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Local Perception of The Effects of Climate Uncertainty on Cattle Farming in Burkina Faso: A Case Study of The Mouhoun Province

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Abstract
Climate change represents a threat to pastoralists in the Mouhoun Province, whose main source of income is the exploitation of natural and animal resources. The problem of this study is based on the good perception of breeders which was necessary for them to adapt to the climatic crises that have already occurred. The objective of this study is to analyze the perception of the effects of climate uncertainty on ruminant breeding in the Mouhoun province. For this purpose, 286 breeders, including agro-breeders and agro-breeders, or 22 breeders per village, were surveyed. In addition, a focus group was organized in each village, for a total of thirteen (13). Phinks software was used to process the individual survey data. The results indicate a deterioration in the forage supply of natural rangelands (100%), an increase in the mobility of animals (69.31%), an increase in morbidity (69.3%) and a drop in the frequency of twin births (56.0%). In summary, it appears that the population has a good perception of the effects of the local climate on animals and forage resources. Furthermore, although it is difficult to integrate research evidence into development policies and practices, the results of this research could guide policy decision-making. This study leads to the conclusion that the changes perceived by breeders are relevant for the development of adaptation strategies to climate change.

Key words: Burkina Faso, climate change, herders, local perception, ruminants.

1.Introduction

The climate is generally described through the evolution of various variables such as temperature, rainfall, radiation, air humidity, and wind speed. It is manifested by severe climatic events, known as extreme events, such as droughts and heatwaves—events whose intensity is rare compared to the time of year or the location where they occur. Since these events are difficult to predict, they are referred to as climatic hazards. Climate change is likely to alter the seasonality of forage production, and livestock systems are highly sensitive to these changes [1, p. 18], which can lead to an imbalance between forage supply and demand. This represents a major constraint on the socioeconomic development of rural populations [2]. It is becoming increasingly concerning for the sustainability of rural households in sub-Saharan Africa, where communities heavily rely on the exploitation of natural resources. According to the Intergovernmental Panel on Climate Change (IPCC)... [2], the consequences of climate change on the economies of African countries are already significant, and the situation could become even more disastrous given the predictions of increased frequency of extreme events with global warming. In this context, sub-Saharan Africa, where agriculture and livestock are the primary sources of employment and income for the majority of the population, emerges as the region most exposed to climate change [3].

In Burkina Faso, livestock is a key sector of the economy and is practiced by more than 80% of the population. It contributes approximately 15% to the national GDP and 35% to agricultural GDP [4, p. 1]. The livestock management practices are based on mobility, which enhances the complementarity of ecological spaces. Over 80% of livestock-keeping households in Burkina Faso rely on natural pastures to

ensure their livestock's nutrition [5], However, the advance of agricultural frontiers, combined with the effects of climate change, is gradually reducing grazing areas, as well as the availability of forage and water resources.

The present study aims to analyze the perception of the effects of climate uncertainty on ruminant livestock farming in the Mouhoun province. This will help to understand the extent to which farmers have a good perception of these effects, which can guide decision-makers, programs, and projects operating in this field. Consequently, the study will be beneficial for agents and technicians working in this area. The hypothesis indicates that farmers have a good perception of the effects of climate uncertainty on ruminant livestock farming in the Mouhoun province.

2. Methodology

In the context of this study, the methodological approach was based on selecting the study area, conducting a literature review, choosing data collection tools, and employing processing techniques. The geographical approach involves starting from the reality of the field to define spatial organization models.

2.1. Presentation of The Study Area

The Mouhoun Province, located in the northwest of Burkina Faso between longitudes 2° 26' and 4° 38' West, and latitudes 11° 15' and 13° 44' North [7, p. 10], It is bordered to the east by the Sanguié Province, to the north by the Nayala Province, to the northwest by the Kossi Province, to the west by the Banwa and Houet Provinces, and to the south by the Balé Province. Photo 1 shows a pasture near the commune of Ouarkoye, while Photo [1] depicts cattle drinking water in the commune of Ouarkoye.

