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Agriculture in the Northwest Region of Cameroon: The Impact of Farmer-Grazier Conflicts in Nkambe Central Subdivision, Donga-Mantung Division

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Abstract

Background

Climate change and declining soil fertility have caused farmers and pastoralists in Nkambe Central Subdivision to switch to shifting cultivation and nomadism, respectively, leading to farmer-grazier conflict. The development of agriculture is significantly impacted by the recurrence of these conflicts in Nkambe Central Subdivision. The study examines the impact of farmer-grazier conflict on agriculture in Nkambe Central Subdivision.

Methods

A quantitative research design was adopted. Primary and secondary data sources were used. Using a multi-stage sampling technique, structured questionnaires were administered to 150 participants. Descriptive statistics were used for data analysis, and the results were presented in charts and tables.

Results

The findings show a lack of clear boundaries between farm and pasture areas, 60.7% agreed, conflicting administrative decisions 64% agreed; stray cattle and teenage herdsmen, 96% strongly agreed, increase in the number of people and cattle 98.7% strongly agreed, pressure on land resources 89.3% agreed. Frequent barbarism between farmers and graziers 66.7% agreed to be cause of farmer-grazier conflict. Findings on the effects of farmer-grazier conflicts revealed a decrease in farm productivity 57.3%, increase in poverty 64.7%, social insecurity 58%, inadequate supply of food 64.7%, disruption in children's education 58%, reduction in family healthcare 66%, decrease in family income 68.7%, high food prices 61.3%, and an impact on rural development projects 60.7% agreed. Results on mitigation measures revealed that 94% of respondents strongly agreed with the use of a dialogue platform. Most participants, 61.3%, 94% and 66.7% agreed with the use of administrative authorities, mapping farm and grazing lands and facilitation of land title procedures, respectively.

Conclusions

There is a need to put in place a regulatory mechanism in the Donga-Mantung Division in general and the Nkambe Central Subdivision in particular because the recurrence of farmer-grazier conflict has had a devastating effect on local and agricultural development.
Keywords: Agriculture, Conflict, Farmer-Grazier, Impact, Nkambe Central Subdivision

Introduction

According to the United Nations General Assembly (2022), grazing occupies more than half of the planet's land area, with Asia making up 36% and Africa 30% of this amount (Gregorini et al., 2022). Reid et al. (2014) advanced that 91% of grasslands and rangelands worldwide are unfenced, have few borders, and are used for just a small amount of crop cultivation. With a combination of more extensive grazing and farmed land, the residual grass and rangelands include 13% of North America, 10% of Australia and New Zealand, 8% of South America, and 3% of Europe (Gregorini et al., 2022), which are privately owned and utilized. An estimated 25% to 69% of the Earth's surface is made up of grasslands (Milazzo et al., 2023), where grazing takes place. Additionally, the drylands and migratory herds are directly linked to it (Jenet et al., 2017). Over 2 billion people and half of the world's livestock live in drylands, which make up 41% of the land area and provide 44% of the world's crops (United Nations Convention to Combat Desertification: UNCCD, 2018). Grazing systems are responsible for about 30% of the world's sheep and goat meat production and 9% of its beef production (de Haan et al., 1997). About 100 million of the 200 million people who depend on grazing livestock for their only source of income live in arid regions (Peacock & Sherman, 2010), whereas a comparable proportion reside in other ecological zones.

Despite the challenges posed by land degradation and climate change, pastoralism remains a vital economic activity for many communities, particularly in developing nations (Wróbel et al., 2023). It involves the significant use of grassland for animal production and is one of the primary production methods in dry land (Wróbel et al., 2023). Although grazing can be a cost-effective method of using marginal land and lowering feed prices, it can also become costly because of inadequate management and the possible requirement for more feed (Joe, 2023). Although land is necessary for grazing systems, the total cost and land requirements differ greatly depending on the kind of grazing system, the productivity of the land, and the management techniques used (Kenny et al., 2025). In communities where raising cattle is the main economic activity, social structure, resource management, productivity, trade, and social and welfare systems all have an impact on the cultural and economic system of grazing (Moulin & Ickowicz, 2023). Approximately 20 million homes worldwide rely on grazing (Nji & Manu, 2016). It is practiced by 25% of the world's population, and it contributes 10% of global meat output (Nji & Manu, 2016). Grazing contributes significantly to Cameroon's economy by producing beef, milk, organic fertilizer, and animal draught power, which enhances employment and food security (MINEPAT, 2010).

The Donga-Mantung Division's climate, especially in the Ndu Subdivision, is characterized by high rainfall and a cold, misty climate, which makes it generally conducive to agriculture and livestock production (Ngwani et al., 2024). However, climate variability poses a challenge, as it can impact agricultural outputs and result in conflicts between farmers and graziers (Chiambah & Kometa, 2022). Large tracts of land are needed for both farming and grazing, which are done simultaneously in most of the Division. In the age of mixed farming, there is a beneficial relationship between crop farming and animal husbandry (Mekuria & Mekonnen, 2018). To fertilize their farms, farmers work with graziers to buy cow pets. After harvesting the crops, farmers occasionally ask graziers to bring their animals and graze in the area (Beef Cattle Research Council: BCRC, 2020). The yield of crops and cattle will both rise if this symbiosis is properly utilized. Sadly, this symbiosis is only the beginning because both parties use land as their primary resource, which might lead to

war. This study is based on the idea that to preserve stable societies, human needs must be satisfied and hence, the relevance of the Human Needs Theory (HNT).

Farmers and pastoralists in Nkambe Central Subdivision have been forced to transition to shifting cultivation and nomadism, respectively, due to climate change and diminishing soil fertility. These conflicts have a substantial impact on agricultural development. Even though the frequency of farmer-grazier conflicts in Nkambe Central Subdivision is unknown, these conflicts are extremely stubborn and are marked by strong animosity and ethnocentrism (Nji & Manu, 2016). Authorities' attempts to handle conflicts sustainably have all failed, either out of greed or a lack of concern (Nji & Manu, 2016). Tension often rises because of administrators' and municipal leaders' inaction and passivity. Furthermore, the Mborroros are viewed as aliens due to the many classifications of residents, such as the case of farmer-grazier conflicts, making it simple for indigenous crop producers to intrude on their grazing territory (Landry & Soleil, 2015). Additionally, the lines separating pasture and farmed areas are poorly marked or nonexistent. Due to these factors and other geopolitical ramifications, land use in the Donga-Mantung Division is an unavoidable source of conflict, with the Nkambe Central Subdivision serving as a key hub due to its inherent potential. Agro-pastoral areas of the Donga-Mantung Division, in general, and Nkambe Central Subdivision, in particular, are often the scene of conflict, commonly referred to as farmer-grazer conflict, between non-Mbororo subsistence farmers and ethnic Mbororo cattle herders. Competition for water and land resources is the primary cause of many disputes (Awazi & Avana-Tientcheu, 2020) for both agricultural and non-agricultural uses (Milczarek Andrzejewska et al., 2018), population growth in humans and animals (Ntangti et al., 2019), rights to resource access, inadequate grazing resources, and cultural, religious, and value-based beliefs. This study examined the impact of farmer-grazier conflicts on agriculture in Nkambe Central Subdivision, Donga-Mantung Division, Cameroon.

LITERATURE REVIEW

Farmer-Grazier Conflicts

Government projections, which are updated on a regular basis, indicate that the world's population will reach 9.1 to 9.8 billion people by 2050 (Gu et al., 2021). Suppose human production and consumption patterns do not shift at the same time. In that case, half of the population growth is predicted to be concentrated in a few nations, primarily in Asia and Africa (Feldt et al., 2020). As a result, the ecological carrying capacity of the planet would be pushed even closer to or beyond its boundaries (Gu et al., 2021). Given the present world population of 8 billion, these estimates may still be seen as cautious, but the development trajectory itself appears to have gained widespread acceptance, igniting conversations about how to manage its effects rather than its causes (Department of Economics, 2024). Rapid urbanization rates are linked to human population expansion; by 2050, two-thirds of the world's population is expected to reside in cities (Valavanidis, 2024), with Asia and Africa accounting for almost 90% of this development (Ritchie & Roser, 2018). Meanwhile, rural development continues to be promoted by national and international development programs as a means of improving living conditions, creating jobs, and reducing rural out-migration to neighbouring cities or abroad (Feldt et al., 2020). Despite all health and environmental issues, these efforts lead to an intensification and extension of agricultural output (Garcia, 2020), preferably relying on rural-urban linkages,

to provide more meat, fresh vegetables, and animal-based goods high in protein to the expanding urban population (Shafieisabet & Mirvahedi, 2021). However, if all potential repercussions are not considered and all relevant stakeholders are not consulted, such development projects may misdirect efforts and disregard the actual requirements of the local community (Feldt et al., 2020). These factors contribute to the growing number of conflicts that exist now around the world, not just between agricultural interests and environmental demands but also between rural communities' traditional ways of life (Adams et al., 2023). Unfortunately, disputes over shared but diminishing resources have long existed in many regions of Africa between pastoral groups and crop farmers, and more recently, with large-scale agricultural investors (Holechek et al., 2017).

