



Perception of the Degree of Severity of Climate Crisis and Effectiveness of Coping Strategies for Sedentary Livestock Production in the Northern Agro-Ecological Zone of Katsina State, Nigeria



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ABSTRACT

The study was carried out to appraise the severity of climate crisis and effectiveness of coping strategies adopted by sedentary livestock producers in the Northern Agro-Ecological Zone of Katsina State Nigeria. The study was carried out in three sampled LGAs of the study area, and 267 households engaged in to sedentary livestock production were surveyed with the aid of structured questionnaires administration. The households sampled for the study were selected using multi stage sampling technique and the result was analysed using descriptive statistics. The results show that nearly 40% of respondents reported severe impact of climate crisis on sedentary livestock production while more than 35% of the respondents perceived the impact of climate crisis on sedentary livestock production as moderate. The result also indicated that majority of the respondents (44.6%) are of the view that climate crisis will likely be damaging to sedentary livestock production in future. The result further outlined switching from crops to livestock and to irrigation production systems was considered very effective. It was observed that adoption of drought resistance breed was understood to be effective according to respondent's opinion. The study concludes that severe and very severe impact of climate crisis may affect the sedentary livestock production system and also the effect may likely be damaging and disruptive over time and the study recommended for the need to increase livestock productivity through improvements in animal genetics and switching from crops to livestock to irrigation production systems as well as adoption of drought resistance breed.

CITATION

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INTRODUCTION

Over the past decades, the world has started witnessing higher temperatures and changing precipitation levels, which led to the poor agricultural production. Evidences of climate crisis have already affecting crop and animal production especially in many countries of global dry

lands. According to Sule et al., (2024) sedentary livestock production is so sensitive to climate crisis and will be continuously affected by the adverse effect if urgent action adaptation and mitigation strategies were not taken. Agriculture in particular livestock production is a highly climate-sensitive sector, and it is already affected by

climate crisis in many parts of the world, Nigeria and Katsina State inclusive.

Livestock production is one of the world dominant land use that support the livelihood of the people, it covers about 45% of the Earth's land surface (Lance et al., 2015). Climate crisis (CC) can affect severely the major components of the livestock production systems such as the amount, quality of produce as well as the reliability of production, and the natural resource base which the livestock production depends. Globally livestock production systems especially in developing countries are changing rapidly in response to a variety of drivers such as climate crisis, population expulsion, and population pressure on natural resources, rapid urbanization and the global demand for livestock products among others (Agbeja et al., 2021). Climate crisis therefore remains one of important factor that negatively and severely affect agricultural productivity by making the environments harsh and unsuitable for the purpose of livestock production.

Livestock production systems directly and indirectly support the livelihoods of millions of people. Spiller et al., (2023) argued that livestock sector employs 1.3 billion people and creates livelihoods for around one billion of the worlds poor. Globally, mixed livestock systems provide 50 percent of the world's meat and over 90 percent of milk, and extensive pasture and grazing systems provide about 20-30 percent of beef and mutton production. It is one of the rapidly-growing agricultural subsectors among the low incomes and poor vulnerable households' of developing countries Agbeja et al., (2021) argued that livestock play a critical role in the agricultural sector in developing nations, and the livestock sector contributes 40% to the agricultural GDP, as the global demand for foods of animal origin is growing and it is the livestock sector that is growing and expanding.

The sustainability of livestock production systems is drawing the attention of so many stakeholders both from the research and policy making dimensions. For instance Agbeja et al., (2021) argued that livestock system is one of the most important and critical sector of agrarian economy, that provides sustainability and stability to the nation economy by contributing to food and energy production as well as food security. Unfortunately climate crisis is seen nowadays as a major threat to the survival of many species, ecosystems and the sustainability of livestock production systems especially in dry lands of the world. The impact of climate crisis on livestock production systems can be noticed from shocks such as drought. prevalence of parasites and diseases mortality of the livestock reduction of animal feed and fodder, reduction on the availability of surface and ground water among others (Agbeja et al., 2021; Sule. Yaro & Adamu, 2020). Many studies including Seijan (2013), Sule, Yaro & Adamu (2020) and Agbeja et al., (2021) further maintained that

livestock production systems are adversely affected by the detrimental effects of extreme weather. These climatic and extreme weather events significantly affect the quantity and quality of the products thereby resulting to declines in production and mortality of the livestock.

