Review of: "Exploring the Link between Climate Change and Farming in Rural and Peri-Urban Communities in Sierra Leone"

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Potential competing interests: No potential competing interests to declare.

Exploring the Link between Climate Change and Farming in Rural and Peri-Urban Communities in Sierra Leone[GDD1]

Abstract

Climate change has been impacting farming and livelihood outcomes around the world. In Sierra Leone, limited studies have been done in this direction. The aim and objectives were achieved through the following research questions: What crops and animals are reared by the farmers? What has been the trend in the yield of crops and the number of animals produced between 2014 and 2023? How have climatic parameters been impacting farming in the study area? What have been the coping strategies adopted by the farmers to reduce the impact of climate change on farming in the study area?

Data was collected from 315 respondents selected using purposive and simple random sampling techniques, and a semi-structured questionnaire was administered to them. Climatic data was also collected from 3 weather stations as ancillary data. Data was analysed using the Statistical Package for the Social Sciences, version 26 (SPSS).

Findings reveal that farmers grow mainly food crops like rice, cassava, and vegetables. The main animals reared by farmers are poultry, cattle, and goats. The yield of the main food crops was increasing between 2014 and 2017 but remained constant between 2017 and 2020. However, the yield increased between 2021 and 2023. The reasons for the increase in yield, according to the farmers, are using more fertilizer to improve soil fertility and expansion of farmlands. Reasons for the decline in yield of main crops include erratic and low rainfall, flooding of farmlands, ~~at the start of the rainy season~~, inadequate land for farming, reduction in the growing periods of some varieties of crops, increase in diseases, and invasion of strange weeds. Animals reared in the study communities are increasing in number, though climate change has an impact on them, including reduction in the growing periods of some varieties of crops, increase in diseases, and invasion of strange weeds. ~~Some farmers have been experiencing poor harvests because of erratic rainfalls and sometimes flooding of farmlands. They~~ Farmers have been mitigating late rainfall by adjusting the planting time, planting crops that can withstand drought, and some farmers have to move to the swamps, especially during the dry season. ~~Temperatures have been increasing, according to the farmers and the data from the weather stations.~~ High temperatures have been affecting the normal growth of the crops, seed germination, and heat stress affecting cattle. Increasing humidity has led to increased incidences of diseases in both plants and animals. Rainstorms result in wind-thrown of tree crops and the spread wildfires. Adjusting planting and harvest times, regular watering and mulching, were some of the coping

strategies adopted by farmers.

Capacity building is required for farmers to ensure sustainability and food security in the communities.

Keywords: Climate change, farming, livelihood outcomes, flooding, rainfall.

1. Introduction

Climate change is a global phenomenon. The effects range from high temperatures and evaporation, which have resulted in the depletion of the soil structure and its resultant effects on crop failures and the health and productivity of farm animals (Gowda et al., 2015; Ziska et al., 2016, Walsh et al., 2016). There has also been flooding of farmlands which has resulted in the wiping out of entire cultivated fields, decreased yields of cereals (FAO 2016; Ghaffar et al., 2022). Long or intermittent periods of drought and heat stress, as a result of increases in temperature, have affected farming all over the world, and as such, their impact on food availability is becoming acute (Mottaleb et al., 2017; Azad et al., 2018; Haleeb et al., 2018).

A report by the World Bank (2021) clearly states that increasing temperatures, water availability, shifting agro-ecosystem boundaries, invasion of pests and diseases, and more extreme weather events are posing food security challenges and have put about 690 million people, especially in Sub-Saharan countries, at the mercy of hunger and starvation (World Bank, 2021). Studies by (Wang et al., 2017; Aryal et al., 2019b) have predicted that climate change will impact farming, which can lead to an increase in food prices and eventually food insecurity and increased poverty. Evidence of the effects of climate change on agricultural production has shown that heat and humidity have been affecting the health and productivity of animals raised for meat, milk, and eggs (Walsh et al., 2020). Temperature increases and changes in precipitation regimes can also affect the occurrence and number of insects, weeds, and diseases that will infest farmlands (Ziska et al., 2016). This eventually will lead to reduced crop yields, lower nutritional quality of cereals, and lower livestock productivity (Habeeb et al., 2018; World Bank, 2021, Habib-ur-Rahman et al., 2022). ~~In a study by~~ Habib-ur-Rahman, et al., (2022) ~~in Asia, it is stated~~ predicted that there will be a yield reduction of rice and wheat production by 15.2 and 14.1 % respectively, as a result of climate change in Asia. Wang et al., (2018), stated that climate change had affected four main crops grown in India: maize, rice, wheat and soyabeans.

