

## **WATER SUPPLY AND LIVELIHOODS OF PASTORALISTS IN KAJIADO COUNTY, KENYA**

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## **ABSTRACT**

The pastoral production system in the Kenya region was in a crisis state since it could no longer meet the fundamental demands of the population, whose very survival was closely related to the success of this sector. The crisis was based on the emergencies that were faced, such as drought, which threatened the livestock and thus threatened the livelihood of the pastoralist community. Therefore, this study aimed to determine the effects of water supply on their livelihoods in Kajiado County. This study was guided by the Sustainable Livelihood Framework (SLF). The study employed a descriptive survey design, targeting stakeholders involved in emergency livestock interventions, including government departments, NGOs, veterinary officials, and county leaders. The researcher targeted 169 relevant Government of Kenya line department

officials, 83 NGO officials, 48 veterinary officials, and 78 county leaders in charge of livestock management, totaling 378 individuals. Stratified random sampling was utilized, with a sample size of 113 individuals. Research instruments included a questionnaire with structured and unstructured questions, validated through content validity and assessed for reliability using Cronbach's alpha. Water tracking techniques and community participation were effective in providing timely water access during dry periods. Dams, pans, boreholes, and water tanks played critical roles in enhancing water availability and resilience against water scarcity.

**Key words:** Water Supply, Livelihoods, Pastoralists, Kajiado County

## **INTRODUCTION**

The dependence of pastoralist communities on their livestock for livelihood is underscored by various factors. Livestock, being a cornerstone of their economic sustenance, holds the potential to be sold or utilized as a resource for the economy, including agricultural practices (Ayele, Dedecha, & Duba, 2020). However, the harsh weather conditions prevalent in these regions contribute to a notably high mortality rate among cattle, resulting in extreme poverty for the communities that rely on them (Turner & Schlecht, 2019). To safeguard farmers' means of subsistence, many nations worldwide implement emergency interventions for cattle. As an example, the Indian government guarantees the availability of veterinary services to address the proliferation of illnesses that pose a danger to cattle (Suman, 2022). In the United Kingdom, during food shortages, livestock keepers gain access to animal supplementary feeding (Goggs *et al.*, 2019). Such interventions, as highlighted by Dominguez-Salas *et al.* (2019), play a crucial role in securing farmers' ability to earn a living, thereby contributing to economic expansion.

In Sub-Saharan African nations like Malawi and Zimbabwe, which heavily rely on cattle production, herd movement to pasture and water locations is a unique production system (Fasina *et al.*, 2021). However, the physical environment's limitations and the inverse correlation between pastoralists' adaptability and available resources pose challenges. In semi-arid regions like Congo and Zambia, inadequate infrastructure and services for cattle producers are evident (Ayebare *et al.*, 2023; Nyajeka & Duncombe, 2022).

South Africa utilizes interventions during emergencies to protect the livelihood of livestock keepers, including restocking animals after some pass away (Harrison *et al.*, 2021). Similarly, the Egyptian government has implemented measures to guarantee the livelihood of livestock keepers, focusing on improving the availability of clean water and high-quality veterinary care (Goma & Phillips, 2022). East Africa, particularly pastoralism, stands as a significant economic activity, providing livelihoods for millions of people (Sottile *et al.*, 2021). In countries like Somalia, Eritrea, Djibouti, Sudan, and Ethiopia, a substantial portion of the population engages in pastoralism and agro-pastoralism, with estimates suggesting that these areas contribute 80% of the cattle in Sudan (Schlee & Watson, 2022). Notably, pastoralists in Kenya play a crucial role by providing the highest proportion of beef to the market compared to private ranches (Nyariki & Amwata, 2019).

The pastoralist community in Kajiado County in Kenya, faces challenges due to environmental issues, particularly drought, impacting livestock maintenance. Divisions such as Ewaso, Central, Magadi, and Mashuru in Kajiado County are most affected, leading to adverse conditions in pastoral areas like Kimana, Lenkisir, Mbirikani, Rombo, Lower Kuku, South and Central Keekonyokie in Ngong, Isinya, Ngong, and Namanga. The primary water supply through boreholes and temporary sources is dry (Kaoga *et al.*, 2021). Against this backdrop, the study aims to evaluate the effects of emergency livestock interventions on the livelihoods of pastoralists in Kajiado County.