In Katsina State, sedentary livestock production is considered as one of the most important sectors in economy and is a life support economic activities among the peasant farmers. Thus, Katsina State is highly vulnerable to effects of climate crisis and understanding the responses of the farmers on the crisis is crucial, as it will help to find suitable and appropriate coping and adaptation strategies. Furthermore, Nimet (2024) and Sule et al., (2024) argued that climate crisis characterized with below normal rainfall amounting 418mm-750mm may likely create water stress in and around parts of Katsina State especially the desertification trend line Local Government Areas where this study was conducted and pointed out the key economic activities that may be affected including livestock, crop and aquaculture production and stressed the need for effective water resources management systems with a view of equipping the country, communities and households who will be vulnerable to the projected scenarios with seasonal climate prediction to prepare for the situation.

In an effort to establish a clear gap; Sule, Garba, Liman & Tayo, (2025), appraised Sedentary Livestock Production amidst Climate Crisis in the Northern Agro-Ecological Zone of Katsina State, Nigeria, Sule, Yaro & Adamu (2020) that assessed of sedentary pastoralists perception of climate change in and around forest and grazing Reserves of semi-arid areas of Northern, Nigeria. While Yaro, Sule, & Adamu, (2020) investigate Fulani pastoralist perception of climate change in some selected communities of Dutsin-Ma Local Government Area Katsina State, Nigeria and that of Murtala, Arokoyu, & Weli (2020) that conducted study on perception of climate change and its effects on rural livelihood in Katsina State, Nigeria. None of these studies investigated the perception of the degree of severity of climate crisis and effectiveness of coping strategies for sedentary livestock production in the northern agro-ecological zone of Katsina State, Nigeria.

CONCEPTUAL CLARIFICATION

Livestock Production Systems

According World Atlas of Desertification as cited in Sule et al., (2024) livestock production systems consist of many types of land cover and land use, cropping systems, pasture conditions, sizes of human populations, herd structure and genetic composition and management strategies, depending on the type of production system, livestock play different roles in people's livelihoods. Livestock production systems for simplicity can be classified into four types, based on the degree of integration of livestock with cropping systems. These are;

grazing system in which more than 90 % of dry matter fed to animals comes from rangelands, pastures, annual forages and purchased feeds. Grazing systems occupy about 26% of the Earth ice free land surface. Followed by mixed rain-fed systems where more than 90 % of the value of non-livestock farm production comes from rain-fed land use as well as mixed irrigated systems which more than 10 % of the value of non-livestock farm production comes from irrigated land use. The landless system is the fourth one which highly involve intensive monogastric or ruminant systems where feedstuff is purchased from external sources associated primarily with urban areas. According to Agriculture Nigeria (2022) and Sule et al., (2024) livestock is a term used to describe any domesticated animal raised in an agricultural setting to produce commodities such as food, fiber, labor and profit. Animal husbandry is a component of modern agriculture and has been practiced in many cultures and is one of the major source of government revenue as well as household income and means of livelihood.

Sedentary Livestock Production Systems

These systems have to do with herders live in non-transportable dwellings places its involves the settlement of herders within geographical area with the shift from a single animal husbandry livelihood option to a diversified options based on animal husbandry, with modernization, specialization, and intensification as a natural resource capital. Extensive sedentary systems are practiced mainly everywhere in the World especially where properties have boundary fences and are often divided into fenced paddocks (Sule et al., 2024).

Sedentary livestock production is a pastoralism predominated with a shift from seasonal nomadism to a settlement of nomadic herders with a small proportion of livestock, it is the mode of production that shifted from a single animal husbandry livelihood to a diversified livelihood based on animal husbandry with modernization, specialization and intensification as nomadic livestock production changed so as nomadic livelihood capital. Sedentary livestock systems are likely to be affected more by the negative impacts of climate change and crisis as predicted in dry land regions by Intergovernmental Panel on Climate Change (IPCC) than pastoral or nomadic systems.