The former confrontations are referred to as farmer-grazier conflicts. Not just in the African setting, raising livestock is one of the main factors contributing to habitat change and biodiversity loss (Young et al., 2020). Thus, except for fish, the biomass of humans and their domestic cattle today surpass that of all other vertebrate animal species combined (Bar-On et al., 2018). However, in addition to a rapidly changing environment, cattle owners are now more frequently dealing with a range of social-ecological problems and constraints (Feldt et al., 2020). This relates to traditional pastoral tribes or communities that migrate periodically with their livestock or maintain nomadic lifestyles (Bhasin, 2011). Disparities in culture and religion can intensify rivalry for resources and minor disputes, which can occasionally escalate into uncontrollable violent outbursts that resemble civil war (Feldt et al., 2020). Political ecology theory states that "the interplay of local and extra-local social and ecological processes" is what leads to conflicts (Svarstad & Benjaminsen, 2020). According to Ratner et al. (2013), their primary causes are the continuously growing populations of humans and animals, as well as the gradual changes in land use brought about by the growth and intensification of agriculture. Uncertain land-use rights exacerbate tensions because of the combination of intricate contemporary legislation and traditional land systems (Ekpodessi & Nakamura, 2018). The consequences of climate change exacerbate these conflicts (Hoffmann, 2022). Majekodunmi et al. (2014), for instance, documented ethnoreligious conflicts involving pastoral Fulani communities in Central Nigeria's heavily populated Jos Plateau. Feldt et al. (2020) detailed the increasing farmer-grazier conflicts in eastern Tanzania that resulted from corruption, poor governance, and modernization policies that marginalized pastoralists.

Fjelde and von Uexkull (2012) provide a general summary of violent communal wars and rising conflicts in Sub-Saharan Africa. In Central African Cameroon, there have been allegations of increasing violence in the past, although they seem to have decreased more recently (Moritz, 2010). This might be the outcome of changes in pastoral communities' socioeconomic and lifestyle patterns, which bring them closer to nearby agricultural groups through community development programs and greater agropastoral output (Debela et al., 2019). However, given that Cameroon's population is expected to double by 2050, the need to boost agricultural output to fulfil the growing demand for food both domestically and internationally could lead to the resurgence or even worsening of long-simmering conflicts (Feldt et al., 2020). In addition to endangering the lives of those involved, this will indirectly jeopardize the local population's food security. Despite this, Feldt et al. (2020) present a positive picture of the convergent and successful agro-pastoral future of crop producers and livestock keepers in the Western Highlands of Cameroon. A new occurrence that could jeopardize local livelihoods is brought to our attention by Krätli

et al. (2015). They argue that the recent rise in economic inequality between lower segments of society and wealthy capital owners, who are often foreigners residing in Highland towns, would lead to conflicts between farmers and graziers. Hence, the Human Needs Theory notion is important to this study.

Theoretical Framework

This study is based on the Human Needs Theory (HNT), which was developed in the 1970s and 1980s as a broad or comprehensive account of human activities. It is based on the notion that meeting human wants is essential to maintaining a stable society. John Burton claims that:

> In our opinion, humans engaged in conflict situations are compulsively attempting to satisfy fundamental and universal demands within their institutional environments at all social levels, including identity, security, and recognition. They put in more effort to control their environment to develop and ensure that these conditions are fulfilled. There is no stopping this primaeval battle (Burton, 1979:72).

This struggle for needs is theoretically related to the Frustration-Aggression theory (FAT), which is based on the stimulus-response hypothesis. When these requests are not fulfilled, frustration results, which leads to conflict and aggression. The HNT mainly considers absolute necessities or needs, as opposed to the FAT, which also takes desires and wishes into account. Burton continues:

> We now know that some universal ideals or basic human desires must be met for civilizations to stay stable. As a result, it is possible to build institutions and policies without regard to ideology. Unless identity needs are met, distributive justice, a sense of control, and opportunity to fulfil all other human societal developmental needs are present in every social structure, instability and conflict are inevitable in multiethnic cultures (Burton, 1990).

There are several bold assumptions in this theory. According to Burton (1979, 1990), there is no way to end this battle. This is because conflict and instability are unavoidable. These are controversial claims that have broad ramifications. If the theory's premises are true and certain human desires are necessary for social stability and human growth, then the ability to create an environment where these demands may be met by all societal sectors must be the answer to conflict. This is the intersection of Burton's Conflict Resolution Theory (CRT) and Human Needs theory. In 1970, Abraham Maslow listed several needs, such as physiological needs, safety needs, needs for respect, needs for love and belonging, and needs for self-actualization.

> Abraham H. Maslow (1970:35), a psychologist, created a commonly recognized theory of human needs to address the problem of human motivation in work environments. He broke these needs down into five distinct phases in a definite sequence of importance. His strategy states that before attempting to satisfy one's more powerful needs or desires, one must first try to satisfy one's most fundamental ones.

John Burton lists the following: response, stimulation, security, acknowledgement, distributive justice, meaning, the need for control, the need for role defense, and the

desire to appear and grow sensible. His list of basic needs includes things like "food, shelter, sex, reproduction, and more" (Burton, 1979:72). Among the basic needs enumerated by Edward Azar are security, a distinct identity, social acceptance of one's identity, and active participation in the process that shapes one's identity (Azar, 1994). Humans have physical, physiological, social, and spiritual needs, according to Faleti (2005). In his view, "granting someone access to one need, such as food, while denying or hindering another, such as freedom of worship, amounts to denial and may lead to people using violence to defend these needs" (Faleti, 2005, pp. 51-52). Burton found a connection between people's urge to satiate their basic wants and annoyance, which leads to violent behaviour (Faleti, 2005:52). He contends that because people cannot be trained to tolerate behaviours that jeopardize their identity and other goals related to those requirements, they are compelled to react negatively to the things, people, and organizations that they perceive to be endangering those needs. This is like the relative deprivation theory put forward by Gurr (1970:24), which holds that "anger and violence are more likely to occur when there is a discrepancy, no matter how small, between what is desired and what seems possible." Regardless of socioeconomic class, everyone has the same insatiable demands for life, survival, security, protection, affection, involvement, creativity, understanding, and identity. In the end, every attempt by a community or organization to stifle or obstruct these demands will either be unsuccessful or result in much greater harm. Like Gurr's argument regarding relative deprivation, Max-Neef (quoted in Faleti, 2005:52) contends that the primary problem that human needs theory seeks to resolve is the conflict between potential and deprivation, since political and economic issues will only get worse if essential needs are not met. When Nnoli (2006:9) stated that "social discrimination, economic marginalization, and political exclusion are so dangerous to citizens' safety that they see the state as the biggest danger to their lives," he most likely had the human needs theory in mind. In a desperate attempt to protect their core beliefs from the danger of unpopular government acts, the affected citizens turn to the legal system themselves. This idea is important because it acknowledges and supports the needs of farmers and graziers in the Nkambe Central Subdivision. Neither of their wants must be satisfied at the expense of the other. This facilitates the transition from a zero-sum to a win-win situation. The idea that "human needs" are mutually exclusive is diminished by the abstraction of these requirements. For example, the conflict between the opposing objectives of maintaining peace and the constitutional future of the grazing routes changes to one in which both groups work to meet their needs for security, development, identity, and recognition. These and the other community's requirements are met without compromising quality.

Methods

Study Area

The Northwest Region of Cameroon, specifically the Nkambe Central Subdivision of the Donga-Mantung Division, is where this study was conducted (Figure 1). The Donga-Mantung Division's headquarters is in Nkambe Central Subdivision (Awudu et al., 2023). The Municipality is located at longitudes 10°01.03' and 10°01.45' east of the Greenwich Meridian and latitudes 6°00.7' and 6°01.13' north of the equator (Awudu et al., 2020). According to estimates as of 2011 (Community Initiative for Sustainable Development: COMINSUD, 2018), the population of Nkambe Central Subdivision is around 171,478 inhabitants, with 351.8 persons per km^2 as the population density (Awudu et al., 2020).

Misaje Council borders it in the west; Ako Council borders it on the north; Nwa Council borders it on the northeast; Ndu Council borders it on the southeast; and Noni Council borders it on the southwest (Awudu et al., 2020). Like the rest of the area, Nkambe Central Subdivision is in a tropical climate. The region's diverse climate is greatly influenced by relief and seasons. The average temperature in high-altitude regions is low, ranging from 12°C to 16°C (Awudu et al., 2020). The average monthly temperature in the lowland regions is a warm 27°C (Awudu et al., 2020). During the dry season, the Subdivision experiences scorching afternoons and cold mornings, while the rainy seasons are usually warm (Awudu et al., 2020). The dry and wet seasons are the two primary seasons that define the region. The dry season, which runs from November to March, is often shorter than the rainy season, which lasts for a lengthier portion of the year (Awudu et al., 2020). March is when it begins, and October is when it finishes. This region often receives a lot of rainfall, ranging from 1300 to 1900 mm per year (Awudu et al., 2020). The Wimbum people are the most common tribe in the Nkambe Central Subdivision. Nonetheless, the municipality is home to a diverse population from around the nation, including Fulanis, Hausas, and Muslims, who are cattle graziers. Nkambe Central Subdivision is the perfect place for this study because it provides a very conducive climate for both crop production and cattle grazing.