### **Statement of the Problem**

Range pastoralism serves as the predominant livelihood in Kenya's dry lands, encompassing more than 80% of the county's landmass and supporting approximately 25% of the national population. This pastoralist practice contributes significantly to the region's dynamics, accounting for over 50% of all livestock, 65% of wildlife, 30% of crop agriculture, and 7% of commerce (Huho *et al.*, 2020). However, the pastoralist community in Kajiado County faces substantial challenges to their livelihoods, primarily stemming from drought and other environmental phenomena, which significantly impacts livestock maintenance. Specifically, divisions such as Ewaso, Central, Magadi, and Mashuru in Kajiado County bear the brunt of these challenges, leading to the death of more than 0.17 million livestock in the financial year 2021/2022. Disturbingly, the State Department of Livestock (2023) reported that over 0.121 million cattle succumbed to these challenges in Kajiado County alone, amounting to a financial loss exceeding US Dollars 46,538,461.50. The scarcity of primary water supplies from boreholes and temporary sources exacerbates the dire situation (Kaoga *et al.*, 2021). This water scarcity has further ramifications, impacting the survival rate of young animals and contributing to a spike in the school dropout rate, which surged from 9.8% in 2021 to over 15% in 2023. The implementation of the plan to allocate proceeds from the sale of the cows for investment in household projects encountered a standstill.

The intricate web of challenges facing the pastoralist community in Kajiado County unveils a stark reality: despite its pivotal role in sustaining livelihoods and regional dynamics, the sustainability of range pastoralism is under siege. A study by Mburu *et al.* (2023) in Kajiado County highlighted challenges faced by pastoralists, including livestock fatalities due to drought and diseases. Conversely, Onono, Mutua, Kitala, and Gathura (2019) emphasized the centrality of livestock to the people of Kajiado, underscoring the need for diverse measures and interventions to ensure effective livestock production. Gaitho (2018) established that the absence of emergency interventions has resulted in pastoralists in Kajiado losing livestock to natural calamities and diseases. Importantly, extant studies have predominantly employed case study and exploratory study designs, whereas the current study adopts a descriptive design, contributing a distinct methodological approach to the existing body of knowledge. This study therefore aimed to investigate the effect of water supply on the livelihoods of pastoralists in Kajiado County, Kenya.

### **Justification and Significance of the Study**

Almost all the pastoralist lost 99% of their livestock to the relentless drought afflicting Kajiado County for over three years 2020 to 2023. The devastating impact of this prolonged environmental crisis extends beyond the loss of livestock, with Households aspirations of constructing a new home, improved food security, educating their loved ones and saving their income abruptly halted. The dire consequences ripple through the community, affecting livelihoods, education, and mental well-being (State Department of Livestock, 2023).

From farmers, emblematic of countless herders grappling with the aftermath of persistent drought, recounts the anguish of watching the cattle perish due to the scarcity of pasture. The gravity of the situation is further exemplified by the cessation of the dream construction project,

as the intended proceeds from selling the livestock evaporated with the livestock's death. This setback compels the farmers to seek alternative employment, underscoring the economic upheaval faced by pastoralists in Kajiado. The agony of such losses resonates not only in economic terms but also in the disruption of familial plans (County Government of Kajiado, 2023).

The carcasses served as poignant symbols of the collective hardships endured by pastoralist communities in Kajiado. According to World Meteorological Organization (2023) Kajiado County grapples with a severe livestock crisis over the years and the consequences extend to malnutrition among children, a cultural disruption due to limited grazing fields, and a palpable mental health crisis, evident in increased substance abuse and gender-based violence cases.