Climate Crisis

The United Nation Development Programme [UNDP](2023) described the climate crisis as the serious problems that are being caused, or are likely to be caused, by changes in the planet's climate, including weather extremes and natural disasters, ocean acidification and sea-level rise, loss of biodiversity, food and water insecurity, health risks, economic disruption, displacement, and even violent conflict. The

Intergovernmental Panels on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC) have identified climate change as one of the most important and greatest threat of the century and reported that the earth's average temperature has risen by 0.740 C. Climate crisis is caused by both natural and anthropogenic causes resulting to various environmental issues such as rising sea levels, melting of ice at the world's poles and on its mountains and violent downpours resulting in over flooding and submerging of coastal areas and consequent migration of animal species; heat waves leading to desertification, depletion of water availability, reduced animal metabolism and agricultural food production, loss of biodiversity, food insecurity, decreased animal production and health etc (Onoja, Dibua & Enete, 2011).

MATERIALS AND METHODS

The study area covers the extreme northern part of Katsina State which includes LGAs like Jibia, Kaita, Mashi, Mai'adua, Zango and Baure. These LGAs are prone aridity and lies within the Sahelian region of Nigeria. The area stretches from Jibia, passes through Kaita, Mashi, Mai'adua, Zango and Baure LGAs. The study area shares boarder with Niger Republic to the North, Jigawa to the North-East, and Zamfara State to the West (Figure 1).

The area enjoys a hot semi-arid climate according to the Koppen climate classification system. The climate of these LGAs is the tropical wet and dry type (Koppen Aw Climate). The climate is typically hot and dry, with prolonged dry seasons and short wet seasons (Abdulkadir, Usman & Shaba, 2013). Rainfall is low and irregular, usually ranging from 300 mm to 600 mm annually. The rainy season lasts from June to September, while the dry season can extend from October to May. There is a strong distinction between the wet and dry seasons. The wet season brings brief but intense rainfalls, while the dry season is long and marked by drought conditions (Lawal, 2013; Murtala, Arokoyu & Weli, 2020).

The area experiences high temperatures year-round, with the hottest period between March and May when temperatures can exceed 40°C. Cooler temperatures are observed during the Harmattan season (November to February), when dry, dusty winds from the Sahara bring down temperatures, especially at night. This cause cooler temperatures, with dusty conditions often creating hazy skies. The climate of this region is harsh, with limited rainfall, high temperatures, and strong seasonal winds, making it vulnerable to drought and desertification. The short rainy season supports only sparse vegetation, typical of Sahelian regions (Folorunsho, Olatunde and Ibrahim, 2024). Sparse vegetation with grasses and scattered trees such as acacia and baobab, are commonly found toward the northern border Sahel savanna. As you transition further south, a more dense Sudan savanna vegetation with

a mix of grasses and shrubs are increasingly available. The region is prone to seasonal changes, with greener

vegetation during the rainy season and dry, barren landscapes during the dry season (Larwanou, 2011).

