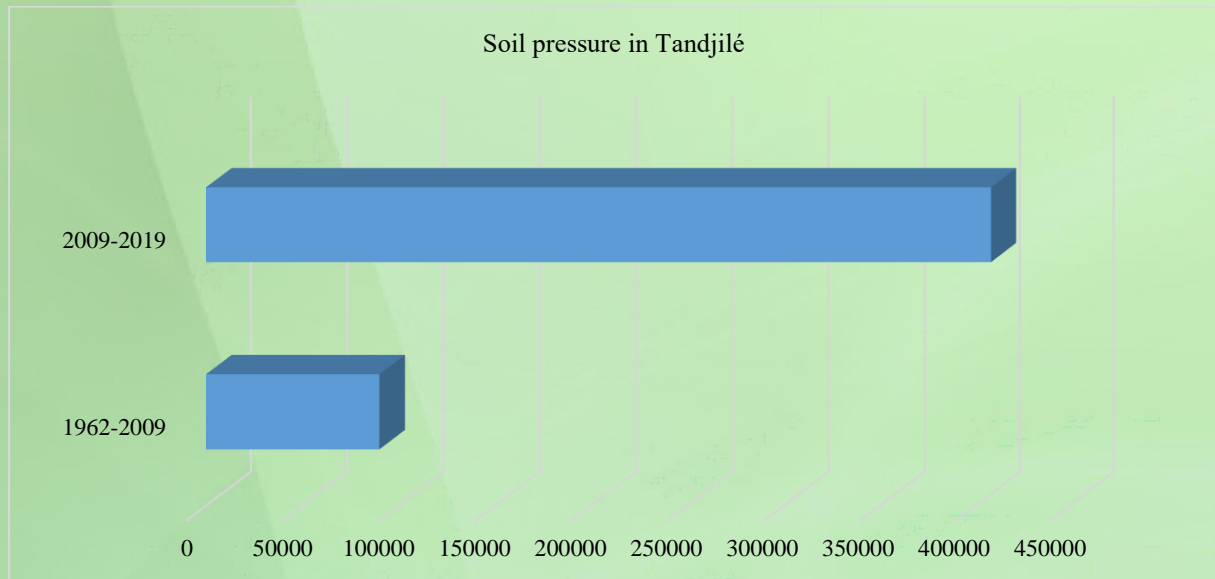


Figure 2. evolution of soil pressure.

From 1962 to 2009 we witnessed a subdivision of 90,000 ha only for residential areas in 47 years.

From 2009 to 2019 we have a subdivision area of 408,000 ha in 10 years.

That is a total of 498,000 ha of residential land. This demographic pressure has played a role in the disappearance of resources and influences on the areas reserved for agriculture and livestock. In 10 years we note an occupancy of 81.92%.

### The Forage Deficit

98% of interviewers observe the forage deficit. Recently in the Tandjilé Province, most of transhumant herders and agropastoralists (88%) have turned to aerial grazing, which is over-exploited during certain periods of the year between the months of February to May due to the low reconstitution of the herbaceous cover. Passage of the bush fire and the late arrival of the rainy season. This overexploitation of aerial pastures strongly affects the regeneration of certain species. *Faidherbia albida*, *Daniella oliveri*, *Zizyphus mucronata*, *Zizyphus mauritiana*, *Adansonia digitata* are highly threatened species during our work in the area.

### Water resources

For majority of agropastoralists surveyed (87%), water resources in the region were abundant. All ferricks are located near a water point. The availability of ponds, rivers and traditional wells, has meant that the projects intervening in pastoralism have only built 3 modern wells for livestock in those 13 ferricks visited.

During the focus group, the agro-pastoralists declared that in the past the ponds and even the traditional wells are perennial and the animals do not need to go down to the river. Currently the wells and the ponds dry up from the month of March. The reasons mentioned were, among others: the silting up of the ponds, but above all the descent of the transhumant with the herd of dromedaries very early in the locality on January.