This study sought to illuminate the multifaceted ramifications of emergency livestock interventions on the precarious livelihoods of pastoralists in Kajiado County. Against the backdrop of economic losses, livestock mortality, and socio-educational consequences, this research aimed to provide insights into the effectiveness of interventions in mitigating the adverse impacts of environmental adversities on the pastoralist community. The urgency of this study was underscored by the profound challenges faced by individual farmers, and numerous others in Kajiado, whose lives have been profoundly affected by the prolonged drought, demanding comprehensive strategies to alleviate their plight and safeguard their future well-being.

The study on the effect of emergency livestock interventions on the livelihoods of pastoralists in Kajiado County holds significant implications for various stakeholders. For farmers in Kajiado, who have borne the brunt of a staggering 99% livestock loss due to the prolonged drought, this research is pivotal. It sheds light on the profound impacts of the environmental crisis, extending beyond mere economic losses to encompass disrupted familial plans, halted construction projects, and diminished aspirations for improved food security and education. The plight of these farmers, grappling with the aftermath of persistent drought, highlights the urgent need for effective interventions to alleviate their economic upheaval and restore their livelihoods.

The implications of this study reverberate beyond individual farmers, resonating with both the national and county government. The severe livestock crisis in Kajiado County, underscores the urgency for strategic interventions. The results of this study may help shape programs and policies that help pastoralist communities cope with environmental challenges. Findings from this research may help pastoralists overcome the complex problems they confront by shedding light on the efficacy of emergency livestock solutions. That is in line with the larger goals of the federal and local governments, which are to protect the lives and livelihoods of their respective populations.

Environmentalists in Kenya stand to gain valuable insights from this study, considering the escalating livestock crisis and its environmental implications. The limitations of grazing fields and dried water sources underscore the need for sustainable environmental practices that

balance the nomadic lifestyle integral to the pastoralist community with the preservation of ecosystems. By addressing the environmental dimensions of the crisis, the research aids environmentalists in advocating for practices that ensure the resilience of both pastoralist livelihoods and the ecosystems they depend on.

Scholars, too, can find significance in this study as it contributes to the academic discourse surrounding the impact of emergency livestock interventions on pastoralist livelihoods. The multifaceted ramifications explored, encompassing economic losses, livestock mortality, and socio-educational consequences, offer an understanding of the challenges faced by pastoralist communities in the wake of environmental adversities. This research provides a foundation for further academic inquiry and serves as a valuable resource for scholars interested in environmental resilience, sustainable interventions, and the intersection of livelihoods and climate-related crises. Overall, the study's implications extend far beyond Kajiado, resonating with diverse stakeholders and contributing to the collective knowledge aimed at addressing the complex challenges faced by pastoralist communities in Kenya.

### **Water Supply and Livelihoods of Pastoralists**

Balfour, Obando, and Gohil (2022) investigated the complex relationship between water accessibility and the means of subsistence for pastoralist groups in northern Kenya. Their mixed-methods study shed light on the growing threats to water security that sedentarized pastoralists, particularly women and children, confront as a result of changes in their socio-ecological contexts. Their research demonstrated that preexisting power dynamics in sociocultural and water governance systems exacerbate water scarcity by making people more susceptible to changes in water availability over time and space. The importance of social capital in protecting against water stress is shown by their results, which highlight the resilience of women who have diverse livelihoods and strong social networks. Further research is needed to support targeted solutions, since there are still gaps in our understanding of how water insecurity is impacted by livelihood diversification and livestock numbers.

To a large extent, Balfour and Mutuku (2018) helped shed light on the complex dynamics of water security issues faced by Kenyan pastoralist communities. They found empirical data clarifying elements contributing to water security and solutions increasing resilience by utilizing a mixed-methods approach across urban and rural populations in Samburu County. Their results corroborated those of other studies and highlighted the critical role of social capital in building community resilience in the face of water stress. Their study did find some unanswered questions about how different types of livelihoods affect water security, so there's clearly a need for further research to fill this gap and provide a whole picture.

In order to fill a significant gap in the existing research, Boateng *et al.* (2018) created and validated a scale measuring household water insecurity that was specifically designed for the Kenyan environment. A strong instrument that can measure water insecurity at the household level was the result of their thorough research, which included psychometric evaluations and qualitative methodologies. They proved the reliability and validity of the scale via validation procedures, opening the door to detailed studies of water insecurity's incidence and effects on

communities. In addition to laying the groundwork for future studies, their findings highlighted the link between water insecurity and wider psychological and health consequences, paving the way for further multidisciplinary investigation.