This assertion was also supported by Azad et al., (2018), who had earlier reported that as a result of rising temperatures which promote crop evapotranspiration, there will be a reduction in wheat yield. Furthermore, other studies have shown that climate change will affect the length of the growing periods of certain crops in many parts of the world (Zhao et al, 2015; Walsh et. al, 2020).

Notwithstanding the negative impact of climate change on agriculture, climate change has been reported to have some positive impacts, as reported by the United States Environmental Protection Agency (EPA), that an increase in temperature and carbon dioxide (CO_2) can lead to a resultant increase in some crop yields in some places, though water should be available to release soil nutrients (Hatfield et al., 2014).

In Africa, climate change has negatively impacted food crop and livestock production, thus worsening the already food

insecurity situation experienced by low investments in agriculture by governments (Woetzel et al., 2020). African farmers are more vulnerable to climate change (high temperatures and fluctuations in rainfall, etc.) than farmers in other parts of the world, especially in Europe, the U.S.A., and other developed countries (Woetzel et al., 2020), where farmers can mitigate the effects of drought by irrigating farmlands and using more resistant varieties of seeds, along with innovations, fertilizers, pest and disease control mechanisms (Hatfield et al., 2014; Woetzel et al., 2020).

In order to mitigate the effects of climate change around the world and boost food production, and thus reduce food insecurity and hunger around the world, studies have shown that some agricultural practices have been developed and adopted, and these include climate-smart agriculture. Climate-smart agriculture is an integrated approach which enables farmers to manage their environments (cropland, rangeland for livestock, forests, wetlands, and water bodies) in a sustainable linkage that will promote food production and reduce climate change impacts (World Bank, 2021). Others have recommended alternating planting times and planting density of crops, crop rotations with legumes, agroforestry, mixed farming, using climate-resilient plants, livestock, and fish breeds in order to reduce the effects of climate change on farming (Gownda et al., 2018; Habib-ur-Rahman et al., 2020; World Bank, 2021).

In Sierra Leone, where the study was carried out, there have been incidences of climate change-related issues, stemming from flooding, intermittent drought (especially in the dry seasons), blowing of strong winds in the early and late parts of the rainy season, and changes in the rainfall pattern (Johnson et al., 2009; Kamara et al., 2015; Lahai et al., 2022b). In a report by Johnson et al. (2009), it was stated that there was unprecedented rainfall in March and April that disrupted the burning of brushed farm lands, thus leading to changes in the crops that will be eventually cultivated. This has led to a decline in agricultural productivity over the years, especially in food crop production (Johnson et al., 2009; Lahai et al., 2022a). A similar report of climate impact on animal farming was made by Sesay (2022), though in one district in the north of the country. Tere There is inadequate proven scientific data on climate change and farming in the four geographic regions of the country. This study was therefore undertaken to understand the link between climate change and farming in rural and peri-urban communities in the four regions of Sierra Leone. This was done by asking the following research questions:

What are the main types of crops grown in the selected communities in the four regions? What are the main types of farm animals reared in the study areas? In which agro-ecologies are these crops grown and animals reared? What are the estimated yields of the main food crops in the study area over the past 10 years (2014-2023)? Is there a relationship between the decline in yields of crops cultivated and climate change? What climatic parameters or elements are seriously affecting crop production and animal rearing? What have been the coping strategies farmers have employed to reduce the effects of climate change on farming in their communities in the study area?

2. Methodology

The study employed a mixed-method research design, which encompassed the collection of data from Household heads involved in farming in seven districts in rural and peri-urban communities in Sierra Leone. The districts were the Western Rural District in the west, Bombali and Tonkolili districts in the north, Kenema and Kono districts in the east, and Bo and

Moyamba districts in the south, (Figure 1).