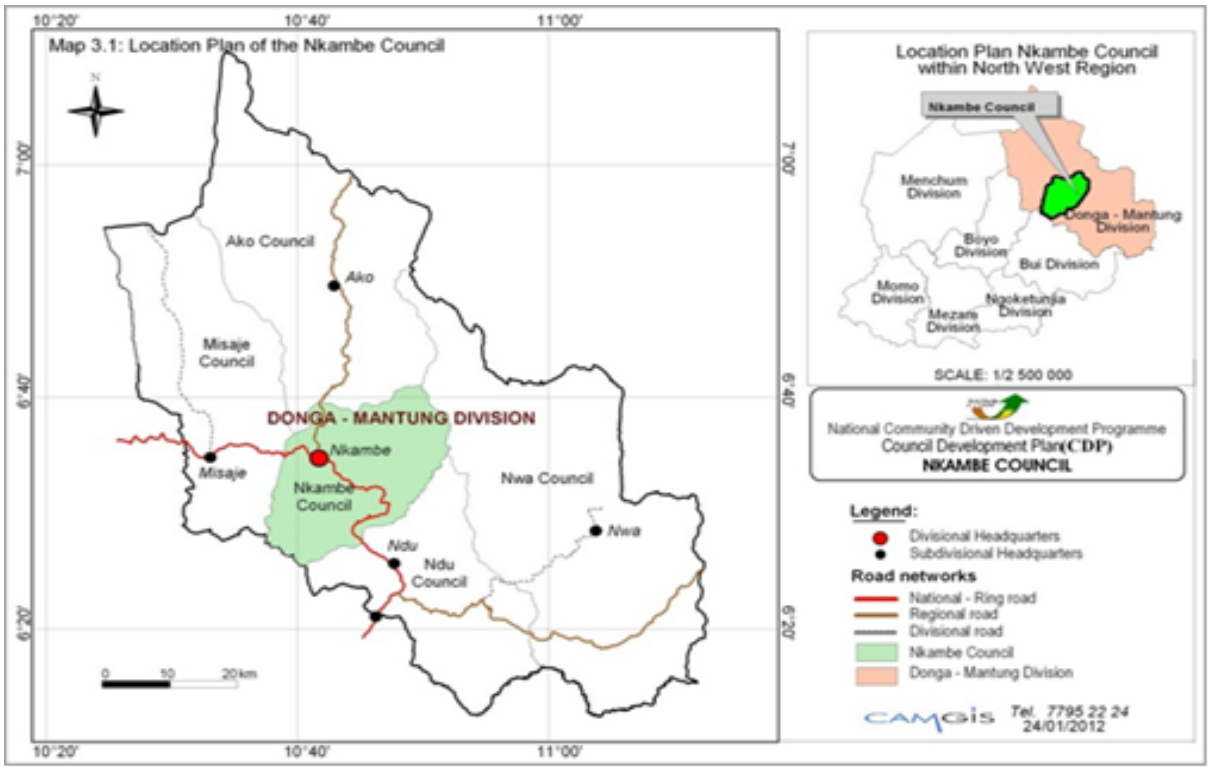


Figure 1: Map of Donga Mantung Showing Nkambe

Source: COMINSUD (2018)

Research Design

In this study, quantitative research design was used. Quantitative research measures correlations between variables, tests hypotheses, and extrapolates findings from a sample to a larger population (Ghanad, 2023). It involves collecting and analyzing numerical data using structured methods like surveys and experiments to find trends, confirm causal relationships, and generate objective, quantitative results (Ghanad, 2023). In March 2023, a survey was carried out in Nkambe Central Subdivision to investigate how farmer-grazier

conflict affected agriculture. Among the many benefits of survey research is its capacity to effectively and economically collect standardized data from many participants.

Study Population

The study population comprised the population of the three villages (Binka, Binju, and Binshu) that make up Nkambe Central Subdivision. An estimated 171,478 people live in Nkambe Central Subdivision (COMINSUD, 2018), including settlers from other tribes like the Fulanis, Hausas, and Muslims who graze cattle, as well as a diversified population from all walks of life and different parts of adjacent Nigeria. The target population was used to determine the sample size, which consisted of farmers and cattle graziers living in the three villages that comprise Nkambe Central Subdivision. The sample did not include the population of non-graziers and non-farmers.

Sample Size and Sampling Procedure

A sample of 150 participants was employed in the investigation. Because Nkambe Central Subdivision is home to a sizable number of farmers and graziers in the Division who are vying for land for agricultural purposes, the researcher purposefully chose it. Second, the Division has designated Nkambe Central Subdivision as a red zone for conflicts between farmers and graziers. A multi-stage sampling technique was used in the study. The researcher initially identified all the major streets in each of the communities that were purposively selected for the study. Five main streets were found in each of these settlements and categorized into Wards, for a total of 15 Wards. The researcher proceeded to identify and record every farmer and cattle grazier in each Ward in the second stage. Ten (10) participants, consisting of farmers and graziers, were selected from each Ward in the third stage using systematic random sampling. Sampling frames and sampling intervals were developed in the field with the assistance of each Ward leader. In the third stage, a total of 10 participants, consisting of farmers and graziers were selected from the Ward. In the fourth stage, a representative sample of 50 participants, consisting of farmers and graziers, was selected from each of the three communities that comprise Nkambe Central Subdivision, giving a total sample size of 150 participants for the survey.

Data Sources

The study made use of both primary and secondary data sources. Participants were given structured questionnaires to complete to gather primary data alongside field observation. Secondary sources of data collection included the use of the internet, a review of prior research on the subject gleaned from search engines like Google Scholar, ResearchGate, and Web of Science, newspaper publications, journal articles, and published and unpublished materials. The researcher visited some of the farmer-grazier conflict hot spots in Nkambe Central Subdivision to observe the extent of damage caused by cattle and the consequences of farmer-grazier conflict in the Nkambe Central Subdivision.

Instruments of Data Collection

The study employed a structured questionnaire to gather primary data from participants due to its quantitative technique. There were two sections to the questionnaire. The questionnaire's first part asks about the personal characteristics of the participants, while its second part asks about the primary study concerns. The questionnaire was

standardized and supplemented with other Participatory Rural Appraisal (PRA) instruments, such as field observations. Data was collected with the use of smartphones and cameras during the field walk. Participatory mapping, transect walks, Venn diagrams, pairwise and simple ranking, triangulation of preexisting data, and problem analysis via problem trees are a few examples. The information gathered through the questionnaire was also supplemented by brainstorming, interactive conversations, direct observation, and site visits (walkabout).

Administration of Instruments

To administer the questionnaire and gather data from study participants, the primary investigator trained two enumerators who had at least a first degree. Each gathered information from 50 participants during a month-long visit to each of the three communities that comprise Nkambe Central Subdivision. Participants in the three villages purposively selected were given a total of 150 questionnaires. Literate participants who chose to fill out their own questions were permitted to do so, whereas illiterate people who could neither speak nor write were guided with the use of pidgin language (lingua franca), and their responses were recorded by the research assistants. In situations where the participants were unable to understand the English language or the lingua franca, the researcher additionally enlisted the assistance of a local translator to assist in explaining the questions to the study participants.

Validity and Reliability of Instruments

A pre-test of the instrument was conducted with a small sample in an area different from the actual study area to determine if the research instrument could gather the data necessary for answering the research questions. The data was analyzed, and some adjustments were made before administering the instrument properly in the study area. This was done to ensure the validity of the instruments. In research, validity pertains to the degree of accuracy with which a study addresses the research question or the quality of the study's results (Sullivan, 2011). Validity pertains to measurement accuracy for outcome measures like tests and surveys. In this context, validity is defined as the degree to which the assessment instrument truly assesses the relevant result. Validity is determined by how the assessment instrument is interpreted or used with specific learners and situations rather than by the tool itself. The reliability of the instruments was evaluated using Cronbach's Alpha. The correlation values between the responses on your evaluation tool are often determined using Cronbach's alpha, a test of internal consistency (Bland & Altman, 1997). The most popular statistic for evaluating internal consistency and reliability, which gauges how similar the items on a scale or questionnaire are to one another (Vaske et al., 2017). Higher results (often above 0.75) imply strong internal consistency, which shows that the assessment tool's items consistently measure the same underlying construct (Izah et al., 2023). The range of this coefficient is 0 to 1 (Izah et al., 2023).

Methods of Data Analysis

The Statistical Package for Social Sciences (SPSS) software version 25.0 and Microsoft Excel 2013 were used to analyze questionnaire data at the 95% significance level ($\alpha = 0.05$). Descriptive statistical tools were used to calculate frequencies and percentages, and the data were presented as tables and charts. The results were reported and discussed.

Results

Demographic Characteristics of Participants

Variables such as sex, age, marital status, educational qualification, religious affiliation, occupational status, position in the community, number of years of living in the community, victim of farmer-grazier conflict, major causes of farmer-grazier conflicts, major effects of the farmer-grazier conflict and how the conflict was resolved were examined in the analysis.