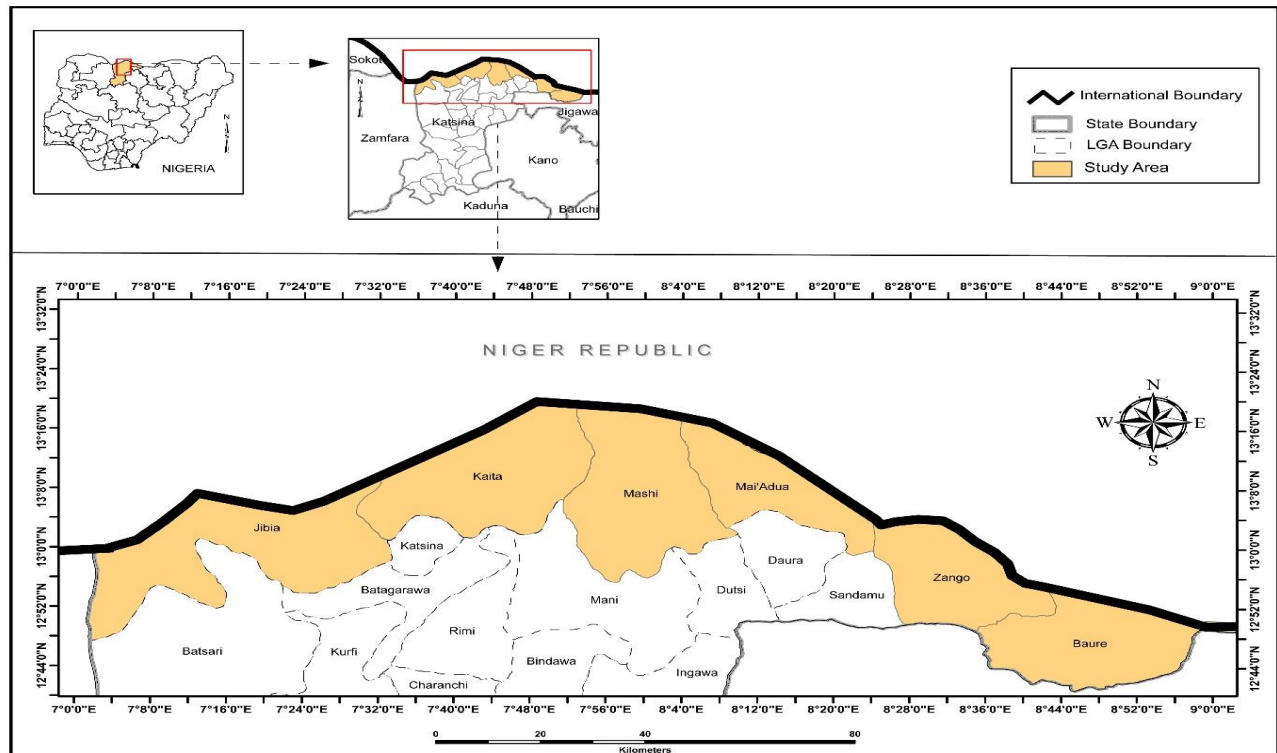


Figure 1: The Study Area
Source : GIS LAB FUDMA

Types and Sources of Data

Both quantitative and qualitative data were used in this study which was generated from both primary and secondary sources. The types of data utilized by the study include socio-economic data of the households such as types and nature of livestock production practice by the households, income/wages, occupation, livelihood options etc. Others are household’s perception on magnitude of the effect of climate crisis on livestock production practiced by the households as well as the coping strategies adopted by the livestock producers to mitigate the effect of climate crisis among others. Furthermore the data for this study were sourced from both primary means by administration of questionnaires and key informant interviews conducted with some stakeholders in the livestock production sector and environmentalist. While data with regard to poor and vulnerable household from LGAs of the study area were obtained from the archived of National Social Safety-Nets Coordinating Office (NASSCO) Katsina State Operation Coordinating Unit 2024 (KATSOCU)

Sampling Methods

Sampling Techniques

The sampling technique used to select the sample for this study is simple random sampling technique. Both the

sampled LGAs and the selected communities were chosen using shuffled cards in which the names of the LGAs and Communities were written on the cards and selected was made from the cards without replacement to give every LGA and Community chance to be selected without bias, through this process all three (3) LGAs and Six (6) communities for the study were selected.

Sampling Frame and Size

According to the National Social Safety-Nets Coordinating Office (NASSCO) Katsina State Operation Coordinating Unit 2024 (KATSOCU), the extreme northern part of Katsina State with Six (6) Local Government Areas (Jibia, Kaita, Mashi, Mai’adua, Zango and Baure) have the total of 91927 poor and vulnerable households. Furthermore, three (3) Local Government Areas out the Six (6) Local Government Areas where sampled and selected for the study, Local Government Areas are Kaita, Mashi and Mai’adua. In addition two (2) communities were selected from each of sampled Local Government Areas Therefore, to determine the sample size, Bartlett, Kotrlik and Higgins (2001) method of determining sample size was adopted. Based on this model, the population sample stands at 91,927 at confidence level of 95% and margin error of 5% while the sample size is 384 elements. The method is computed as:

$$n_0 = \frac{(t)^2 \times (p)(q)}{d^2} \quad (1)$$

Therefore, the required sample size for the population (N) of the study area is calculated as:

$$n_1 = \frac{n_0}{1 + n_0/N} \quad (2)$$

and

$$n_2 = \frac{n_0}{(r/100)} \quad (3)$$

For adjusted sample size for response rate

Where: t = value for selected alpha level of 0.025 in each tail which is 1.96

$(p)(q)$ = estimate of variance which is 0.25

d = acceptable margin of error for proportion being estimated which is 0.05

n_0 = sample size of not more than 5%

n_1 = required return sample size

n_2 = sample size adjusted for respond rate

N = population size

r = anticipated response rate

In order to determine how the questionnaires were to be distributed proportionate distributions was adopted where equal number of respondents in each of the selected communities remains the same. Based on the determined sample size, a total of 384 copies of a questionnaire were administered in the three (3) selected LGAs and two (2) communities drawn from each of three (3) selected LGAs using simple random sampling.

Purposive sampling technique was adopted in this research, to select the households (respondents) to be involve in the study, this was accomplish through careful selection of the respondents from register of selected communities obtained from the LGA Desk officer. The bases for this were to gather information from the households who were genuinely enrolled into the State Social Register.

Adequacy of the Data Collection Instruments

The sum of three hundred and eighty questionnaires were distributed to the target respondents but only two hundred and sixty nine (269) questionnaires were retrieve and returned for data analysis.

$269/384 \times 100 = 70\%$, this implies that 70% of the administered questionnaires were returned and this is adequate for any survey research.

Method of Data Analysis

The quantitative data used in this study was analysed using descriptive statistics and the result was presented in form cross tabulated tables and SPSS version 26 was used to analyse the data. While the result of qualitative data (key informant interview) was presented in form narrative statements and incorporated where necessary and appropriate in the discussion of the result.

RESULTS AND DISCUSSION

Demographic Characteristics of the Households

This section presents the demographic variables of the surveyed households. Table 1 shows that households in the study area are predominantly headed by men (83.9 percent) whereas 16.1% are headed by women. Sule, Yakubu & Tanko (2023) argued that the low of number female head of households in the core north of Nigeria may be attributed to the religion and culture of the people, the study pointed out seclusion (*Purdah*) is the most widely limiting factor.

Age distribution in Table 1 indicates that 3.4% fall within the age bracket of 15-25 years, 15.4% are within the age 26-35 years, and 40.8% are within the age brackets of 36-45 years while 28.8% were between 46-55 years and those above 55 years account for 11.6% of the respondents. This implies that majority of the heads of households are within their productive age which means that they can engage intensively in various forms of livestock production and also deal with climate crisis may affect the livestock production systems and other income-generating activities in the study area. In terms of marital status, the result shows that more than 89% of the respondents were married but their marital status varies greatly, the majority of the head of households (47.2%) were monogamous, (42.3%) were polygamous, (5.6%) were divorces, (3.7%) were separated and (1.1%) were widows. This implies that married people are more involved in livestock production in the study area.

The result further indicated that 39.7% had adult and non formal education while 39.0% had had primary education, 17.6% had Secondary School education and only 3.7% that had tertiary education. Nevertheless, this study argued that educated head of household realizes and are more informed on the negative impact of climate crisis and become more interested in adopting coping strategies that may improve the sedentary livestock production systems in the area.

Other means of livelihood option and income generating activities to some extent determines the stability of livestock production systems in the households. The findings of this study revealed that 72.4% engaged directly in regenerative livelihood options such as crop production, agro-forestry, wood carving, mat making, timber exploitation among other activities this is complement the sedentary livestock production. While those engaged in extractive livelihood options account for 27.6%, these are people that include artisans, sand miners and those engaged in off farm activities like trading. This emphasizes that other means of livelihood option is an un-debatable factor that can improve the livestock production as well as increases the level of income of the households in the study area.

The estimated monthly income level in study area indicated that majority (more than 40% earned less than 30, 000 per month, while those earning above 71,000 monthly account for 22.5% only. This study is of the view that household with high income level could easily engaged in extensive sedentary livestock production and withstand shocks may arise from the climate crisis considering the fact that the high income level can make it easier to afford food and medicine to their livestock.