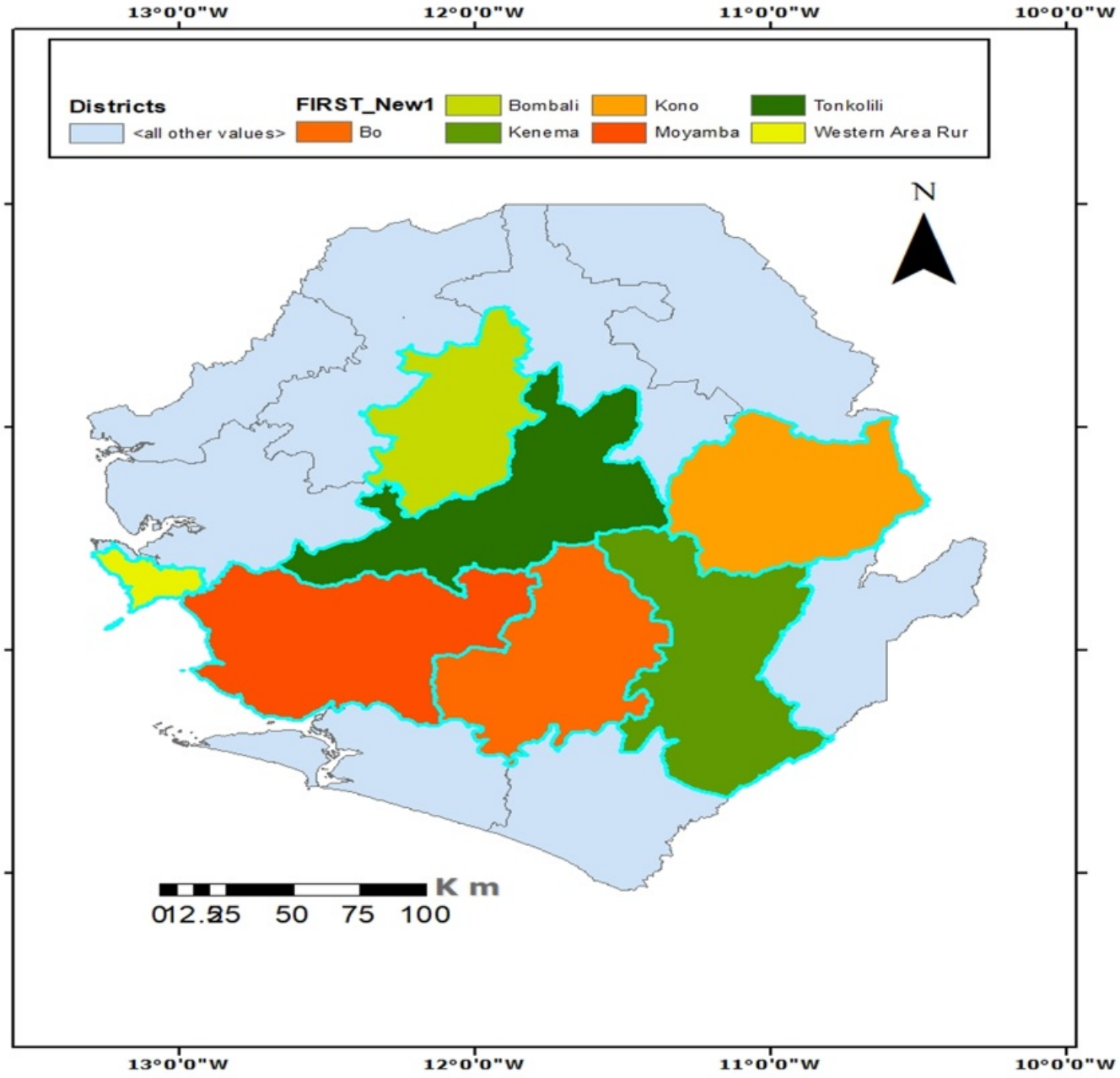


Figure 1. Map of Sierra Leone showing study districts.

The Western Rural district is closer to Freetown, the capital city of Sierra Leone. It has several peri-urban and rural communities, and a good number of the residents are engaged in vegetable, poultry, and piggery farming. Bombali and Tonkolili districts are two districts in the north and share boundaries; they have a large grassland area (boli-land) and are renowned for rice cultivation as well as animal rearing. Kono and Kenema districts are the two large districts found in the east which have large tracks of forest cover (Lahai et al., 2022, Wilson & Wilson, 2013). The main crops cultivated in these two districts are food crops like rice, cassava, and yam, etc. The districts are also renowned for tree crops farming.