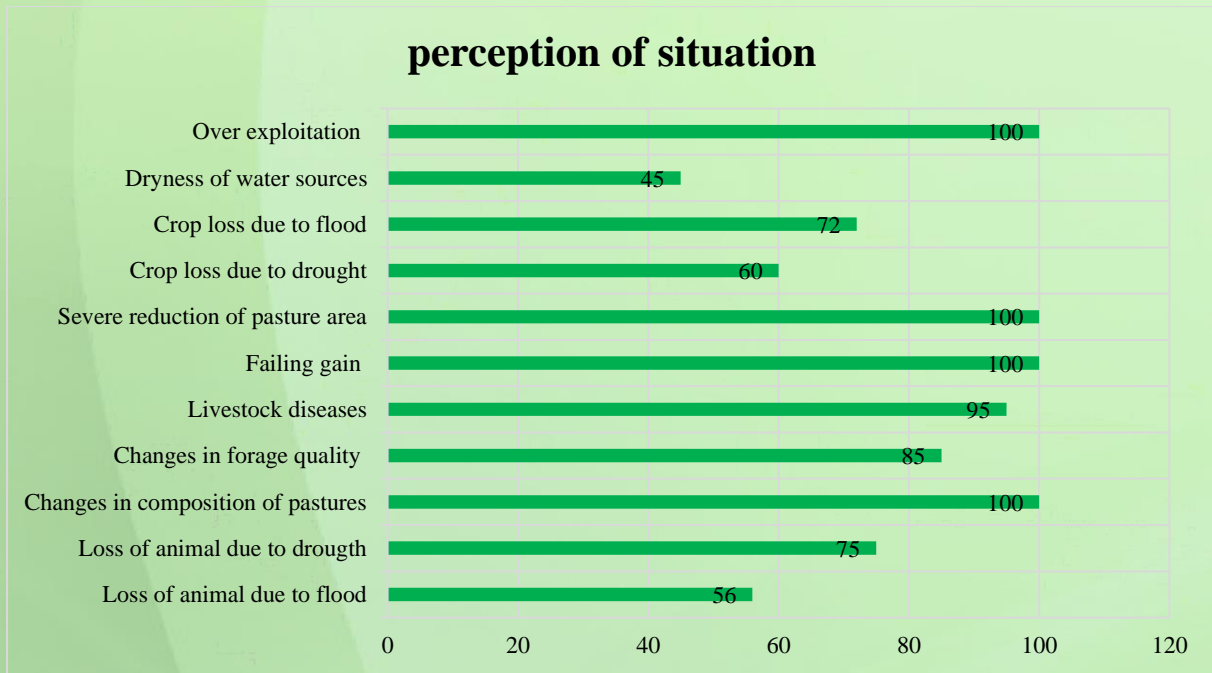


Figure 3. shock situation

#### ***Impact of climate change on agropastoral households***

All the agro-pastoralists interviewed felt that there is a big change in Tandjilé province. The drought of 1984 and the famine of 1985 are still in the minds. "We survived these years by grace of God said the head of Nao ferrick". For all the agro-pastoralists, the events of 1984 and 1985 are the causes of the decline of a large number of pastoralists and agro-pastoralists recognizes the head of another ferrick of Damdou.

The loss of our animals has imposed the work of cultivation on us, but at this level also the yields of the crops are only decreasing.

Climate change has undoubtedly had an impact on incomes. For 86% of agropastoralists, eating habits have changed: milk is only served to children and the rest is intended for sale. 76% of agro-pastoralists eat one meal a day between March-April and the month of July due respectively to insufficient income from the sale of milk caused by forage deficit and mosquitoes.

All of the women (100%) interviewed said they went to the market every day with fresh milk, curd and butter more than years ago, but today very few of them (22%) said, they went to the market every day with fresh, curdled milk and butter; half sell curd and butter and the rest of the women sell fresh milk irregularly.

#### ***Relation between users of agro-pastoral resources in the Tandjilé***

Tandjilé has long remained a conflictive Province between farmers, agro-pastoralists and transhumant herders.

After the murderer conflicts of recent years, which have recorded hundreds of deaths in the cantons of Kolon, Bere, Tchoua, Boulou, Mouroum and Kabalaye in the Tandjilé, a forum for peace and peaceful cohabitation was initiated by civil society and religious leaders in 2020. This forum showed 17 points considered by the participants as the origin of the conflict. On both sides, the participants agreed to respect the principles and peacefully resolve their problem from the representative head of the villages or ferricks.