Photo 1: Cattle grazing and watering area near the commune of Ouarkoye.

Source : Zan A. (2022)

The province has a climate characteristic of the Sudanese-Sahelian zone, with three variations: to the north, the southern Sahelian sector with an average annual rainfall of 500 to 700 mm; in the center, the Sudanese sector with 700 to 900 mm of annual precipitation; and to the south, the southern Sudanese sector with 1,000 to 1,400 mm of rain per year [7, p. 24]. Figure [1] represents the ombrothermic diagram of the Mouhoun Province. Temperatures vary, with a maximum average of 40°C during the hot period (March to May) and a minimum average of 24°C during the cold period (December to February) [8].

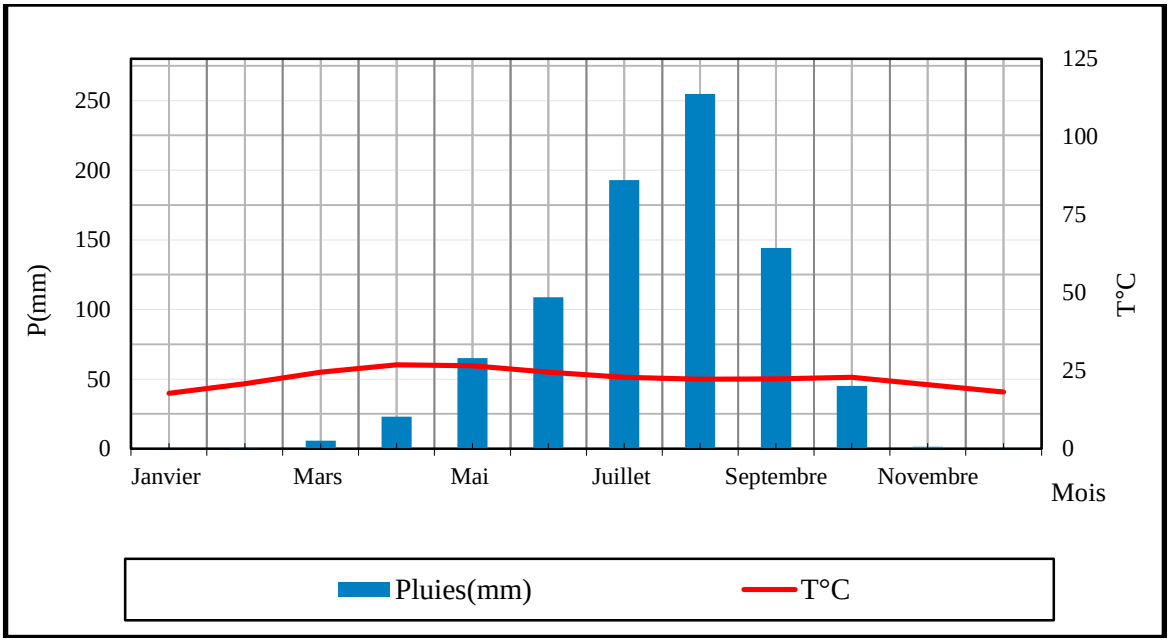

Figure 1: Ombrothermic Diagram of the Mouhoun Province.

Livestock farming, an important economic activity in this province, is practiced extensively alongside agriculture by most households, particularly those from pastoral Peulh communities. The livestock consists of cattle, sheep, goats, and donkeys, with large herds entrusted to Peulh herders [7, p. 15]. This traditional livestock farming plays a crucial role in the local economy as a form of savings for households. However, the province faces significant challenges, particularly due to climate change and variability. Figure [2] shows the study area and the surveyed sites.