The Bo and Moyamba districts are located in the Southern region, with fallow bush as the dominant vegetation, though there are flooded plains known as “baati” in Bo districts and mangrove swamps on the coastal areas of Moyamba districts.

A total of 315 semi-structured questionnaires (45 questionnaires for each site) were administered to household Heads, who were purposively selected, based on having been engaged in farming for the past ten years in the sampled rural and peri-urban communities in the seven districts. The questionnaires sought farmers’ perceptions of climate change and crop and animal production over the past 10 years to find out whether the climatic elements, especially temperature, rainfall, humidity, and wind velocity, have impacted their farming activities and if so, to what extent. The data was collected over a period of one month in the seven districts; at least a minimum period of 4 days was allocated to each district. Ethical procedures for social science data collection were followed, and permissions were granted by community leaders and household Heads before the semi-structured questionnaires were administered.

Climatic data (rainfall, temperature, and humidity) for the past 10 years from weather stations that were accessible (mainly from Mile 91, Njala University, Kenema, and the Western area) were collected, analysed and used to triangulate with the household survey data.This information is presented in Figure 2 as a combined rainfall and temperature graphs.

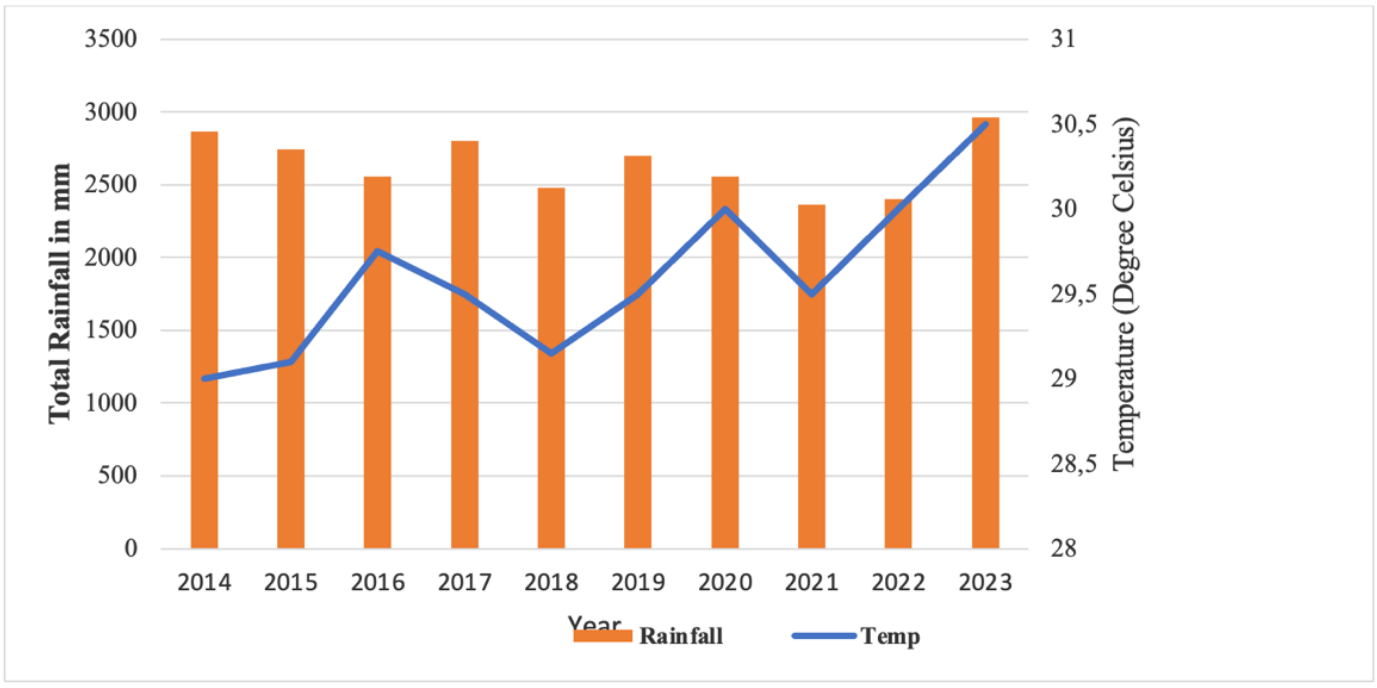


Figure 2. Average temperature and combined average total rainfall from 2014-2023 for the study areas
Source: Njala University Weather Station, Daru Weather Station, and Mile 91 SLARI Weather Station.