According to the local NGOs and during the focus-group, the remarks were the same: "The years ago, migration initially was seasonal, with herders spending November to May in the Southern zone before returning north. Over the last decades, the available pastures shrank in the far north, herders have been staying in the southern zone longer and recently, some have chosen to graze their herds there permanently and cultivate around their ferricks. This has triggered increasing disputes over land use with growing populations of sedentary crop farmers in Tandjilé province".

#### ***Misunderstandings between users and some reasons mentioned***

According to the agro-pastoralists (78%) met in the Tandjilé Province, climate change contributes to misunderstandings between users of natural resources. Such misunderstandings often lead to conflicts that are sometimes so violent that they cause deaths on both sides, as in the Tchoua, Kolon and Boulou Cantons over the past five years.

90% of agro-pastoralists had also mentioned that the use of ponds by farmers for irrigating fields in the dry season causes misunderstandings.



The breeder must bypass the trap fields and travel for miles to water his herd. The distance already covered for watering leads to an increase in expenditure linked to walking (maintenance expenditure) which means that animals in free grazing in the dry season, instead of gaining in weight gain, rather fall in weight gain declared the respondents during the focus group.

#### **Agropastoralists and Farmers**

Conflicts between Agropastoralists and farmers in Tandjilé were frequent according to 92% of population interviewed. 44% of agropastoralists said that these conflicts are linked to climate change. 31% felt that conflicts were low in the Tandjilé region unlike other southern regions. 25% of ferric agropastoralists have not experienced conflicts between users of natural resources.

#### **Agropastoralists and transhumants**

More than half of the agropastoralists (65%) underlined that the most frequent conflict between agropastoralists and transhumant people arises around water points and on rangelands. Transhumant herders contribute to degrading the resources strategically defended by agropastoralists around the ferricks. The other conflicts are much more related to cattle rustling. The Peulh agro-pastoralists had felt that they were victims of cattle theft organized by transhumant traders of the Arab ethnic group.

Table 2. Distribution of agropastoralists on the frequency of conflicts around resources between transhumant and agropastoralists.

Cause of conflicts	Pasture	Water	Others
Percentage	55	30	15

The cultivation on pastoral passages, the transformation of pastures into rice fields, the devastation of fields by animals, the monopolization of pastoral water points by groups of market gardeners, the new transhumant people settle, the non-respect of transhumance calendars to facilitate agricultural activities, the anarchic creation of residential areas, management of the passage of breeders, cattle theft, alcoholism, bad trials are the points raised during the Provincial Forum for Peace and Cohabitation peaceful which took place in June 2022 in the Tandjilé.

Those situations create misunderstandings leading to conflicts, sometimes very violent.

The outcome of this framework forum for consultation and peaceful cohabitation a document providing for the possible prevention and management of these conflicts by securing pastoral mobility on the basis of clear and consensual rules of access to resources and respect for transhumance.

This cropland expansion was pointed out by breeders as one of the factor which amplifies the misunderstanding.

#### **Change in transhumance mode**

88% of agropastoralists said they send animals on transhumance only when germination shoots are good or during periods of flooding. In Tandjilé there is a wide variety of crops, but the most dominant are those of rice and flood recession sorghum. Rice is grown in all departments with the exception of a few cantons. However, sorghum is cultivated only in the department of Tandjilé-EST and more precisely in Soumraye, Tchaguine and Ndam cantons, suggested the heads of rural development departments.

According to the agro-pastoralists interviewed, they send the animals to graze during the rainy season, which corresponds to the plowing period in those Cantons. The stay of the animals is linked to the activities in the three cantons which only began to plant sorghums that had receded after the withdrawal of the rainwater.

For the majority of agro-pastoralists, around 30 years ago, the start of transhumance was early. But currently less than 6.02% were sending animals to fallback areas in June. Most of it left late between July and August. The overall return is early from October just after the last rains.

#### **Adaptation**

For agropastoralists interviewed in Tandjilé, each group adapts according to its strategy, its type of livestock farming and the feeding habits of the livestock which imposed the choice of the area on them. The Arabs are found all around the ponds and the river, not far from the urban center and the main axes. They affirmed that in the past, milk was the basis of their food. But, with the decrease in milk production, maize flour consumption as in the form of porridge has become their food habits. Consequently, rice is inaccessible because the prices had increased and making the exchange milk also become difficult.