Sex Distribution of Participants

Figure 2 on the sex distribution of participants reveals that most of the participants, 130 or 87% of the sample, were female, whereas male participants made up only 19 or 13%. This suggests that in the research area, because women make up most of the small-scale farming labour force in many affected locations (particularly in Nkambe Central Subdivision) and because the nature of the conflict disproportionately affects their primary responsibilities and land rights, more women than men are involved in farmer-grazier conflicts.

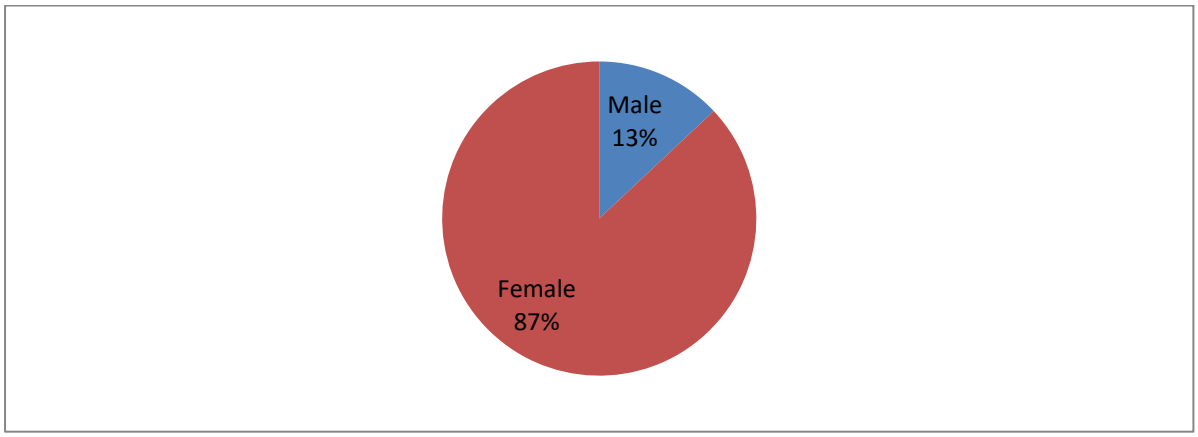


Figure 2: Sex Distribution of Participants

Age Distribution of Participants

Figure 3 shows that most participants, 60 or 40%, are between the ages of 41-50, followed by 33participants or 22% falling into the 61+ age range. Some 28 or 19% were between the ages of 31-40, and 21 or 14% were between the ages of 51-60, while 8 or 5% were between the ages of 20-30. This suggests that different age groups are involved in conflicts, and although middle-aged adults (41-50) are involved simply as established farmers or herders with decision-making powers, younger people are usually seen as the main participants or perpetrators of violence.

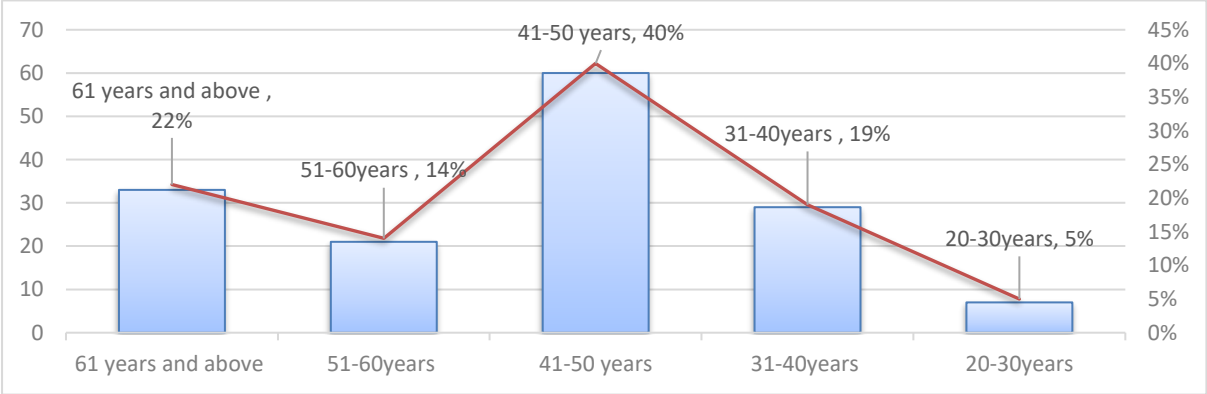


Figure 3: Age Distribution of Participants

Marital Status of Participants

Figure 4 shows that 103 or 69% of participants who are married make up the sample, followed by single participants, 25 or17%, and widows made up 17 or 11%, while widowers made up 8 or 3%. This implies that a greater number of married individuals are employed in agriculture, most likely because of shared labour requirements, domestic duties, and the pooling of resources to maintain family livelihoods.

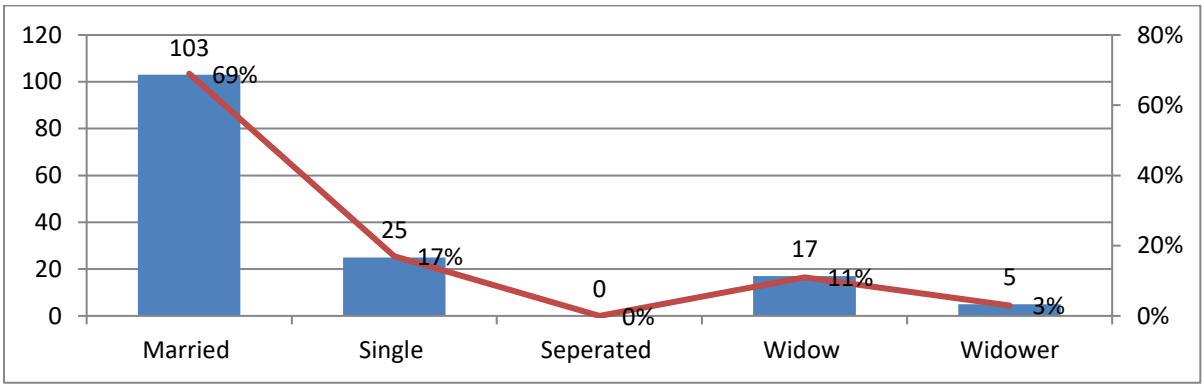


Figure 4: Marital Status of Participants

Educational Qualification of Participants

According to the data in Figure 5, most participants, 90 or 60%, had no formal education, followed by those with First School Leaving Certificates (FSLC), 51 or 34%, and participants with Government Certificate of Education (GCE, ordinary level), 9 or 6%. The recurring confrontations between farmers and graziers in Nkambe Central Subdivision may also be explained by the research area's low educational attainment.

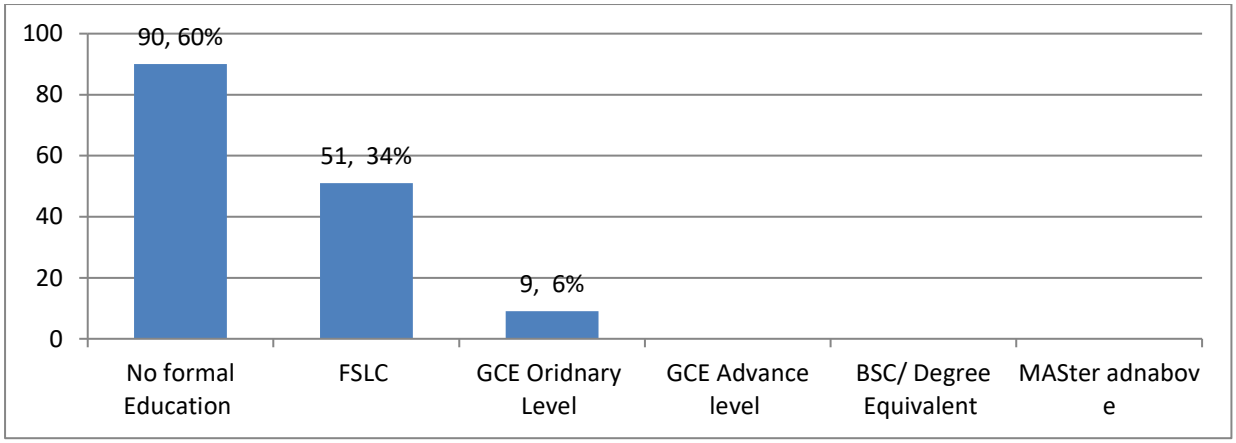


Figure 5: Educational Qualification of Participants

Religious Affiliation of Participants

As seen in Figure 6, most participants, 129 or 86% are Christians, followed by Muslims and members of other denominations, with 21 or 7% respectively. This suggests that Christians are more likely to be involved in crop production than Muslims, who are more involved in cattle rearing; hence, more Christians are victims of farmers-graziers conflict in Nkambe Central Subdivision.