The weather data, as shown in the graph, were used for verification of the farmers’ perception of the climatic phenomena over the 10 years period (2014-2023).

The data from the semi-structured questionnaires were assigned codes and inputted into the Statistical Package for Social

Sciences (version 26) spreadsheet. The data collected from weather stations were inputted into the Excel spreadsheet and analysed and developed into graphs. Some of the data from the survey was presented in tables and graphs and then reported. Correlation and regression analyses were done to show the relationship between climatic elements and farming, and further analysis, mainly multi-linear regression, was done to predict the impact of climate change on farming in the study areas.

3. Results and Discussion

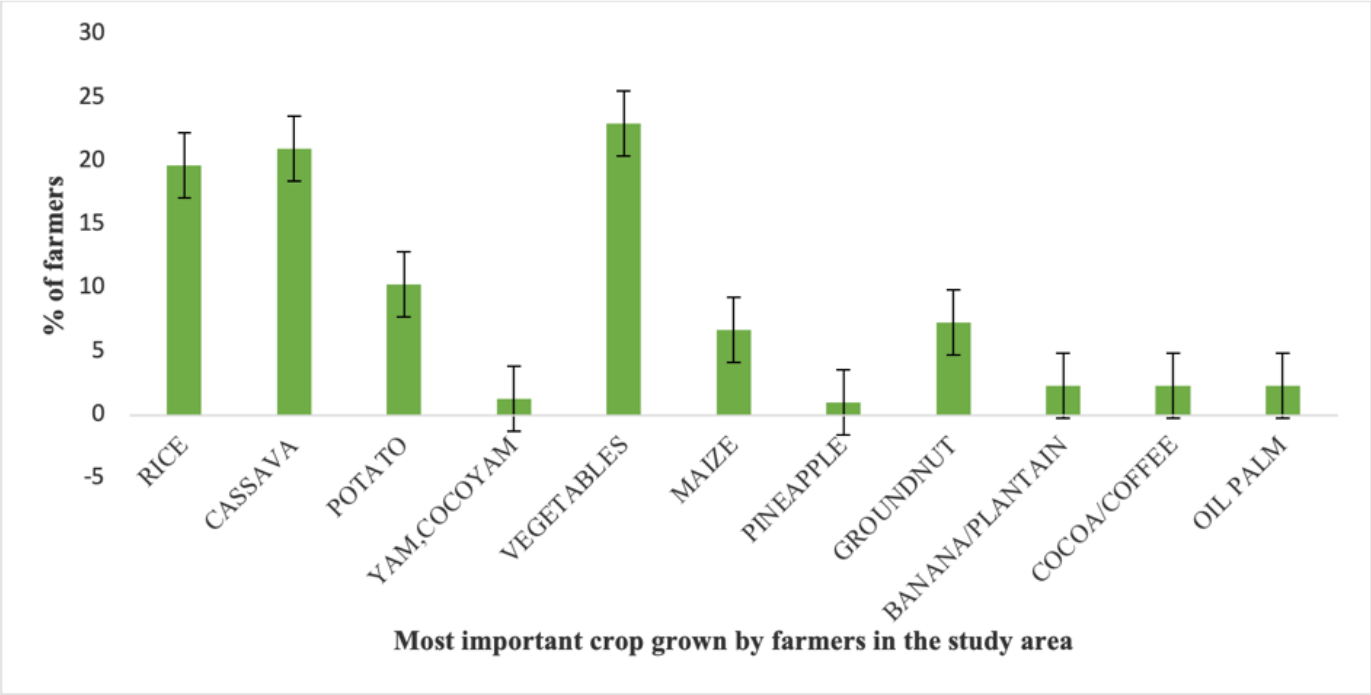
3.1. Socio-economic and Demographic Profile of Farmers