The majority of Fulani pastors encountered were mainly involved in livestock breeding, even if they also engage in agriculture or small business. Some agropastoralists families still have a large number of cattle; small ruminants and poultry. Most of their herd is entrusted to a family member who continues to raise in a transhumant mode system. Others on the other hand (who can be described as herdsmen) mainly have entrusted animals (businessmen and traders...). The price of cereals increase that is why we plant crops to get cereals for our own consumption. We are convinced and know that livestock rearing cannot be our only source of food.

The most important adaptation practice are seen in figure 4.



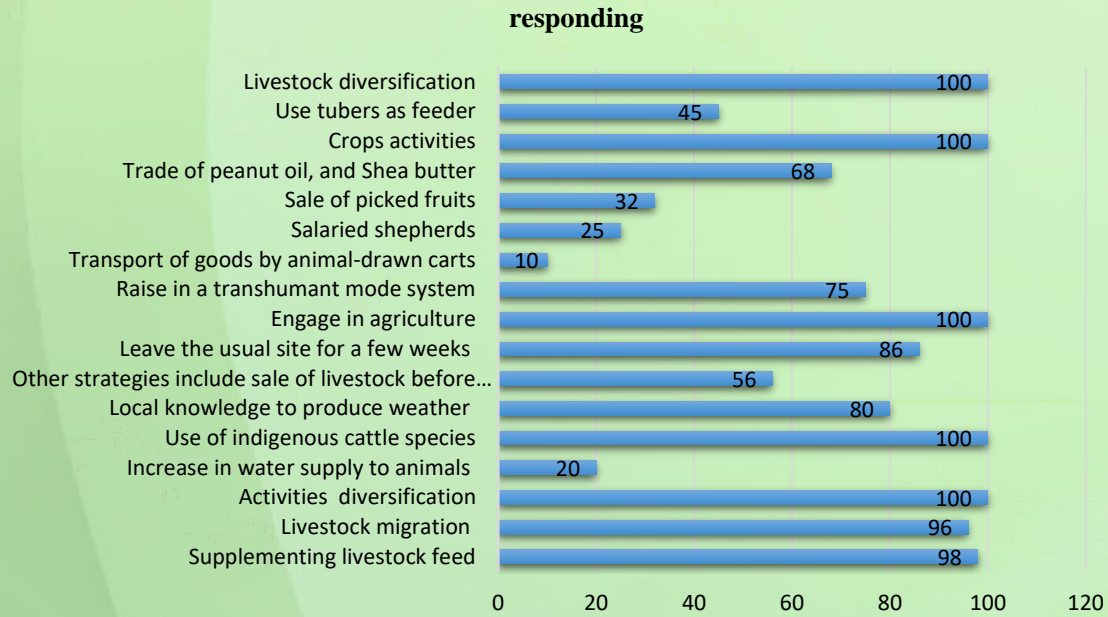


Figure 4. Agropastoralist adaptation strategy

100% of Agropastoralists do mostly activities and species' diversification; and also livestock transhumance but in addition they use also improved varieties of maize around there ferrick.

For some agropastoralists (86%) living in the plains of Tandjilé, they have an idea of the flood periods of their site. Their strategy is to leave the usual site for a few weeks to settle near the roads until the waters recede.

There are various factors undermining the adaptation of families of agropastoralists, even old ones, on the site for more than thirty years. The responses and strategies developed by the latter in the face of climatic influences always revolved around mobility, the development of certain activities such as the transport of goods by animal-drawn carts, young people converted into motorcycle taxi drivers and parents in ferricks have remained salaried shepherds (25%), paid to keep the animals of the political elites and traders of the province. It is a good deal for us without agriculture activities.

During our survey work, the chief of ferrick of Ningua declares in these terms "we lost most of our herds during the droughts of 1984 and the rest of the cattle in the resolution of conflicts and to face insecurities, which you see are the entrusted animals. Even if you have the animals I am ready to raise for you against a salary which is paid monthly at 1000F CFA per head of cattle".

The women meanwhile, in addition to the milk trade, had turned to the sale of picked fruits, the trade of peanut oil, and shea butter.

These agro-pastoralists practice agriculture on the small parking plots around the ferrick which are very profitable during the rainy season. These agropastoralists become good cereal farmers and buy back the females after the sale of the cereals thus produced to reconstitute their herd.