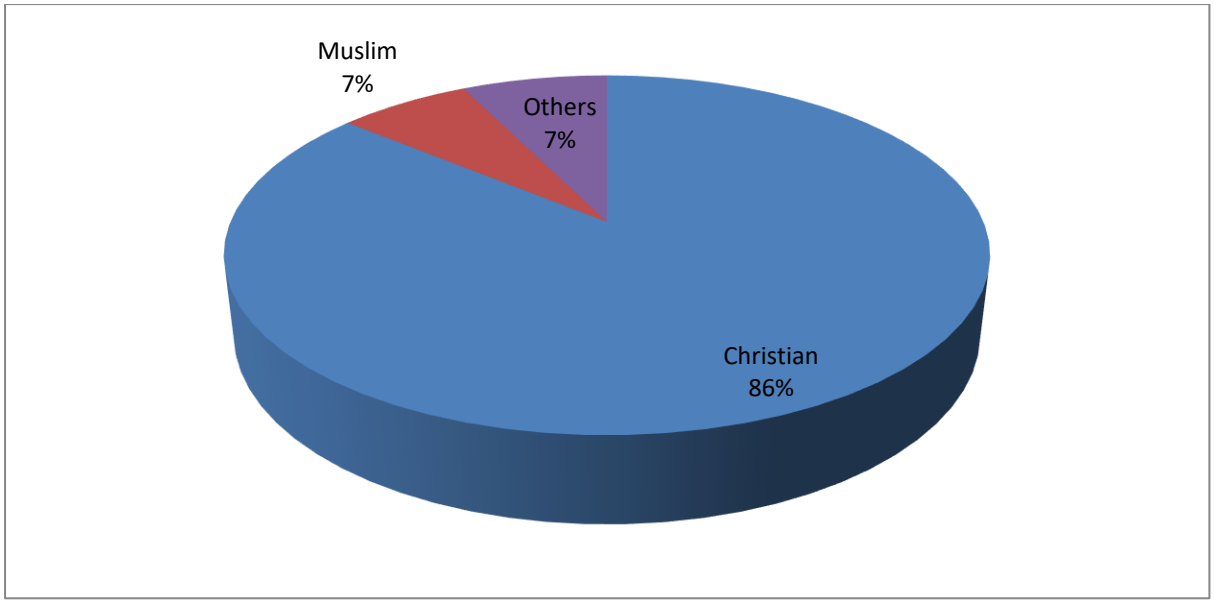


Figure 6: Religious Affiliation of Participants

Occupational Status of Participants

Figure 7 on the occupational status of participants revealed that 142 or 95% were farmers, whereas 8 or 5% were traders. Cattle graziers in the Nkambe Central Subdivision are part of this large agricultural population.

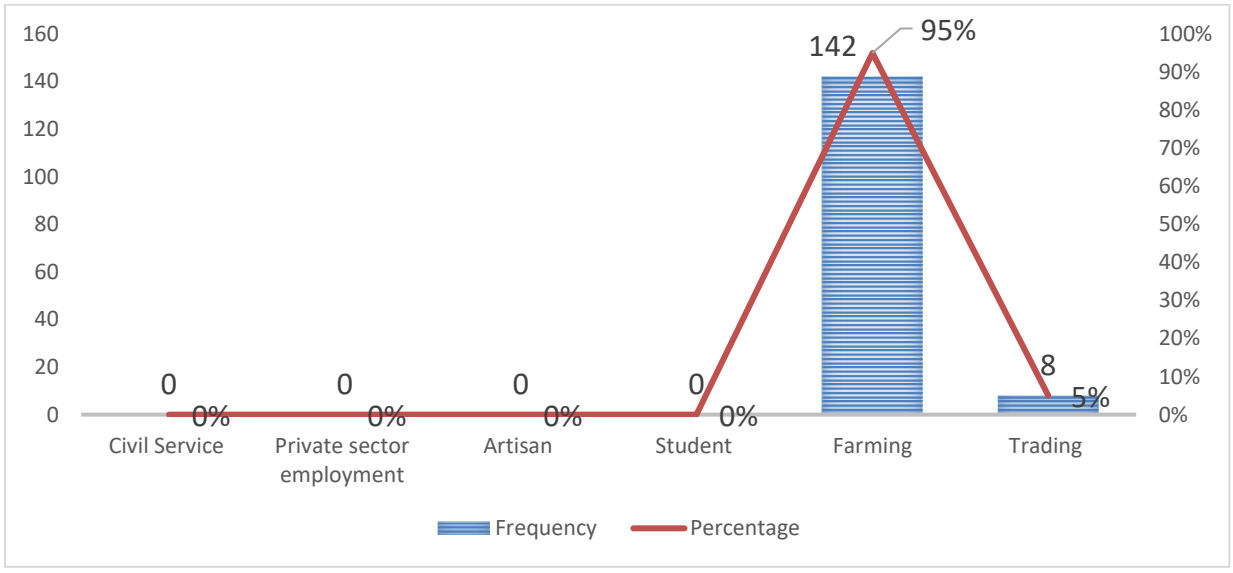


Figure 7: Occupational Status of Participants

Position in the Community

Most respondents, 137 or 90%, are farmers (Figure 8), followed by graziers, 7 or 4.5%. local notables, 4 or 3%, Quarter heads and ordinary community members made up 2 or 1%, respectively. This explains why there are more farmer-grazier disputes in the study area, since a large portion of the land that could have been used for grazing is being used for agricultural crop production, taken up by the large number of crop producers.

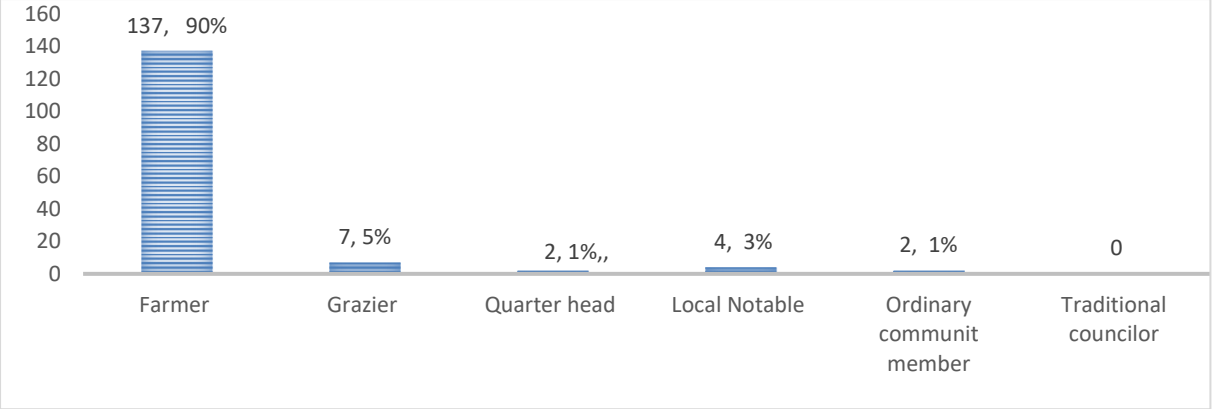


Figure 8: Position in the community

Number of Years of Living in the Community

Data in Figure 9 reveals that most participants, 51 or 34%, have been in the neighbourhood for 41-50 years, followed by those who have been in the community for 31-40 years, who were 37 or 25%. Some 19 or 13% were in the community for 51-60 years, and 17 or 11% had been in the community for 61-70 years, while 14 or 9% had been in the community for 21-30 years. Additionally, the result reveals that 3 or 2% had been in the community for 10-20 years and 71-80 years or more, respectively. These results demonstrate that after a long period of residence in the neighbourhood, most respondents have a solid grasp of the conflict situation in Nkambe Central Subdivision.

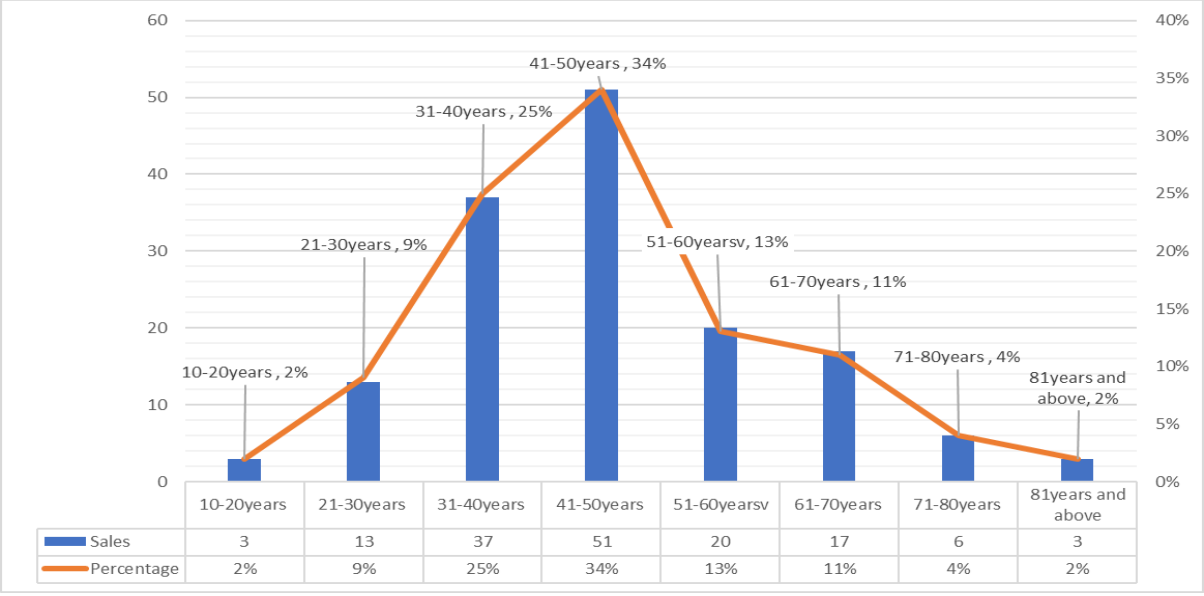


Figure 9: Number of years of living in the community

Victim of Farmer-Grazier Conflicts

Most participants, 129 or 86%, had been victims of farmer-grazier conflict (Figure 10), while only 21 or 14% had not experienced farmer-grazier conflict situations in their farms. This suggests that their lack of involvement in farming operations may be the cause of this. These results demonstrate that the farmers-graziers conflict in Nkambe Central Subdivision is a severe issue with a high victimization rate.