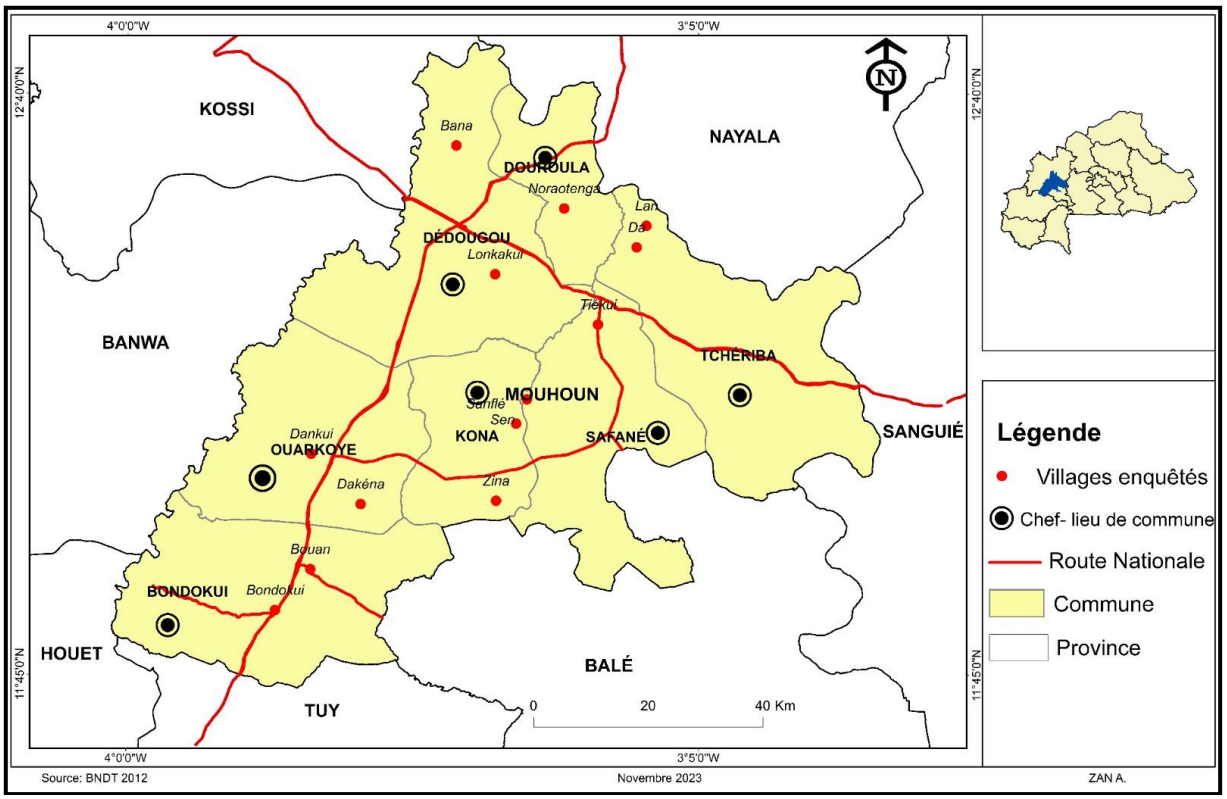

Figure 2: Map of the study area and surveyed sites.

2.2. Data Collection And Analysis

In the context of this study, information was collected from thirteen (13) villages in the province. Based on criteria such as accessibility and vulnerability, established with local technicians, the villages of Tiékui and Sin were selected in the commune of Safané; the villages of Lan and Dah in the commune of Tchériba; the

villages of Fakena and Dankuy in the commune of Ouarkoye; the village of Noraogtenga in the commune of Douroula; the villages of Bondokuy and Bouan in the commune of Bondokuy-Rural; and finally, the villages of Zina and Sanflé in the commune of Kona. Additionally, the province is traversed by the isohyets of 700 and 800 mm, which is one of the reasons for choosing this study area.