The other populations have a purely agricultural vocation, turning to off-season crops and market gardening. There is also an intense development of fruit growing on land near water points around agropastoralists ferricks.

To recall, for 96 % of agropastoralists, Cattle remains important species according to the agropastoralists, the small ruminants are becoming more and more important because they requiring less water and food and are less vulnerable to warming. For economic reasons corn and millet are the most important crops cultivated around ferrick.

## Discussion

### Soil pressure

The soil pressure in Tandjilé province is reel. There was a land occupation of 90 000 ha from 1961 to 2009 against an occupation of 408 000 ha from 2009 to 2019. Between 2009, to 2019 we assist to the speed expansion of 82.92% of demographic pressure to the land. The results show a real demographic pressure on the soil. Akpan and Ebong, (2021), in Nigeria, revealed that agricultural land has continued to increase and currently averaged at 68.78%, indicating massive land expansion for use in farming. Furthermore, the findings showed that most arable crop outputs increase majorly from land expansion rather than land productivity. This situation cannot assure sustainable agricultural land use for food security in the near future. Besides, the country's agricultural land policies should focus on achieving land productivity and sustainable land-sharing strategies among major land



users. The result show that the speed expansion of land use in Tandjilé province is superior to the result obtained by Akpan and Ebong in Nigeria. The study of Hansen, and Reenberg, (1998), in Burkina has showed rather the fields expansion onto idle bush land.

#### **Forage deficit**

98 % of interviewers observed the forage deficit in Tandjilé province. The deficits sometime are caused by the farmers themselves who burn crop residues such as rice straw preventing the animals of the breeders from grazing in their fields. For Harouna et al., (2020) anthropogenic practices such as the collection of straw, which leads to a reduction in the edaphic stock of seeds, and the extension of crop fields to grazing areas, aggravate this degradation. These practices are the result of population growth and the decline in agricultural production.

Most of transhumant herders and agropastoralists (88%) in Tandjilé Province have turned to aerial grazing, which is over-exploited during certain periods of the year between the months of February to May due to the low reconstitution of the herbaceous cover. Passage of the bush fire and the late arrival of the rainy season. This overexploitation of aerial pastures strongly affects the regeneration of certain species. *Faidherbia albida*, *Daniella oliveri*, *Zizyphus mucronata*, *Zizyphus mauritiana*, *Adansonia digitata* are highly threatened species during our work in the area. Our results confirm the study conducted by Dione et al. (2020) in Senegal which showed that 82.14% of the woody species inventoried are considered fodder. These include *Adansonia digitata*, *Cordyla pinnata*, *Faidherbia albida*, *Ficus capensis*, *Zizyphus mauritiana* and *Sterculia setigera*. This observation shows the importance of the specific richness of the fields where all these species are found. Other respondents use these woody fodder for human food, pharmacopoeia, crafts, lumber, firewood, etc. This shows a strong pressure on these resources. According to Sarr et al. (2018), trees are the main source of green aerial fodder in the Sahel in all seasons and are found not only in agroforestry systems, but also in natural pastures. In pastoral areas, fodder supply during the dry season or in years of low rainfall is difficult with annual plants, and in these cases woody pasture becomes an important element (Niang, 2009).

Woody fodder species are much more exploited in the dry season when natural food resources become critical. This shows the importance of woody species in animal feed in the dry season. Our survey results confirm those of many authors who note the maximum use of aerial fodder by livestock during the dry season (Dione et al. 2020; Bakaye, 2014; Bechir and Kaboré-Zoungrana, 2012), the dry season is the period during which woody plants are more exploited by agropastoralists. To access the different parts of the trees, breeders often practice cutting or pruning (Bakhom, 2020). Diallo, (2019) in Mali confirm that the high demand for woody fodder crops leads to overexploitation of the most demanded. The consequence is the scarcity of these species in the harvesting areas. The results of the survey reveal the existence of overexploitation of woody fodder species which are consequently less and less abundant in the area. The overexploitation of species leads to the rarity or even the total disappearance of the species in the area.