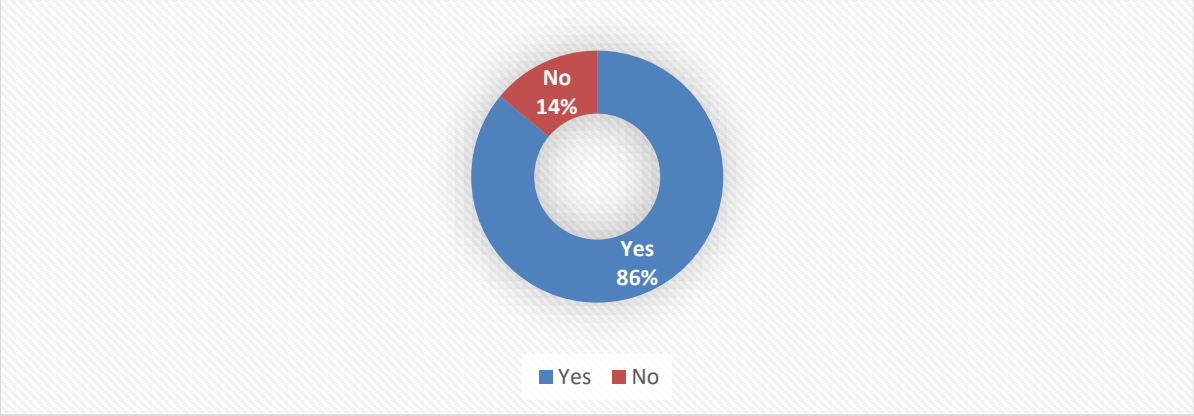


Figure 10: Victim of Farmer Grazier Problem

Major Causes of Farmer-Grazier Conflicts in Nkambe Central Subdivision

Figure 11 on the major causes of farmer-grazier conflict reveals that most participants, 100 or 67%, agree that the destruction of crops is a major cause of farmer-grazier conflict in the research area, and participants who said destruction of farmlands was 25 or 17%. These results support those of Nforya (2020), who discovered that the primary causes of farmer-grazier conflicts are vegetation damage, soil erosion, and water pollution, influencing cattle grazing in Noni Subdivision. The results also differ from those of Liman (2021), who found that devastation of farmland, the spread of small arms, the rise in cattle rustling and banditry, water scarcity, desertification, population growth, rising unemployment, and fake news and media propaganda are the primary causes of farmer-grazier conflicts. The results also deviate from those of Garba et al. (2018), who state that, among other things, inadequate grazing reserves 51.35%, a lack of a designated livestock route 54.05%, and a negative attitude of the government towards agricultural growth 52.03% are the main causes of farmer-grazier conflicts. Additionally, the research shows that destruction of fence 17 or 11% and insults accounted for 8 or 5%. These results are consistent with those of Feldt et al. (2020), whose research showed that land tenure issues will be critical in the future, since some participants had an official land title and pastoralists seemed less equipped to handle land disputes than crop farmers, who more frequently used fencing to claim land ownership. This suggests that graziers may not have enough space for grazing activities because of over-farming, forcing them to invade farms by tearing down fences and uprooting crops. According to the literature review, intergroup conflicts and prejudices, resource competition, land tenure insecurity, and climate-induced environmental factors (Adams et al., 2023) are the primary causes of farmer-grazier conflicts.

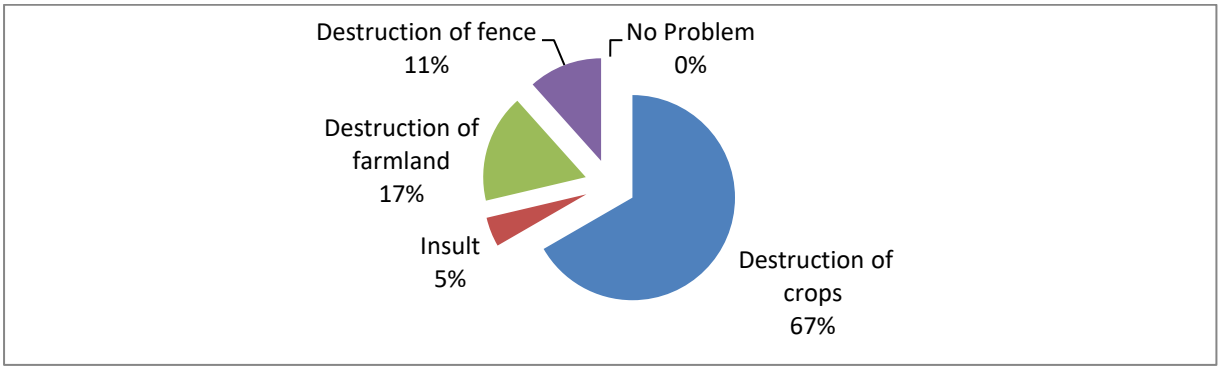


Figure 11: Major cause of Farmer-Grazier Conflicts in Nkambe Central Subdivision

Major Effect of the Farmer-Grazier Conflict in Nkambe Central Subdivision

Figure 12 indicates that the major effects of farmer-grazer conflicts in the study area are increasing poverty, with 36 or 24% of participants, followed by enmity and food shortages, with 29 or 19% respectively. This implies that since cattle usually destroy farms, farmers may not have a good harvest, which they could sell, and that alone tends to render them poor. The results corroborate those of Innocent et al. (2017), whose study demonstrated the detrimental effects of this pattern of insecurity on people's general well-being, including poor quality of life, food insecurity, high food prices, population displacement and even death, business destruction, property and equipment damage, relocation, and business closures. The findings of this study are different from those of Obasanmi and Enoma's (2022) study, which demonstrates that the farmer-grazier crisis has caused several problems, including the displacement of people from their communities, the vulnerability of women and girls to sexual and economic predators, the significant financial strain on the government that results in lost revenues, the depletion of food supplies and their rising costs, the growing divide between the Federating states, and threats to national security. Additionally, 21 or 14% of participants said there was no effect, and 15 or 10% of participants reported having a poor income. Results further that 7 or 5% of participants said the major effects of farmer-grazier conflicts are low farm productivity and injury, respectively, while 6 or 4% said wars were the major effects of farmer-grazier conflicts in the study area.

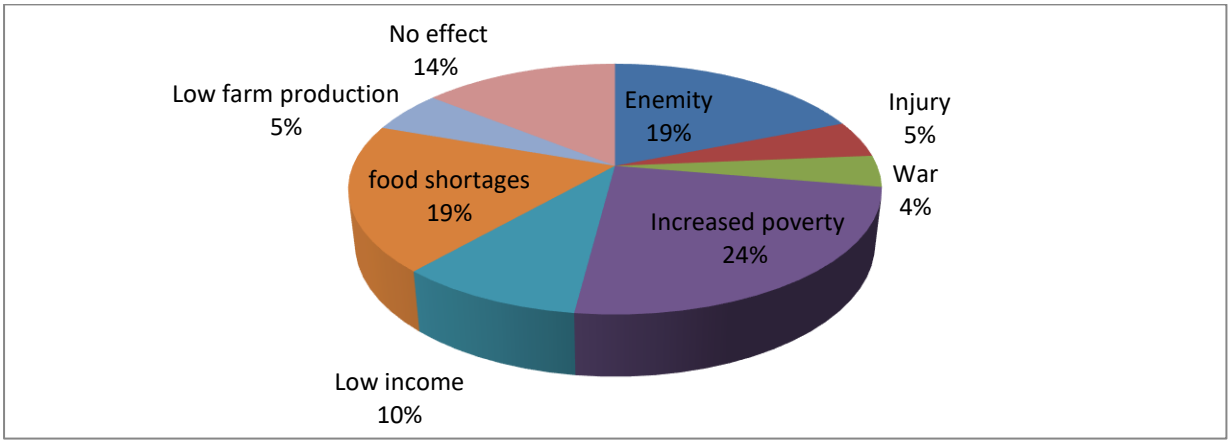
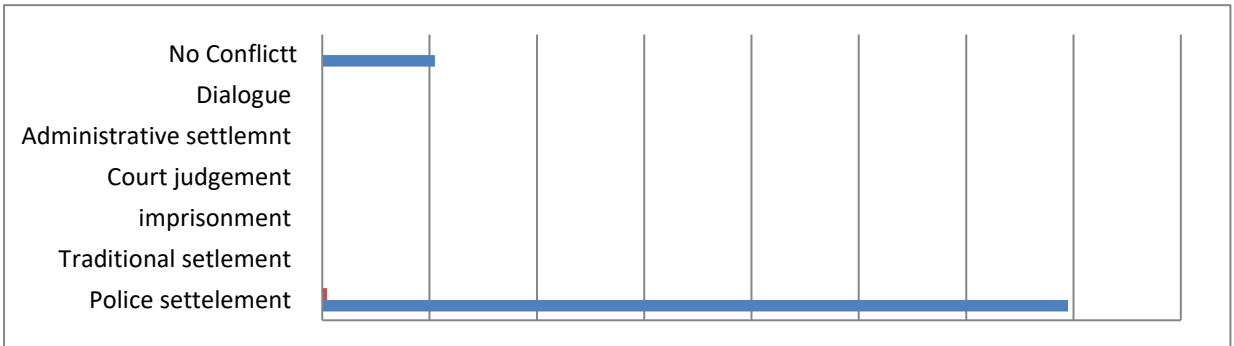