The result of this study further maintained that households farm land size determine level of fodder resources to be dispose to livestock from the farm during growing season, the result indicated that more than 30% of the respondents are small scale farmers with less 2 hectares of land, with 2-

4 ha account for 27.0%, 5-6 ha 22.5% while 19.8% account for those with above 7 ha of farm land in the study area. The study opined that to the large extent households with large farm lands will no doubt engaged in to extensive livestock production than those with small farm lands. The result further reveals that households with size of 1-5 persons account for 18%, 6-10 people took the lion share of 40.8% while 24.7% and 16.5% went to those with 11-15 and above 15 persons respectively. This study is of the opinion that household size determines to a large extent the contribution of the family members to the provision fodder and pastures resources to the livestock, it is observed that polygamous households has more people to engaged in taking care of livestock.

Table 1: Demographic Characteristics of the Households

Sex	Frequency	Percentage (%)
Male	224	83.9
Female	43	16.1
Total	267	100.0
Age Structure		
15-25 yrs	09	3.4
26-35 yrs	41	15.4
36-45 yrs	109	40.8
46-55 yrs	77	28.8
Above 55yrs	31	11.6
Total	267	100.0
Marital Status		
Monogamous	126	47.2
Polygamous	113	42.3
Divorce	15	5.6
Widow	03	1.1
Separated	10	3.7
Total	267	100.0
Educational Background		
Adult/Non Formal Education	106	39.7
Primary	104	39.0
Secondary	47	17.6
Tertiary	10	3.7
Total	267	100.0
Other Sources of Income		
Regenerative Livelihood Options	193	72.4
Extractive Livelihood Options	74	27.6
Total	267	100.0
Estimated Monthly Income		
Less than 30000	110	41.2
Between 40000-700000	97	36.3
Above 710000	60	22.5
Total	267	100.0
Farm Land Size		
Less than 2ha	82	30.7
2-4ha	72	27.0
5-6ha	60	22.5
Above 7ha	53	19.8
Total	267	100.0

Household Size		
1-5	48	18.0
6-10	109	40.8
11-15	66	24.7
Above 15	44	16.5
Total	267	100.0

Source: Field Survey 2024

Degree of Severity of Sedentary Livestock Production to Climate Crisis

According to Afolabi and Tihamiyu (2021), information is crucial in all human endeavor, profession and disciplines, it is a tool for creating knowledge and awareness in the form of representations that provide meanings and context for purposive action. Thus, there is need for effective and reliable access to information on changing climate. From the result in Table 2, increase in rain fall and temperature variability especially decrease in rainfall and increase in temperature regime coupled with drought and desert encroach in the study area clearly shows the degree and extent to which climate crisis is affecting pasture and fodder production which in turn has significant impact on

sedentary livestock production system. It is evident from the result that, nearly 40% of respondents reported severe impact of climate crisis on sedentary livestock production in their communities while more than 35% of the respondents perceived the impact of climate crisis on sedentary livestock production as moderate, furthermore more than 15% are of the view that the degree to which climate crisis affect sedentary livestock production is becoming very severe as against insignificant number of 9% of the respondents that reported contrary opinion that the effect of climate crisis on livestock is regarded to them as not severe. This study is in agreement with Murtala, Arokoyu & Weli (2020) that reported climate variability reduced livestock production in Katsina State.

Table 2: Extent to which Sedentary Livestock Production is Vulnerable to Climate Crisis

Responses	Frequency	Percent
Very severe	41	15.4
Severe	104	39.0
Moderately severe	98	36.7
Not severe	24	9.0
Total	267	100.0

Source: Field Survey 2024

Similarly, several researches have indicated that results in warming and drying climatic trends were found to negatively affect grazing capacity and rangeland productivity by lowering forages' quantity and nutritional quality, causing higher levels of nutritional stress in livestock, thus affecting the farm's overall productivity. Changes in precipitation patterns and more frequent droughts may lead to shorter pasture growing periods (Spiller et al., 2023, Hidoso & Guyo, 2017; Nardone et al., 2010).

Expected Impact of Climate Crisis on Sedentary Livestock Production over Time

Table 3 summarizes the future expected impacts of climate crisis on sedentary livestock production in the study area. From the result, majority of the respondents (44.6%) are of the view that climate crisis will likely be damaging to sedentary livestock production in future. The result further outlined that 15.3% of the respondent reported that this situation will likely happened within a very long period of time, 14.9% reported that it will likely happened within the next decades while 14.4% are

optimistic that the situation will happened within this century (Table 3).