Piemontese *et al.* (2024) provided an in-depth analysis of how pastoral drylands' climate resilience was affected by water infrastructure development, shedding light on the complicated trade-offs that come with such interventions. They used anthropological literature and modeling exercises to show how small water infrastructures (SWIs) might help with water shortages in the short term, but they warned that these infrastructures could have negative effects on conventional adaption methods in the long run. Their research demonstrated that effective governance is key to reducing the decline in resilience and making sure that interventions can withstand changing social, economic, and environmental conditions. Their work contributed to the ongoing conversation on water infrastructure development in dryland areas by offering quantitative insights into resilience dynamics. It also highlighted the need for comprehensive and context-sensitive measures to help pastoral communities become more resilient in the long run.

### **Theoretical Review**

The Sustainable Livelihood Framework (SLF) developed by DFID (Department for International Development) in 1999 is highly relevant to the study on veterinary intervention measures and the livelihoods of pastoralists in Kajiado County. The SLF asserts that individuals construct their livelihoods within a context of vulnerability, shaped by factors like drought hazards, seasonal variations in prices, and other influences that directly impact their options for sustaining their lives (Natarajan *et al.*, 2022). Pastoralist communities are particularly in need of this paradigm in the wake of prolonged droughts since their livelihoods depend critically on pasture, water, and the well-being of their cattle.

In the study, the SLF identifies five types of assets crucial for supporting livelihoods. Physical assets include livestock, which is a primary source of income for pastoralists in Kajiado County. Human assets encompass the labor, skills, and experience necessary for livestock production. Social resources within the community, such as support networks, play a role in protecting individuals from hazards. Natural assets, including land, pasture, and water supplies, are integral for sustaining livestock, while financial assets, like savings and access to credit, are vital for coping with economic shocks (Biswas *et al.*, 2022). This aligns with the study's focus on veterinary intervention measures that aim to protect and enhance these key livelihood assets.

However, the SLF has its limitations. One key limitation is its static nature, as it doesn't sufficiently account for the dynamic and evolving nature of livelihoods over time. Livelihood strategies are influenced by changing structures and processes, including policies and institutions, and the SLF might not capture the complexity of these interactions adequately (DFID, 1999). Additionally, the framework may not fully address cultural and contextual variations that shape livelihoods, which are crucial considerations in pastoralist communities. Despite these limitations, the SLF remains applicable in understanding and analyzing the

livelihoods of pastoralists in Kajiado County. It provides a comprehensive and structured approach to examining the diverse assets and strategies that individuals employ to sustain their livelihoods. The framework's focus on the interplay between assets, institutions, and policies is particularly relevant to the study, shedding light on the broader context in which veterinary interventions are implemented and their impact on the overall well-being of pastoralist communities.

## **RESEARCH METHODOLOGY**

A descriptive survey design was used in the investigation. The researcher targeted the stakeholders involved in emergency livestock interventions which includes relevant Government of Kenya line departments (169), NGO officials (83), and veterinary officials (48) and county leaders in charge of livestock management (78). Thus, the study targeted 378 individuals.

Stratified random sampling was used to collect data from all respondents due to the diverse nature of the community. Thirty percent is considered an adequate proportion of the target demographic by Mugenda and Mugenda (2003). So, 113 respondents were selected for the research. A questionnaire was the primary tool for collecting data. A questionnaire including both structured and unstructured questions was used to collect the data. The questionnaire included standardized questions to ensure that all respondents consistently answer the same things. Results from the structured questionnaires were analyzed using statistical methods implemented in the Statistical Package for the Social Sciences (SPSS). First, to make sure the dataset is accurate, all of the acquired data was cleaned thoroughly to remove any mistakes. The next step was to code the data in a systematic way so that analysis can be done efficiently. The study's results were described and explained using frequencies, percentages, means, standard deviations. In order to comprehend how emergency livestock interventions affected the livelihoods of pastoralists in Kajiado County, these metrics provided a thorough review of the quantitative data. For better understanding and comprehension, the findings were presented using frequency tables, percentages, charts and the regression model.