Figure 12: Major Effects of Farmer-Grazier Conflicts in Nkambe Central Subdivision

How the Conflicts were Resolved

According to the data in Figure 13, most participants, 139 or 86% stated that a police statement was used to mediate the issue, while 21 or 14% claimed that no conflict existed. The results of this study deviate from those of Ajiye (2020), who discovered that, although the farmer-grazier conflict continued to worsen during the research period, several measures implemented by the government at different levels, security organizations, and civil organizations had no beneficial effects. According to a different study by Sone (2012), addressing the region's land-related conflicts and implementing land reform will be necessary to solve this issue. The literature analysis found that litigation, direct discussions for damage compensation, and third-party involvement (mediation and arbitration) were the primary conflict management techniques employed (Adams et al., 2023). Nforya (2020) found in another study that the primary methods for resolving farmer-grazier conflicts are the use of the agro-pastoral commission and the legal system.



	Police settelement	Traditional setlement	imprisonment	Court judgement	Administrative settlemnt	Dialogue	No Conflictt
Percentage	86%	0%	0%	0%	0%	0%	14%
Frequency	139	0	0	0	0	0	21

Figure 13: How the Conflicts were Resolved

Causes of Farmer-Grazier Conflicts in Nkambe Central Subdivision

Table 1 on the causes of farmer-grazier conflicts in Nkambe Central Subdivision reveals that most participants, 91 or 60.7% agreed and 42 or 28% strongly agreed that the absence of a distinct boundary between farm and grazing grounds is the main cause of farmer-grazier conflicts, whereas 15 or 10% disagreed and 1 or 0.7% strongly disagreed. This suggests that agriculture in Nkambe Central Subdivision is carried out in open fields, and these farming areas should be restricted from cattle grazing to avoid future occurrences of conflicts. The table further states that 97 or 64% of participants agreed with contradictory administrative choices made by successive administrations, 46 or 30.7% strongly agreed, while 7 or 4.7% disagreed. This suggests that since most farmer-grazier conflicts are handled at the level of the Divisional Officer (DO), efforts to successfully resolve these conflicts are challenging, especially in situations where the DO is on transfer to a different Municipality. The incoming DO may change the dynamics of the conflict, further aggravating tension between farmers and graziers. Findings on stray cattle and teenage herdsmen reveal that 144 or 96% of participants strongly agreed, and 6 or 4% agreed. Implying that since they won't be able to manage them, teenage herdsmen shouldn't go around with cattle. Findings on the rising human and cattle population indicate that most participants, 148 or 98.7% strongly agreed, and 2 or 1.3% of participants agreed. This implies that with both an increase in human and cattle populations in Nkambe Central Subdivision, both parties will have to struggle for land for crop production and animal grazing as a means of survival, resulting in farmer-grazier conflicts. Results on pressure on land resources show that most participants, 134 or 89.3%, agreed, and 16 or 10.7% of participants disagreed. This implies that there are instances where angry farmers will have to get revenge directly against cattle after destroying their crops, creating tension and hence farmer-grazier conflicts in the study area. Frequent farmer-grazier barbarism, 100 or 66.7% agreed, and 36 or 24% strongly agreed, while 14 or 9.3% disagreed.

Table 1: Causes of Farmer-Grazier Conflicts in Nkambe Central Subdivision

Variable	Strongly Agreed	Agree	Disagreed	Strongly disagreed	Undecided
Lack of a distinct boundary between farm and pasture areas	42	91	15	1	0
	28%	60.7%	10%	0.7%	-
Disputes between consecutive administrations' administrative decisions	46	97	7	0	0
	30.7%	64%	4.7%	-	-
Stray cattle and teenage herdmen	144	6	0	0	0
	96%	4%	-	-	-
Rising human and cattle population	148	2	0	0	0
	98.7%	1.3%	-	-	-
Pressure on land resources	0	134	16	0	0
	-	89.3%	10.7%	-	-
Frequent farmer-grazier barbarism	36	100	14	0	0
	24%	66.7%	9.3%	-	-

Effect of Farmer-Grazier Conflict on Agriculture in Nkambe Central Subdivision

Table 2 on the effects of farmer-grazier conflicts on agriculture shows that most participants, 86 or 57.3% agreed with the reduction in farm production, 59 or 39.3% strongly agreed, and 4 or 2.7% of all participants disagreed, while 2 or 1.3% strongly disagreed. Implying that the rate of productivity is adversely affected after the cattle enter the farms and destroy crops. The table further states that some 97 or 64.7% of participants agreed with increased poverty, and 47 or 31.3% strongly agreed, while 6 or 4% disagreed. This implies that when cattle destroy crops, or crop farmers destroy cattle, it usually has a detrimental effect on the farmer's income, which leads to greater poverty. Results show that 87 or 58% of participants agreed with social insecurity, and 58 or 38.7% strongly agreed, while 5 or 3.3% disagreed. This suggests that the social security of the research area is adversely affected once fighting begins, and at times can lead to loss of human lives and valuable properties. The table also reveals that most participants, 97 or 64.7% of all participants, agreed on inadequate food supply for the family, followed by 47 or 31.3% who strongly agreed and 6 or 4% disagreed. This is true because once the farms are destroyed by cattle, most farming households find it difficult to afford their normal three-square meals a day.

According to the table, 87 or 58% of participants agreed with the interruption of children's education, followed by 58 or 38.7% who strongly agreed and 5 or 3.3% disagreed. This implies that many children from farming households find it difficult to go to school as parents are unable to pay their school fees and afford other school needs because of farmer-grazier conflicts. On the other hand, some parents will decide to drop the education of their children and instead embark on court cases with graziers, with the hope of making more money in return. Results on the reduction of healthcare provision show that most participants, 99 or 66%, agreed, followed by 45 or 30% who strongly agreed, and 4 or 2.7% disagreed, while 1 or 0.7% strongly disagreed. Many participants, 103 or 68.7%,

agreed on the reduction of family income, followed by 42 or 28% who strongly agreed, and 4 or 2.7% disagreed, while 1 or 0.7% strongly disagreed. This suggests that most households are unable to pay bills in times of farmer-grazier conflicts in Nkambe Central Subdivision. Findings on high prices of common commodities in the local markets reveal that most participants, 92 or 61.3% agreed, followed by 44 or 29.3%, and 10 or 6.7% disagreed, while 2 or 1.3% strongly disagreed. This is because, following the destruction of crops by cattle, production rates must drop, imposing a situation of limited supply in the local markets, hence a rise in the prices of basic commodities in the local markets. Results on the fleeing of the local farm labour force indicate that most participants, 101 or 67.3%, agreed, and 48 or 32% strongly agreed, while 0.7%of all participants disagreed. The table indicates that most participants, 91 or 60.7%, agreed that conflict has an impact on rural development initiatives, followed by those who strongly agreed, 47 or 31.3%, and 10 or 6.7% disagreed, while 3 or 2% strongly disagreed. This suggests that during farmer-grazier conflicts, most of the destruction negatively affects the development of the Municipality, as most development projects are halted until peace and normalcy return.