Nearly 30% of the respondents interviewed are of the opinion that nuisance impact of climate crisis on sedentary livestock production may likely happened over time. From the breakdown 10.9% of the respondents are of the view that the crisis will likely to happen within this century, 9.8% pointed out that the crisis will likely to happen within decades and 8.9% reported that nuisance effect will likely to happen within unspecified years to come.

It is important to note that 25.8% of the respondents reported that the effect climate crisis on sedentary livestock production will be disruptive in the study area. From the result in Table 4, 10.2% of the respondents reported that the impact of climate crisis on sedentary livestock production will become worse in the next years to come, while 8.0% are of the view that the situation will be worse within the next few decades and 7.6% are of the opinion that disruptive situation will likely to happened within this century.

In this regard several studies concluded that the direct effect of climate crisis will likely result in reducing the

number of animal numbers and their products which can be driven by increased temperatures and frequency and intensity of heat waves. While the indirect effects are linked to the alteration of the availability and the quality of feedstuffs and drinking water and the survival and redistribution of pathogens and/or their vectors (Spiller et al., 2023; Thakur *et al.*, 2022; Lacetera, 2019). It is also worthy to note that climate change is also enhancing the worldwide occurrence and frequency of natural hazards

and disasters which directly impact agriculture (including the livestock sector), food security and nutrition (FAO, 2021). It is also necessary to point out the argument that the drought affected areas are likely to become more widely in the State. Lower and heavier precipitation events are very likely to increase leading to more dry condition and in other hand frequency of rainfall is expected to increase leading to higher flood risks.

Table 3: Expected Impact of Climate Crisis on Sedentary Livestock Production over Time

Level of the Severity	Likelihood of the Impact of Climate Crisis on Sedentary Livestock Production to Happen over the Next Decades			
	Likely to happen within this century (%)	Likely to happen within decades (%)	Likely to happen within years (%)	Total
Disruptive	7.6	8.0	10.2	25.8
Damage	14.4	14.9	15.3	44.6
Nuisance	10.9	9.8	8.9	29.6
Total	32.9	32.7	34.4	100

Source: Field Survey 2024

Furthermore studies of Gerten et al., (2011), Nardone et al., (2010) and Reynolds, Crompton & Mills (2010) projected that climate crisis is expected to change water availability and water usage in animal production, as rising temperatures are likely to increase livestock water consumption. Competition for water between livestock, crops, and non-agricultural uses will increase in the coming decades, and it requires more efficient production systems such as switching from crops to livestock and to irrigation production systems, adoption of drought resistance breed systems, to address the water scarcity issues and other related problem that might be brought by climate crisis.

Effectiveness of the Coping Strategies to Climate Crisis for Sedentary Livestock Production

It is evidenced from this study that sedentary livestock farmers have started experiencing climate crisis and they have already devised a means to cope or survive the situation. It is from this point that people responses on the effectiveness of the coping strategies and measures are going to be assessed. Thus, these strategies might be helpful to farmers/rural communities in effectively adapting to the impact of climate crisis in their various communities.

Table 4 presents the coping and adaptation strategies as well as practices employed by the farmers to survive climate crisis. Switching from crops to livestock and to irrigation production systems was considered very effective by 37.6% of the respondents while 34.1% considered this coping strategy as cost effective and only

11.2% described it as not effective, result shows that 41.6% of the respondents viewed diversification to multiple and mixed crop-livestock systems as moderately effective, 30% reported effectiveness of the strategy while 28.5 describe it as very effective coping strategy in dealing with climate crisis.

Table 4 also reveals that adoption of drought resistance breed was understood to be effective 44.6% of the respondent’s opinion. Furthermore 29.6% of the respondents view described it as very effective strategy in managing climate crisis to sedentary livestock producers only less 1% view this strategy as not effective. For herd genetic improvement majority of the respondent (50.6%) are of view that is very effective strategy, while 26.6% view it as effective. For continuous matching of stocking rate with pasture production, the most widely and popular opinion cut across effective and very effective with 41.6% and 37.8% respectively.