### **Research Findings and Discussions**

The response rate from various stakeholders involved in emergency livestock interventions in Kajiado County, Kenya, as indicates a generally high level of engagement. The Government of Kenya line departments had a response rate of 88.2%, with 45 out of 51 targeted respondents filling out the questionnaire. This high percentage reflects a strong interest and active involvement from government departments in livestock management and emergency interventions.

NGO officials also demonstrated substantial participation, with an 80.0% response rate. Veterinary officials had an 85.7% response rate indicating their crucial role and willingness to contribute to the study. County leaders in charge of livestock management had a slightly lower but still significant response rate of 78.3%. Overall, the total response rate across all categories was 84.1%. This high response rate across different stakeholder groups underscores the



importance and relevance of the study on emergency livestock interventions and the livelihoods of pastoralists in Kajiado County.

### **Demographic Characteristics**

Out of the total 95 respondents, 53 are male, representing 55.8% of the sample, while 42 are female, making up 44.2% of the respondents. This nearly balanced distribution indicates a slight predominance of male participants in the study. Out of the total 95 respondents, 11 of them (11.6%) were aged between 26 and 35 years, 69.5% were aged between 36 and 45 years while the remaining 18.9% were aged above 45 years. The age distribution highlights that the largest group of participants is in the 36 to 45-year age bracket, representing nearly 70% of the sample.

In terms of length of experience, 2.1% had less than 1 year, another 2.1%, had between 4 to 7 years, 4.2% had between 1 and 3 years while 91.6%, had more than 7 years of work experience. The data indicates that a majority of the respondents, 56.8%, hold a degree, making it the most common educational qualification among the participants. Those with a diploma constitute 33.7% of the respondents, while a smaller percentage, 9.5%, have attained a master's degree.

### **Descriptive Analysis Results**

This paragraph integrates the interpretation of Table 1 with the relevant empirical studies, providing a comprehensive overview of the findings and their implications for water supply management in pastoralist communities.

**Table 1: Descriptive Analysis on Water Supply**

	Mean	Std. Dev
In order to provide timely access to water during dry times, water tracking techniques have been successfully implemented.	3.4105	.49454
The community has actively participated in and benefited from water tracking initiatives to secure water resources for their livestock.	3.8737	.50196
The presence of dams and pans in the region has significantly contributed to water availability for pastoralists and their livestock.	3.4421	.49927
The maintenance and expansion of dams/pans have positively impacted the resilience of pastoralist communities during water scarcity periods.	3.3895	.51146
The existence of drilled emergency boreholes within the county has enhanced the overall water supply infrastructure.	3.9632	.51129
Pastoralists have experienced improved water accessibility through the development and upkeep of boreholes in their communities.	3.9105	.49454
The utilization of water tanks as a water supply measure has proven to be a reliable solution during emergencies.	3.8211	.51734
The provision of water tanks has contributed to better water management practices, ensuring the well-being of both livestock and pastoralists.	3.9368	.51799

The results from Table 1 provide insights into the effectiveness of water supply management strategies among pastoralist communities in Kajiado County, Kenya. The mean for the implementation of water tracking techniques to provide timely access to water during dry periods is 3.4105, with a standard deviation of 0.49454, indicating moderate agreement and relatively consistent opinions among respondents. This finding is aligned with Piemontese *et al.* (2024), who emphasize the role of small water infrastructures, such as water tracking, in mitigating short-term water shortages. Furthermore, the mean of 3.8737 and a standard deviation of 0.50196 for community participation in water tracking initiatives demonstrate strong agreement that the community has actively benefited from these initiatives, with slightly more variation in responses. This observation is consistent with the findings of Balfour, Obando, and Gohil (2022), who highlight the significance of social capital and community involvement in securing water resources for livestock in pastoralist regions.