Two villages were identified in each commune, except for the commune of Douroula, where only one village was selected for the survey due to accessibility issues related to insecurity (presence of unidentified armed groups). The respondents are aged 50 and above, which allows us to gather essential information regarding climate change (CC), the evolution of pastoral resources, and ruminant livestock farming in the study area. The villages for the survey were chosen based on the following criteria: geographical location, accessibility of the locality (security-related aspects), and representativeness in terms of the desired typology (transhumant, sedentary, and nomadic). A total of 286 livestock farmers, including agro-pastoralists and agro-farmers, were interviewed. Additionally, a focus group was conducted in each village, totaling thirteen (13) focus groups. The Phinks software was used for processing the data from individual surveys and focus groups. Photo [2] illustrates the market in Sin in the commune of Safané.

Photo 2: Market in Sin in the commune of Safané.

Source : Zan A. (2022)

2.3. Theory of Perception

Perception is structured by the symbolic. It is woven by signifiers, and the dynamics of the psyche are nothing other than the emotional relationship to things. According to the conceptual framework emphasized by Jean-Pierre Cléro, perception has a fictional structure [9, p. 438]. Although often overlooked, perceptual construction plays a significant role in how we socially construct our reality. Perception is a form of representation, but it is deeply influenced by emotions [9, p. 434]. It is the ability to orient one's actions and understand one's environment based on sensory information, even though there are always multiple ways to perceive something. For instance, individuals from distinct cultures can interpret identical visual stimuli differently. Malinowski, in 1929, observed that the Trobriand Islanders saw children as resembling their fathers, in contrast to his own observation where he found them more similar to their mothers. Ultimately, each of the perceptual communities mentioned earlier gives rise to different perceptual patterns. These patterns are neither purely individual or idiosyncratic, nor universally human; rather, they result from "perceptual socialization."[10].

4. Results

The results of the study are presented at three levels: the perception of cattle farmers regarding the effects of the reduction of pastures, their perception of the effects related to the mobility of animals, and their perception of the effects related to animal health.

4.1. Local Perception Of Cattle Farmers Regarding The Effects Of Climate Change On The Reduction Of Pastures

The availability of forage is primarily threatened by the presence of invasive species such as *Andropogon pseudapricus*. This situation increases tensions between farmers and livestock herders, and even among herders, while weakening the animals' health. Additionally, 86.7% of farmers assert that the productivity of grazing areas has decreased. However, for [12], The evolution of forage areas has not experienced significant growth. The author estimated that the area of natural forage is 15,545.7 ha, peaking in 2011 at 19,365 ha. Among the respondents, 83.3% observed an increase in the invasion of grazing lands. This situation is attributed to the combined effects of urbanization and climate change, leading to increased conflicts between farmers and livestock herders. A total of 100% of the surveyed cattle farmers reported a degradation of the forage supply from natural pastures.

4.2. Local Perception Of Cattle Farmers Regarding The Effects Of Climate Change Related To Animal Mobility

The daily mobility of herds on a grazing circuit, as well as seasonal regional or even cross-border mobility, are livestock management practices aimed at optimizing selective grazing for cattle. The management of animals follows an extensive approach based on their mobility in search of natural pastures and water [11, p. 186]. This mobility pertains to all types of livestock farming: pastoral, agro-pastoral, and sedentary. It has also proven to be an effective response to reduce the risks faced by herders and their livestock during crises such as droughts, epizootics, and civil insecurity. Selective grazing allows cattle to benefit from forage resources that vary in quantity and quality from one location to another and throughout the seasons. In the Mouhoun province, the mobility of animals has increased by 66.4%, according to farmers' perceptions, highlighting the primary role of pastoral mobility in optimizing selective grazing.

Farmers are often compelled to sell their animals to meet their basic needs. Only 12.6% of respondents noted a decrease in their mobility, although this mobility enables the livestock to exploit pastures rationally and sustainably while benefiting from the complementarity of areas with different characteristics. This helps herders and their herds mitigate the effects of climate variability, such as droughts that impact pasture carrying capacity. Additionally, 13.3% indicated that mobility has not changed.