Very effective account for about 50% of the responses on silvo-pasture and pasture management as a strategy of addressing climate crisis to sedentary livestock producers. Effective accounts for 39.0% and none of the respondent rated this strategy as not effective. Nearly all the respondents (76.0%) consider forage conversion and mixture implementation as very effective. Improved water resource management was considered effective strategy with 42.7% of the respondent’s opinion. On farm and off farm diversification was considered by the respondents a vital strategy with 48.7% of the respondents describing it as very effective (Table 4).

Table 4: Effectiveness of the Coping Strategies to Climate Crisis for Sedentary Livestock Production

Adoption of drought resistance breed	Frequency	Percent
Very effective	79	29.6
Effective	119	44.6
Moderately effective	67	25.1
Not very effective	2	.7
Total	267	100.0
Herd genetic improvement	Frequency	Percent
Very effective	135	50.6
Effective	71	26.6
Moderately effective	43	16.1
Not very effective	18	6.7
Total	267	100.0
Continuous Matching of Stocking Rate with Pasture Production	Frequency	Percent
Very effective	101	37.8
Effective	111	41.6
Moderately effective	43	16.1
Not very effective	12	4.5
Total	267	100.0
Silvo-Pasture and Pasture Management	Frequency	Percent
Very effective	132	49.4
Effective	104	39.0
Moderately effective	31	11.6
Total	267	100.0
Forage conversion and mixture implementation	Frequency	Percent
Very effective	203	76.0
Effective	39	14.6
Moderately effective	25	9.4
Total	267	100.0
Improved water resource management	Frequency	Percent
very effective	58	21.7
Effective	114	42.7
moderately effective	95	35.6
Total	267	100.0
Switching from crops to livestock and to Irrigation systems of production	Frequency	Percent
Very effective	98	36.7
Effective	91	34.1
Moderately effective	48	18.0
Not very effective	30	11.2
Total	267	100.0
Diversification to multiple and mixed crop-livestock systems	Frequency	Percent
Very effective	76	28.5
Effective	80	30.0
Moderately effective	111	41.6
Total	267	100.0
On farm and off farm diversification	Frequency	Percent
Very effective	130	48.7
Effective	84	31.5
Moderately effective	44	16.5
Not very effective	9	3.4
Total	267	100.0

Source: Field Survey 2024

In this regard, Konapala et al., (2020) viewed that climate change and crisis may alter the seasonal pattern and variability of resource availability and crop yield, further impacting livestock production. The changes in the forage availability could bring additional challenges for grazing management and livestock management (Hidoso & Guyo, 2017). This shows the need for effective coping and adaptation strategies to deal with such extreme events. Spiller et al., (2023) pointed out some strategies which involves adoption of acclimation which is the coordinated phenotypic response developed by the animal to a specific stressor in the environment and acclimatization which refers to the coordinated response to several simultaneous stressors, e.g. temperature, humidity, and photoperiod as well as adaptation that involves genetic changes as adverse environments persist over several generations of a species.

CONCLUSION

The study concludes that there is connection between climate crisis and sedentary livestock production. It is revealed that climate crisis can severely impacted the sedentary livestock production systems in many ways, such as heat stress causing a significant decrease and variation of the pasture and related resources, decrease in the availability of water due temperature and precipitation variability. This may likely result in particular to the reduction of dry matter intake due to temperature and heat stress and competition on water. This situation may likely continue to happen over time if no urgent actions are taken to deal with the circumstances.

RECOMMENDATIONS

The following are the recommendations based on the findings of the study

1. Communities should adopt cost effective strategy of switching from crop-livestock production to irrigation production systems
2. Government and communities should ensure adoption of drought resistance breed, herd genetic improvement and continuous matching of stocking rate with pasture production
3. Government must improve water resource management and diversification to multiple and mixed crop-livestock systems
4. Government and communities should adopt result oriented practices such as acclimation, acclimatization as well as adaptation that involves genetic changes as adverse environments persist over several generations of a species.
5. Government should ensure effective early warning and forecasting system on seasonal climatic prediction to sedentary livestock farmers

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