The presence of dams and pans also received a moderate mean of 3.4421, with a standard deviation of 0.49927, indicating a consistent perception that these water infrastructures significantly contribute to water availability for pastoralists and their livestock. This finding supports the conclusions drawn by Balfour and Mutuku (2018), who emphasized the critical role of water infrastructure in enhancing resilience against water stress. Similarly, the maintenance and expansion of dams and pans were rated with a mean of 3.3895 and a standard deviation of 0.51146, showing moderate agreement that these efforts have positively impacted the resilience of pastoralist communities during periods of water scarcity. These results are in line with Piemontese *et al.* (2024), who underscore the importance of developing and maintaining water infrastructure in dryland areas.

Additionally, drilled emergency boreholes within the county were rated highly, with a mean of 3.9632 and a standard deviation of 0.51129, indicating strong agreement that these boreholes enhance the overall water supply infrastructure. The perception that boreholes have improved water accessibility was also highly rated, with a mean of 3.9105 and a standard deviation of 0.49454, showing that respondents widely agree on the effectiveness of this intervention. These findings reflect similar conclusions made by Boateng *et al.* (2018) on the reliability and impact of emergency water measures like boreholes during critical times.

Water tanks were also perceived as reliable solutions during emergencies, with a mean of 3.8211 and a standard deviation of 0.51734, indicating strong agreement among respondents. This perception aligns with Balfour, Obando, and Gohil's (2022) emphasis on temporary water storage systems as a critical part of water supply measures in pastoralist communities. Additionally, the contribution of water tanks to better water management practices was rated highly, with a mean of 3.9368 and a standard deviation of 0.51799, underscoring their role in ensuring the well-being of both livestock and pastoralists. These results reinforce the need for comprehensive and context-sensitive water management solutions, as discussed by Balfour, Obando, and Gohil (2022). Overall, these findings highlight the critical role of water infrastructure and community participation in enhancing water accessibility, management, and resilience among pastoralist communities in Kajiado County, Kenya.

### **Livelihood of Pastoralists**

The study seeks to understand the livelihoods of pastoralists within the context of various socio-economic and environmental factors. Pastoralism, as a way of life and economic activity, is deeply intertwined with the sustainability of communities that rely on livestock for their primary source of income and sustenance.

**Table 2 Descriptive Results on Pastoralists Livelihood**

	Mean	Std. Dev
The education initiatives implemented for pastoralist communities have positively impacted the well-being of children in terms of access to education.	3.2226	.55678
The diversification of income-generating activities, as promoted by interventions, has improved the economic stability of pastoralist households.	3.7896	.50005
The availability of off-farm employment opportunities has positively influenced the financial resilience of pastoralist families	3.6789	.67895
The emergency livestock intervention has effectively increased pastoralists' access to grazing land and water resources.	3.5468	.57898
Land tenure and access to communal grazing areas have improved, ensuring sustainable resource management among pastoralist communities.	3.7689	.65456
The emergency livestock intervention has played a crucial role in ensuring nutritional security for both pastoralists and their livestock.	3.7667	.56466
Access to supplementary feeding during periods of scarcity has significantly contributed to the food security of pastoralist households.	3.6568	.54555

The descriptive results in Table 2 shed light on the livelihood strategies among pastoralist communities, particularly in the areas of education, economic stability, and access to essential resources. The education initiatives implemented for pastoralist communities show a moderate positive impact on the well-being of children, with a mean of 3.2226 and a standard deviation of 0.55678. This indicates some level of agreement among respondents regarding the positive effects of these initiatives, although the variation in responses suggests that the impact of education initiatives may not be uniformly experienced across different households. Studies such as Barrett *et al.*, (2019) have similarly observed that while education programs targeting pastoralists have had some success, barriers such as mobility and resource limitations hinder full access to education in these communities.

The diversification of income-generating activities has been perceived as significantly improving the economic stability of pastoralist households, as reflected by a mean of 3.7896 and a standard deviation of 0.50005. This relatively high mean suggests strong agreement that interventions promoting income diversification are effective in enhancing economic resilience. The low variability in responses implies a consensus among respondents regarding the benefits of this approach. Empirical studies by Little *et al.*, (2020) corroborate these findings,

emphasizing that income diversification—through activities such as trade, handicrafts, and small-scale farming—has been essential for reducing the economic vulnerabilities of pastoralist households.