Obstacles to pastoral mobility stem from various sources: those related to land use dynamics, changes in rural land tenure and access rights to water points, and finally, security-related challenges. The latter factor increases animal mobility not only in search of pastures but also in quest of safety. Herders are becoming increasingly mobile due to attacks, cattle theft, and killings by unidentified armed groups. Furthermore, 55 percent (55%) of the transhumant herders who participated in the survey reported that their departure month has largely been delayed from year to year to adapt to the availability of pastures. Additionally, 44 percent (45%) of the respondents stated that their arrival month has also been postponed.

4.3. Local Perception Of Cattle Farmers Regarding The Effects Of Climate Change On Animal Health

The analysis of animal health in the study area revealed a concerning increase in both diagnosed and undiagnosed diseases. It was found that few farmers use modern dewormers and vaccines. Survey results indicate that 70.3% of farmers report an increase in morbidity, while only 13% observe no change. This strong perception of rising illnesses is associated with conditions such as pasteurellosis and bovine plague. This situation has led to a high mortality rate among animals, highlighting the urgent need to improve veterinary care practices and raise awareness among farmers about the importance of vaccination. The combination of a lack of knowledge regarding proper care and the resurgence of diseases presents a major challenge for animal health in this region.

5.Discussion

Climate change (CC) has had detrimental effects on ruminant livestock farming in the Mouhoun Province. In fact, selon [12], highly sought-after species are becoming increasingly rare in natural pastures due to the expansion of fields (43%), reduced rainfall (29%), the proliferation of invasive species (15%), and demographic pressure (13%). The spread of invasive species, particularly *Mesosphaerum suaveolens* and *Chromolaena odorata*, is also a significant concern. Similarly, the conclusions from [13], the search for pastures (51.2%), water for livestock (39%), and salt licks (4.3%) are the main reasons for practicing

transhumance in Burkina Faso, particularly in Mouhoun. This strong perception regarding the search for grazing land clearly illustrates the decrease in locally available forage, aligning with our findings, which indicated that 86.7% of respondents reported a reduction in pastures. Furthermore, according to the same author, indicators of pasture degradation are constantly rising, with 80% of surveyed individuals noting this trend, which corresponds with the conclusions of various other authors [14, 15], including our own. In contrast, the analysis of land use dynamics in the surveyed farms reveals a stability in forested areas and an increase in improved pastures, according to the results of [14]. This improvement primarily stems from the seeding and partitioning of areas that were previously natural pastures into enclosures.

However, it is worth noting that the vast majority (84%) of transhumant herders who reported changing their routes did not indicate any change in their travel time[12, pp. 6-17]. For [13], regarding livestock mobility, there are four types of constraints, including: insufficient knowledge of regulations related to transhumance, lack of information about administrative documents related to transhumance, exacerbation of conflicts between herders and other stakeholders, and access to livestock routes and various pastoral resources.

Regarding animal health, 70.3% reported an increase in morbidity, while 13% felt there had been no change in animal health. According to[14], climate change has significant effects on food resources. It leads to a chronic forage deficit, a reduction in the most sought-after species, and a doubling of well depths. Regarding animal resources, there is a decrease in lactation duration, a decline in reproductive productivity, and an increased mortality rate, as reported by 100% of the respondents.

6.Conclusion

The results of this study showed that farmers in the Mouhoun Province are aware of climate change and its effects. However, these perceptions deserve to be compared with meteorological data. Farmers perceive climate change through reduced rainfall, rising temperatures, and increased wind intensity. These climatic hazards have a negative impact on the biophysical environment, affecting forage resources and animal health. Local populations possess traditional knowledge that enables them to identify not only the beginning and end of the rainy season but also to assess whether the season will be favorable or unfavorable. Indicators of the start of the rainy season include the direction of the West-East wind and the leafing of *Lannea microcarpa*. Indicators of the end of the season include the flowering of *Balanites aegyptiaca* and the appearance of butterflies. Analyzing these constraints allows for the formulation of recommendations regarding training for stakeholders in the livestock sector, improving pastoral land management, securing these developments, enhancing the transhumance environment, and more.

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