#### **Relation between users of agro-pastoral resources in the Tandjilé**

Conflicts between Agropastoralists and farmers in Tandjilé were frequent according to 92% of population interviewed. Tandjilé has long remained a conflictive Province between farmers, agro-pastoralists and transhumant herders. This murderer conflicts of recent years, have recorded hundreds of deaths. However in Nigeria in 2016, ICG have given an alarming figure of 2500 deaths. These conflicts are, by every measure, complex and multidimensional. Formulating appropriate responses requires a clear diagnosis of their root causes, evolution, impacts and implications.

Historically, relations between herders and sedentary farming communities have been harmonious. By and large, they lived in a peaceful, symbiotic relationship: herders' cattle would fertilize the farmers' land in exchange for grazing rights. But tensions have grown over the past decade, with increasingly violent flare-ups spreading throughout central and southern states in Nigeria.

Migration initially was seasonal, but over the last decades, with available, pastures in southern part of the country, herders staying in the southern longer. This last 30rd years, some have chosen to graze their herds there permanently and cultivate areas around their Ferricks. This situation is general and was reported also in Nigeria by ICG, 2017. For ICG, Among the principal causes and aggravating factors behind this escalating conflict are climatic changes (frequent droughts and desertification); population growth (loss of northern grazing lands to the expansion of human settlements); technological and economic changes (new livestock and farming practices); crime (rural banditry and cattle rustling); political and ethnic strife (intensified by the spread of illicit firearms); and cultural changes (the collapse of traditional conflict management mechanisms). A dysfunctional legal regime that allows crime to go unpunished has encouraged both farmers and pastoralists to take matters into their own hands reported the ICG in their paper published in 2017.

#### **Adaptation Strategies**

Agropastoralists in Tandjilé have adopted several strategies to deal with climate change (fig. 9). Coulibaly et al. (2022) note that agropastoralists have implemented strategies to adapt to climate change by making their activities less sensitive and more resilient to climate change, the most widespread of which are: transhumance, the recomposition of the herd, purchase of complementary feed, destocking, use of crop residues, storage of dry grass, compliance with vaccination schedules, diversification of sources of income (trade and agriculture), adoption new farming techniques (zai, ridge, half-moon) and the use of improved breeds and seeds. These strategies are almost



similar to those implemented by agropastoralists in the province of Tandjilé. Overall, the adaptation results obtained in Tandjilé confirm those of other authors (Coulibaly (2021) in Mali, Ouédraogo (2010) in Burkina cited by Coulibaly (2022).), who mention that mobility, in particular transhumance, constitutes one of the adaptation strategies most practiced by pastoralists to cope with climate change. Nowadays, transhumance is still practiced, but it differs a little from that of before because the departures are early, the returns late and the distances traveled longer and longer. Zaza, *et al.* (2022) notes that mobility continues to characterize livestock systems in the Ras El Ma region in connection on the one hand with the degradation of rangelands and on the other hand with the new rules of access to food resources and fodder, in particular paying.

Other coping strategies existing in fig. 9 such as the sale of milk, sale of fruit, etc. have been noted by Sarr, (2019) in Mauritania and Dangar, (2018) in Chad. These two authors are unanimous on the contribution of agro-pastoral by-products as a source of household income to increase the resilience of agro-pastoralists in the face of climatic hazards. Agropastoralists in Tandjilé have adopted several strategies to deal with climate change (fig. 9). Zaza, *et al.* (2022), note that mobility continues to characterize livestock systems in the Ras El Ma region in connection on the one hand with the degradation of rangelands and on the other hand with the new rules of access to food resources and fodder, in particular paying. Other coping strategies existing in fig. 9 such as the sale of milk, sale of fruit, etc. have been noted by Sarr, (2019) in Mauritania and Dangar, (2018) in Chad. These two authors are unanimous on the contribution of agro-pastoral by-products as a source of household income to increase the resilience of agro-pastoralists in the face of climatic hazards.

#### ***Change in transhumance mode***

88% of agropastoralists said they send animals on transhumance only when germination shoots are good or during periods of flooding. In Tandjilé there is a wide variety of crops, but the most dominant are those of rice and flood recession sorghum. Rice is grown in all departments with the exception of a few cantons. However, sorghum is cultivated only in the department of Tandjilé-EST and more precisely in Soumraye, Tchaguine and Ndam cantons, suggested the heads of rural development departments. Pour Bakuom (2020), les éleveurs, pour faire paître et abreuver le bétail en saison sèche, sont obligés de pratiquer la transhumance.