Over half (55%) of the farmers interviewed are males, and 45% are females. Less than two-fifths (39.7%) have no formal education, 25.4% have secondary education, 18.3% had primary education, and about 16.3% hold a diploma, high teacher's certificate, or a first degree. More than sixty percent (60.7%) are married; others are single (18.0%), widowed (10.7%), or separated/divorced (7.3%). Majority (73.3%) are engaged in farming as their main livelihood activity, while others do trade (10.0%), teaching (5.0%), work in the civil service (6.0%), and the rest do artisan works (6.7%). [GDD2] It therefore indicates that those engaged in other activities do farming as a part-time activity (26.7%). Over two-thirds of the households in the study areas are headed by men (67.7%), and just under one-third (32.3%) are headed by women. Their average income earned per day is about Le 70 ($ 3 U.S. dollars). The findings show that majority of households in rural and peri-urban communities in Sierra Leone are engaged in farming as their main livelihood activity, and that resonates with the 2015 Housing and Population Census (Statistics Sierra Leone, 2015) and FAO (2018). The findings also show that the average income earned by most household heads per day in the study areas is above the national average household income reported by the World Bank for Sierra Leone in 2020, which was $1.90 for less than sixty percent (56.8%) of the population (World Bank, 2020).

3.2. Main crops grown and animals reared

3.2.1. Main crops grown

Figure 3 presents the main crops grown in the study area.



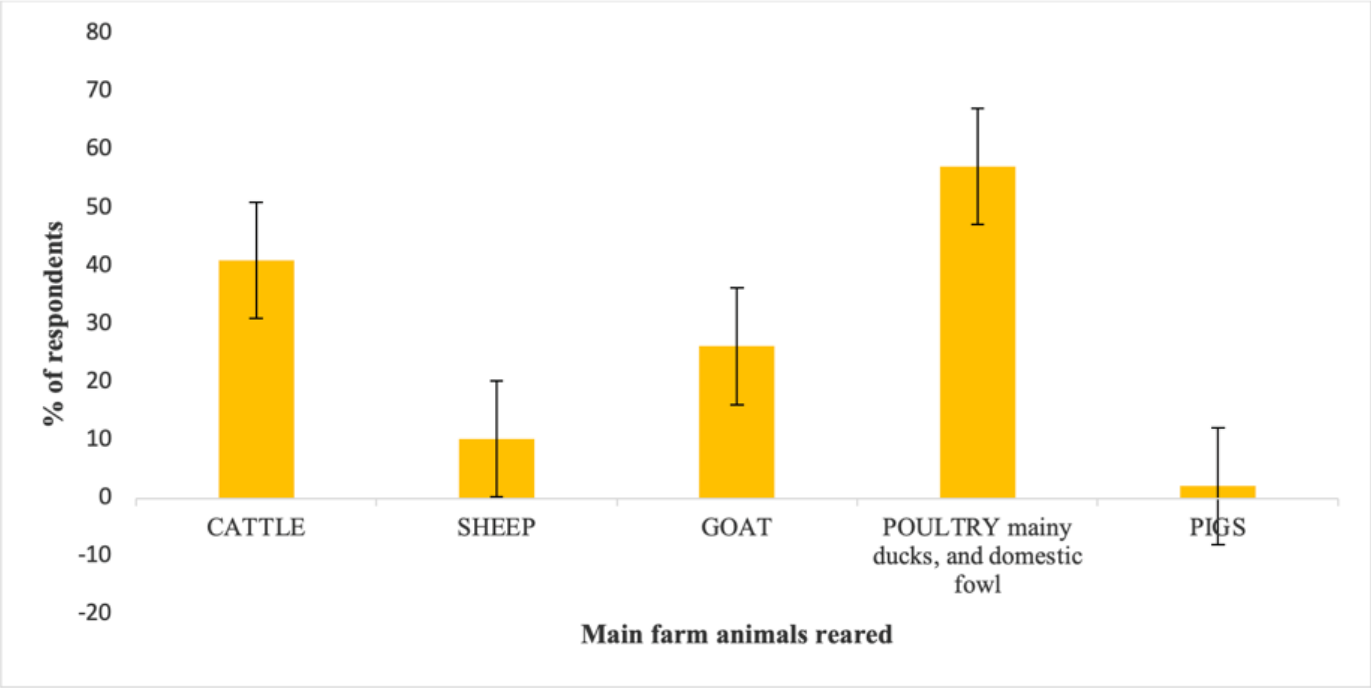
[GDD3]

Figure 3. Distribution of farmers by the most important crop grown in the study area.