Table 2: Effect of Farmer-Grazier Conflict on Agriculture in Nkambe Central Subdivision

Variable	Strongly Agreed	Agree	Disagreed	Strongly disagreed	Undecided
Reduction in farm production	59	86	4	2	0
	39.3%	57.3%	2.7%	1.3%	-
Increased poverty	47	97	6	0	0
	31.3%	64.7%	4%	-	-
Social insecurity	58	87	5	0	0
	38.7%	58%	3.3%	-	-
Inadequate food supply for the family	47	97	6	0	0
	31.3%	64.7%	4%	-	-
Interruption of education of children	58	87	5	0	0
	38.7%	58%	3.3%	-	-
Reduction of healthcare provision for the family	45	99	4	1	0
	30%	66%	2.7%	0.7%	-
Reduction of family income	42	103	4	1	0
	28%	68.7%	2.7%	0.7%	-
High prices in the local markets	44	92	10	2	0
	29.3%	61.3%	6.7%	1.3	-
Flee of the local farm labour force	48	101	1	0	0
	32%	67.3%	0.7%	-	-
Conflict affects rural development projects	47	91	10	3	0
	31.3%	60.7%	6.7%	2%	-

Mitigation Measures to Improve Farmer-Grazier Conflicts on Agriculture in Nkambe Central Subdivision

Using a dialogue platform as a conflict mitigation measure, 141 or 94% of all participants strongly agreed, followed by 8 or 5.3%, who disagreed, and 1 or 0.7%, who strongly disagreed (Table 1). In a bid to restore peace and security, improve food production and accessibility, and respect for one another, this approach will help to bring together the conflicting parties. Most participants, 92 or 61.3%, agreed that administrative authorities should be used to demarcate boundaries, followed by those who strongly agreed, 53 or 35.3% and those who disagreed, 5 or 3.3%. Additionally, they proposed that this would facilitate the issuance of land titles. As seen in the table,141 or 94% of participants agreed on the mapping out of farm and grazing lands, and 8 or 5.3% disagreed, while 1 or 0.7% strongly disagreed. This implies that a detailed mapping of grazing areas and farmlands will greatly reduce conflicts between farmers and graziers in Nkambe Central Subdivision. Most participants, 100 or 66.7%, agreed on facilitating the process of issuing land titles, and 48 or 32% strongly agreed, while 2 or 1.3% disagreed. This now emphasizes the importance of private landownership as a strategy to reduce tensions between farmers and graziers in Nkambe Central Subdivision.

Table 3: Mitigation Measures to Improve Farmer-Grazier Conflicts on Agriculture in Nkambe Central Subdivision

Variable	Strongly Agreed	Agree	Disagreed	Strongly disagreed	Undecided
Dialogue platform	0	141	8	1	0
	-	94%	5.3%	0.7%	-
Administrative authorities to demarcate boundaries	53	92	5	0	0
	35.3%	61.3%	3.3%	-	-
Map out farm and grazing lands	0	141	8	1	0
	-	94%	5.3%	0.7%	-
Facilitate the process of issuing land titles	48	100	2	0	0
	32%	66.7%	1.3%	-	-

Discussion

The results of the study on the causes of farmer-grazier conflicts in the Nkambe Central Subdivision showed that 60.7% of all participants agreed that there were unclear boundaries between farm and pasture areas, 64% agreed that there were conflicting administrative decisions, 96% strongly agreed that there were stray cattle and teenage herdsmen, 98.7% strongly agreed that there were more people and cattle, and 89.3% agreed that there was pressure on land resources. Frequent barbarism between farmers and graziers (66.7%) was cited as contributing to farmer-grazier conflict. These findings differ from those of Awazi and Avana-Tientcheu (2020), who found that a 100% scarcity of arable and grazing areas was the main cause of farmer-grazier conflicts, with a 100% loss of crops and livestock, as well as human casualties, the main outcomes. Literature reviews suggest that conflicts between farmers and graziers are caused by several factors, including urbanization, negligence, the loss of agricultural land, and climate and environmental change (Nwokocha et al., 2022). According to the Human Needs Theory, the main causes of unresolvable conflicts are

unfulfilled basic needs, such as those for identity, security, and a means of subsistence. If these fundamental requirements are not met, conflict would inevitably result from the competition for limited resources like water and land.

Findings on the effects of farmer-grazier conflict on agriculture shows that farm productivity has decreased by 57.3%, poverty has increased by 64.7%, social insecurity has increased by 58%, children's education has been disrupted by 58%, family healthcare has decreased by 66%, family income has decreased by 68.7%, food prices have increased by 61.3%, and rural development projects have been impacted by 60.7% of all participants. These findings are consistent with those of Bobbo and Tsi (2020), who discovered that 52.5% of respondents reported food supply constraints that led to high prices in local marketplaces, and 60% of respondents attested to disruption of livestock activities and the food production cycle. These results corroborate those of Nnaji et al. (2022), whose empirical findings show that both the frequency and intensity of farmer-grazier conflicts significantly increase food insecurity, with the severity of these conflicts having a bigger influence than their incidence. These findings support those of Nwokocha et al. (2022), who discovered that the threat posed by herders in Nigeria has resulted in several detrimental impacts, such as a drop in school enrolment, population displacement, and barriers to educational advancement. The results differ with those of Ekperechukwu and Carla (2021), who reported that the situation has been marked by the murder of farmers and pastoralists, conflicts between local militias and public and private security forces that have also resulted in fatalities, the destruction of farmlands and farm produce, and the forced relocation of citizens from their homelands, leaving them vulnerable to a severe lack of necessities for survival, including food, water, shelter, healthcare, sanitary conditions, and human rights violations, with women and children being the most affected. These findings are like those of Bobbo and Tsi (2020), who discovered that conflicts between farmers and graziers have an impact on rural development projects in the research area, including markets, storage facilities, bridges, roads, electricity projects, microcredit institutions, and portable water. According to the Human Needs Theory, these conflicts make it difficult or impossible for farmers and herders to pursue higher-level needs since they hinder them from achieving their most fundamental needs.

Results on mitigation measures revealed that 94% of all participants strongly agreed with the use of a dialogue platform. Most respondents, 61.3%, 94% and 66.7% agreed with the use of administrative authorities, mapping farm and grazing lands and facilitation of land title procedures, respectively. The results are consistent with previous research by Bobbo and Tsi (2020), who discovered that conversation platforms are among the most effective ways to reduce farmer-grazier conflicts and guarantee food safety in the conflicting areas. According to their results, the administrative authorities should plan out farming and grazing land between the various villages and demarcate boundaries to resolve tenure disputes in the area. Most participants, 66.7%, agreed that facilitating the procedures for obtaining land titles is another conflict mitigation measure to enhance sustainable agricultural development in Nkambe Central Subdivision. This suggests that the process of applying and obtaining private land ownership rights for agricultural production in Nkambe Central Subdivision is so costly and cumbersome for individual farmers, and therefore, the government should address the procedures required for obtaining a land title deed. The Human Needs Theory implies that mitigation strategies work best when they concentrate on meeting these fundamental, non-negotiable needs rather than only the direct causes of conflict.

Conclusion

It is now widely accepted that issues of land and natural resources have the potential to both start and prolong violent conflicts. This is the case of farmer-grazier conflicts in Nkambe Central Subdivision. Should this be disregarded, efforts to advance peace could even lead to new hostilities. However, the study examined the impact of farmer-grazier conflicts on agriculture in Nkambe Central Subdivision, Donga-Mantung Division of the Northwest Region of Cameroon. The results on the causes of farmer-grazier conflicts revealed a lack of a clear border between farm and pasture areas, disputes between consecutive administrations' administrative decisions, stray cattle and teenage herdsmen, rising human and cattle population, pressure on land resources and frequent farmer-grazier barbarism. According to the Human Needs Theory, a stable society depends on addressing human needs. Because individuals try to meet basic and universal needs in their institutional contexts at all social levels, such as identity, security, and acknowledgement, humans get involved in conflict situations. It should be mentioned that a major contributing factor to the disputes between farmers and graziers in Nkambe Central Subdivision is the absence of land titles and certificates. The Human Needs Theory states that when these demands are not met, frustration leads to hostility and conflict. Research on the effects of farmer-grazier conflicts in Nkambe Central Subdivision showed that there was a decline in farm productivity, an increase in poverty, social insecurity, insufficient food supply, disruption in children's education, a decline in family healthcare, a decline in family income, high food prices, and a detrimental effect on rural development initiatives. The Human Needs Theory implies that any disparity, no matter how slight, between what is sought and what appears possible increases the likelihood of conflict. Mapping out farm and grazing areas, utilizing administrative authority to draw boundaries, utilizing communication platforms, and streamlining the land title giving procedure were some of the mitigating strategies used in Nkambe Central Subdivision. Because it acknowledges and verifies the needs of the farmers and herdsmen in Nkambe Central Subdivision, the Human Needs Theory notion is important to this study. Neither of their wants must be satisfied at the expense of the other. Farmer-grazier conflicts are intimately related to the Human Needs Theory, especially as it was articulated by John Burton, which holds that unmet basic needs are the primary source of persistent conflicts. The denial of basic, non-negotiable necessities like subsistence, security, identity, and access to essential resources is what drives these confrontations, which are more than just chance encounters.

Ethical considerations

The Traditional Chief of each of the three communities that comprise Nkambe Central Subdivision, and the administrative authority (The Divisional Officer (D.O) for Nkambe Central Subdivision, all granted permission to conduct the study. Everyone who participated in the study was fully informed about its goals, the nature of their involvement, and the potential risks and benefits of doing so. With this information, participants were better able to determine whether to engage. Additionally, participants were aware that they might withdraw from the study at any time without repercussions. This preserves their independence and ensures that their participation is entirely voluntary. Participants were assured that their responses would be treated with the utmost confidentiality and that no published conclusions would include their names. To further protect their anonymity, all personally identifiable information would be removed or coded, making it difficult to connect comments to individuals. This commitment to

anonymity not only among safeguard participants but also encourages honest and transparent responses, both of which are essential to the study's validity.

Data availability

To prevent access from outside meddling, the study's data was kept on a password-protected computer for five years before the researcher could delete it.

Competing interests*

The author declares no competing interests

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