According to the agro-pastoralists interviewed, they send the animals to graze during the rainy season, which corresponds to the plowing period in those Cantons. The stay of the animals is linked to the activities in the three cantons which only plant sorghums after the end of rainy season. When land productivity declines due to climate change, farmers often migrate to urban areas (IPCC, 2014). This last migration strategy is also used during surveys carried out among herders in Tandjilé. For the majority of agro-pastoralists, around 30 years ago, the start of transhumance was early. But currently less than 6.02% were sending animals to fallback areas in June. Most of it left late between July and August. The overall return is early from October just after the last rains. For Benkhe *et al.* (1993) the organized mobility of people and herds essential to the sustainable development of these ecosystems through pastoralism is a basic strategy for adapting to the strong spatiotemporal variability of pastoral resources.

#### ***Impact of climate change on agropastoral households***

The impact of climate change affected negatively on agropastoralism households. All the agro-pastoralists interviewed felt that there is a big change in Tandjilé province. The drought of 1984 and the famine of 1985 are still in the minds. "We survived these years by grace of God said the head of Nao ferrick". For all the agro-pastoralists, the events of 1984 and 1985 are the causes of the decline of a large number of pastoralists and agro-pastoralists recognizes the head of another ferrick of Damdou.

The loss of our animals has imposed the work of cultivation on us, but at this level also the yields of the crops are only decreasing.

Climate change has undoubtedly had an impact on incomes. For 86% of agropastoralists, eating habits have changed: milk is only served to children and the rest is intended for sale. 76% of agro-pastoralists eat one meal a day between March-April and the month of July due respectively to insufficient income from the sale of milk caused by forage deficit and mosquitoes.

All of the women (100%) interviewed said they went to the market every day with fresh milk, curd and butter more than years ago, but today very few of them (22%) said, they went to the market every day with fresh, curdled milk and butter; half sell curd and butter and the rest of the women sell fresh milk irregularly.

Yabrir *et al.* (2015), therefore reveals that sedentarization remains a large-scale option adopted by the elevations to deal with resilience.

#### **Conclusion**

This study highlights and examine the link between Soil pressure, The Forage Deficit, Impact of climate change on agropastoral households, Relation between users of agro-pastoral resources misunderstandings between users and some reasons mentioned, Change in transhumance mode and Adaptation in the Tandjilé. The analysis of responses indicated that there is problem in the Tandjilé province. Agropastoralists have reported an increased frequency of land pressure, forage deficit and misunderstanding. Given that agro-pastoral systems in this area are rain-fed, production have been falling, affecting the livelihoods of the agropastoralists negatively. Income sources and food supply systems are already compromised by climate change and environmental degradation.





Transhumants in Tandjilé are still considered as strangers and discriminated upon by crop-farmers as far as land is concerned.

Adaptation to climate change needs a well-structured resource base system and collaboration amongst actors. It is recommended that farmers and grazers, local administrative and traditional authorities should work in a participatory way. This will help them to co-develop locally appropriate climate-sensitive methods, build resilience and improve on food production.