The farmers grow varieties of crops, but the most important ones are vegetables (23%), cassava (21.3%), and rice (19.7%). A few farmers grow pineapple (1.0%), cocoyam (3.3%), and oil palm (2%). This finding is in agreement with that of the FAO (2018) report, which stated that many households in Sierra Leone depend on agriculture for their food and income and that the loss of crops and seeds can result in food and nutrition insecurity.

3.2.2. Main animals reared

Figure 4 shows the main animals reared in the study area.



[GDD4]

Figure 4. Distribution of respondents by types of main animals reared in the study area.

Figure 4 indicates that over half (57.2%) of the farmers in the study communities are rearing poultry (domestic fowls and ducks), and only a few are rearing pigs as their main farm animals. This finding resonates with that of Maghey et al., (2019), who reported that domestic fowls are the main farm animals reared in Moyamba District in Southern Sierra Leone.

3.3. Farmers' perception of the trend in the yield of main crops and number of main animals reared by farmers since 2014

3.3.1. Farmers' perception of the trend in the yield of main crops

Figure 5 shows the farmers' perception of the trend in the yield of crops grown in the study areas since 2014.

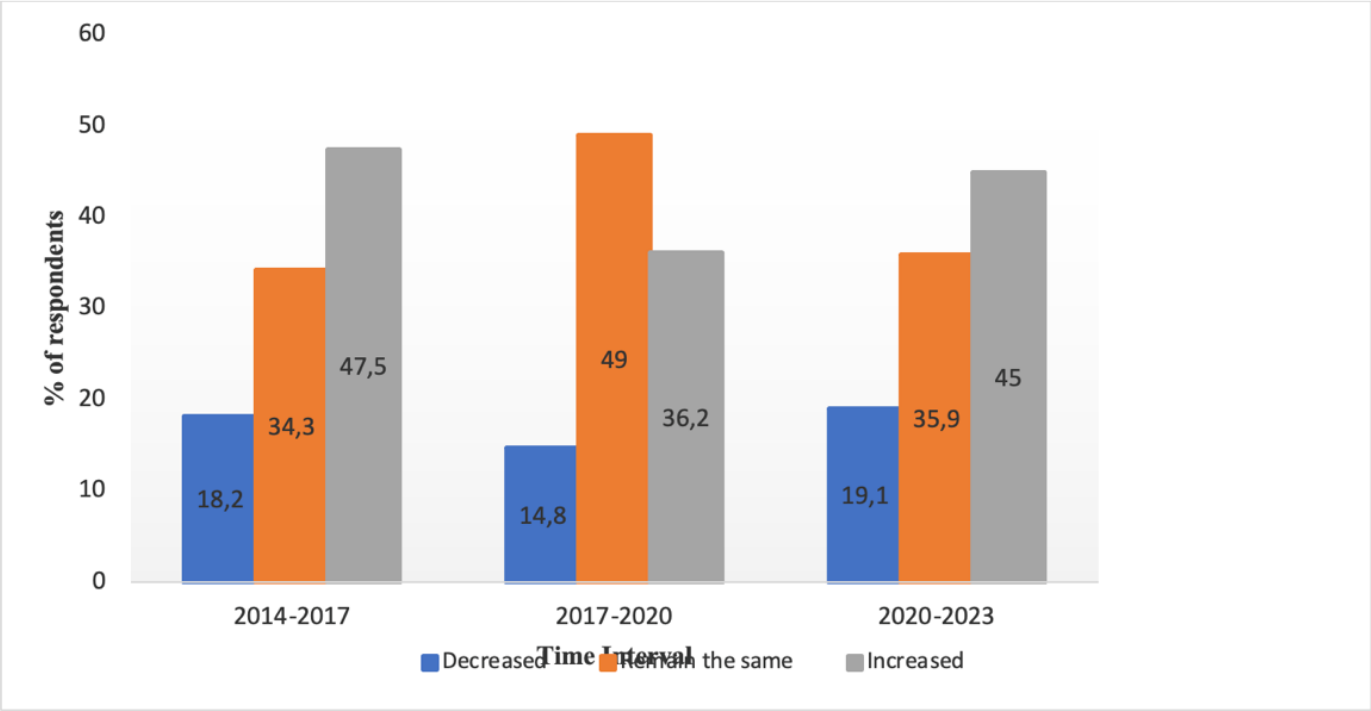