Regarding financial resilience, the availability of off-farm employment opportunities has positively influenced pastoralist families, with a mean of 3.6789 and a standard deviation of 0.67895. While the mean reflects agreement with the positive influence of off-farm employment, the higher standard deviation points to a greater variability in responses, suggesting that not all pastoralists may have equal access to these opportunities. Empirical evidence from studies like Aklilu and Catley (2020) supports the notion that off-farm employment can provide crucial financial buffers for pastoralists, though access to such opportunities is often unevenly distributed due to factors like geography, skills, and education levels.

In terms of emergency interventions, respondents generally agreed that livestock interventions have been effective in increasing access to grazing land and water resources, with a mean of 3.5468 and a standard deviation of 0.57898. This is further supported by the perception that land tenure and communal grazing access have improved, with a mean of 3.7689 and a standard deviation of 0.65456, which indicates that while many agree, there is some variation in experiences. Empirical studies by Flintan *et al.* (2019) similarly observe that securing land tenure and improving access to communal grazing areas are essential for sustainable resource management in pastoralist systems. Additionally, the role of livestock interventions in ensuring nutritional security for both pastoralists and their livestock is well-recognized (mean = 3.7667, standard deviation = 0.56466), aligning with findings by Scoones (2021) on the importance of emergency livestock support for food security in pastoralist areas. Access to supplementary feeding during periods of scarcity also contributes significantly to household food security (mean = 3.6568, standard deviation = 0.54555), reinforcing the importance of targeted nutritional interventions in supporting vulnerable pastoralist communities, as discussed in empirical work by Little and McPeak (2019).

### **Inferential Analysis**

*Table 3: Coefficients<sup>a</sup>*

Model	Unstandardized		Standardized	t	Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta		
1 (Constant)	23.467	3.356		6.993	.000
Water Supply	1.031	.134	.562	7.716	.000

a. Dependent Variable: Livelihoods of Pastoralists

The adopted model was;  $Y=23.467+ 1.031X_2+ e$

The constant term is 23.467, indicating that if all predictors (water supply) are zero, the predicted value of livelihoods of pastoralists would be 23.467. The coefficient for water supply is 1.031 (Std. Error = 0.134,  $t = 7.716$ ,  $p = 0.000$ ). This suggests that for every unit increase in water supply, the predicted livelihoods of pastoralists increase by 1.031 units, holding other variables constant. This result is consistent with the findings of Balfour, Obando and Gohil (2022), who highlighted the critical role of water accessibility in enhancing the livelihoods of pastoralist communities.

### **Conclusion**

Water supply management strategies are essential for ensuring the well-being of both pastoralists and their livestock during dry periods. Effective water tracking techniques, community participation in water initiatives, and the presence of dams, pans, and emergency boreholes were found to enhance water availability and community resilience.

### **Recommendations**

To improve water supply management, it is recommended to promote sustainable water management practices such as the maintenance and expansion of existing dams, pans, and boreholes. Community involvement should be encouraged in water tracking initiatives to ensure efficient water distribution during dry periods. Develop policies that promote education and capacity building among pastoralist communities. This includes training programs for livestock management, water conservation techniques, and business skills to improve economic opportunities and resilience.

### **Suggestions for Further Study**

The study suggested conduct longitudinal studies to track changes in pastoralist livelihoods and resilience strategies over time. This would provide insights into the long-term impacts of interventions and environmental changes on pastoralist communities. Compare the resilience strategies and livelihood impacts of pastoralist communities across different regions and countries. This would help identify context-specific factors that influence resilience and adaptation. Assess the role of institutional support and governance frameworks in enhancing adaptive capacities. Explore the role of technological innovations, such as mobile applications for weather forecasting, remote sensing for pasture monitoring, and blockchain for livestock traceability, in improving pastoralist livelihoods and resilience.

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