## Reference

- Akpan, S. B. and Ebong, V. O. (2021). Agricultural land use and population growth in Nigeria. The need for synergy for a sustainable agricultural production. *J. Agribus. Rural Dev.*, 3(61), 261–270. <http://dx.doi.org/10.17306/J.JARD.2021.01424>.
- Bakaye, S. (2014). Potentiel des ligneux fourragers du terroir de Sokouraba (Burkina Faso). Mémoire de fin de cycle, Université Polytechnique de Bobo-Dioulasso, Burkina Faso, p. 89.
- Bakhom A., Sarr O., Ngom D., Diatta S., Ickowicz A. (2020). Woody fodder uses and pastoral practices in the rural community of Tessekere, Ferlo, Northern Senegal. *Rev. Elev. Med.Vet. Pays Trop.*, 73 (3): 191-198, doi: 10.19182/remvt.31890
- Bechir, A. and Kabore-Zoungrana, C. (2012). Fourrages ligneux des savanes (Tchad). *Journal of Experimental Biology*, 8(1): 35-46. DOI : <http://dx.doi.org/10.4000/books.irdeditions.30688>.
- Behnke R.H., Scoones I., Kerven C. (1993). – Range Ecology at Disequilibrium. ODI, IIED, London 248 p.
- Coulibaly M., Samake S., N'diaye B., Malle M., Timbely D., Coulibaly M., Cisse D., & Atta S. (2022). Stratégies D'adaptation Des Agropasteurs Aux Changements climatiques Dans La Commune Rurale De Diema (Mali) *European Scientific Journal*, ESJ, 18 (8), 21.
- Coulibaly M., N'diaye B., Coulibaly M., Sarra M., Samake S., Malle M., Sanoussi A., Cisse D., Sogodogo D., Daou M. Dabo H., Korbo A. et Timbely D. (2021b). Perceptions des agro-pasteurs de la commune rurale de Diéma dans la région de Kayes (Mali) face au changement climatique. *Les Cahiers de l'Économie Rurale* n° 28, 25-36.
- Dangar M. (2018). Impacts des changements climatiques et stratégies d'adaptation des agropasteurs de la Sous-préfecture de Moussoro dans la région du Bahr El-Gazal au Tchad. Mémoire de master professionnel en pastoralisme, Centre régional AGRHYMET/CILSS, Niamey Niger, 84 p.
- DIALLO, H., DIALLO, S. and MAIGA, Y. (2019). Etude de la filière fourrages ligneux dans le district de Bamako [www.globalscientificjournal.com](http://www.globalscientificjournal.com)
- Dione, A., SARR, O., NGOM S., DIALLO, A., and GUISSSE, A. (2020). Perceptions pastorales des ligneux fourragers par les agropasteurs et les transhumants au centre du Sénégal. *Int. J. Biol. Chem. Sci.* 14(3): 772-787,
- I.C.G. (2017). Crisis Group Africa Report N°252, 19 September 2017 Herders against Farmers: Nigeria's Expanding Deadly Conflict 38 p.
- GIEC, (2014). Changements climatiques 2014 : Rapport de synthèse. Contribution des Groupes de travail I, II et III au cinquième Rapport d'évaluation du Groupe d'experts intergouvernemental sur l'évolution du climat. Genève, GIEC, 161 p. [https://www.ipcc.ch/site/assets/uploads/2018/02/SYR\\_AR5\\_FINAL\\_full\\_fr.pdf](https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full_fr.pdf).
- Hansen, T. S. and Reenberg, A. (1998). Approaching Local Limits to Field Expansion - Land Use Pattern Dynamics in Semi-arid Burkina Faso.
- Harouna, A., Ibrahim, A. K., Boureima K. H. and Moussa, T. Z. (2020). Perception du changement climatique des éleveurs et stratégies d'adaptation aux contraintes environnementales : cas de la commune de Filingué au Niger. 10 P. *Revue d'élevage et de médecine vétérinaire des pays tropicaux*, 2020, 73 (2) : 81-90
- Ouedraogo, D. (2010). Perception et adaptation des éleveurs pasteurs au changement climatique en zones sahélienne, nord et sud soudaniennes du Burkina Faso. Mémoire de DEA. Université Polytechnique de Bobo-Dioulasso-Burkina-Faso, 55 p.
- Sarr, F. (2019). Vulnérabilité et stratégies d'adaptation des agropasteurs face au changement climatique : Cas de la commune de Gouraye, région du Guidimakha (Mauritanie). Mémoire de master professionnel en pastoralisme, Centre régional AGRHYMET/CILSS, Niamey Niger, 84p
- Sarr, O., Diatta, S., Gueye, M., Ndiaye, P.M., Guisse, A., Akpo, L. E. (2018): Importance des ligneux fourragers dans un système agropastoral au Sénégal (Afrique de l'ouest), in *Revue Méd. Vét.*, 2013, 164, 1. 2-8.
- Yabrir B., Laoun A., Chenouf, N.S. and Mati, A. (2015). Caractéristiques des élevages ovins de la steppe centrale de l'Algérie en relation avec l'aridité du milieu : cas de la wilaya de Djelfa. *Livestock research for rural development*, 27. <http://www.lrrd.org/lrrd27/10/yabr27207.html>
- Zaza, B., Sophie, B., Hellal, B., Meriem, B., Marie-Louise, P., and Camille, N. (2022). Les stratégies d'adaptation des agro-éleveurs de la steppe algérienne face au changement climatique (cas de la région de Ras El Ma).