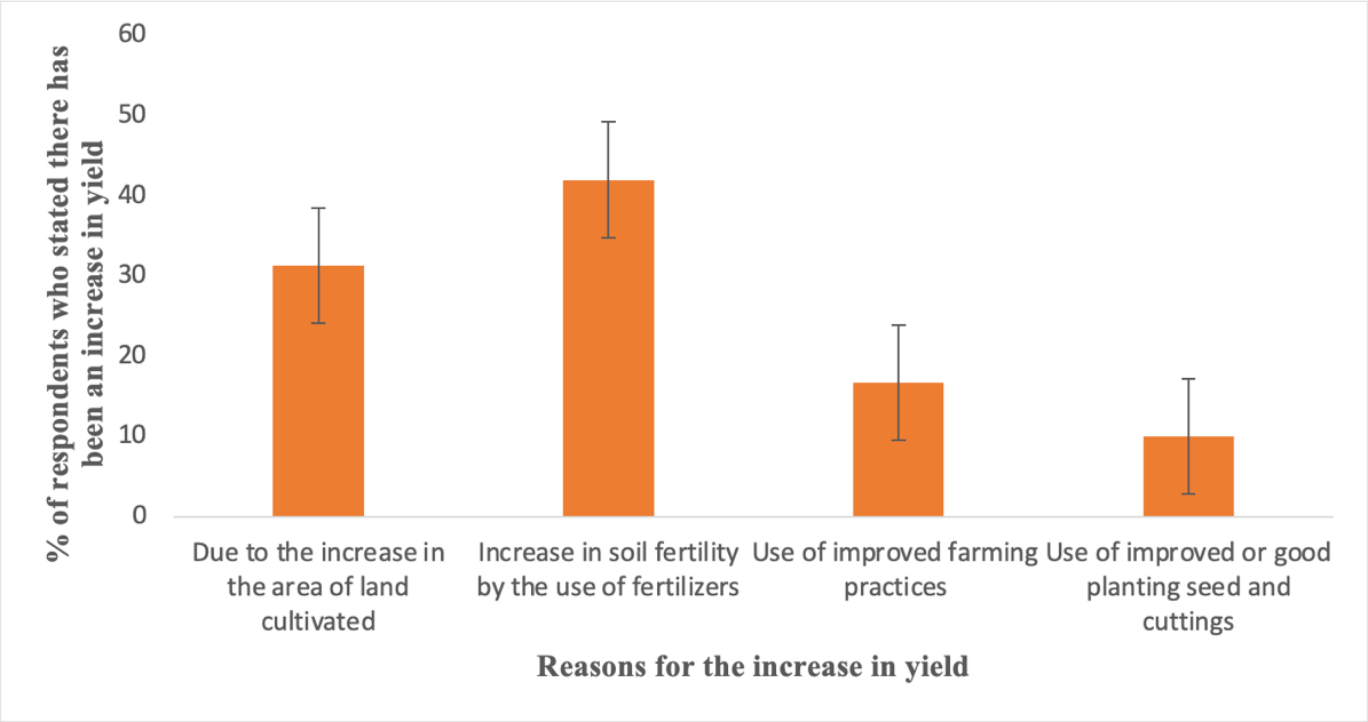
Figure 5. Farmers' perception of the trend in yield in main food crop production since 2014 to 2023.

It is noted in Figure 5 that between 2014-2017, slightly less than eight percent (47.5%) [GDD5] of the farmers stated that there had been an increase in yield in their main crop, while less than twenty percent (18.2%) agreed that the yield in their main crop had decreased. However, between the period 2017-2020, slightly less than half (49%) of farmers agreed that the yield in their main crop grown during that period had remained the same, and only a small percentage (14.8%) agreed that it had decreased. It is also shown on the graph that forty-five percent (45%) of the farmers stated that they had an increase in the yield in their main crop produced between the periods 2020-2023, while less than one-fifth (19.1%) agreed that they had experienced a decrease in yield.

The farmers were asked to state whether there were reasons for the increase or decrease in the yield so as to ascertain the reasons for the change in yield between the time periods indicated in Figure 5. The findings are presented in Figures 6 and 7.

Figure 6 presents the reasons advanced by farmers for the increase in the yield of their main crops between 2014 and 2023.

[GDD6]

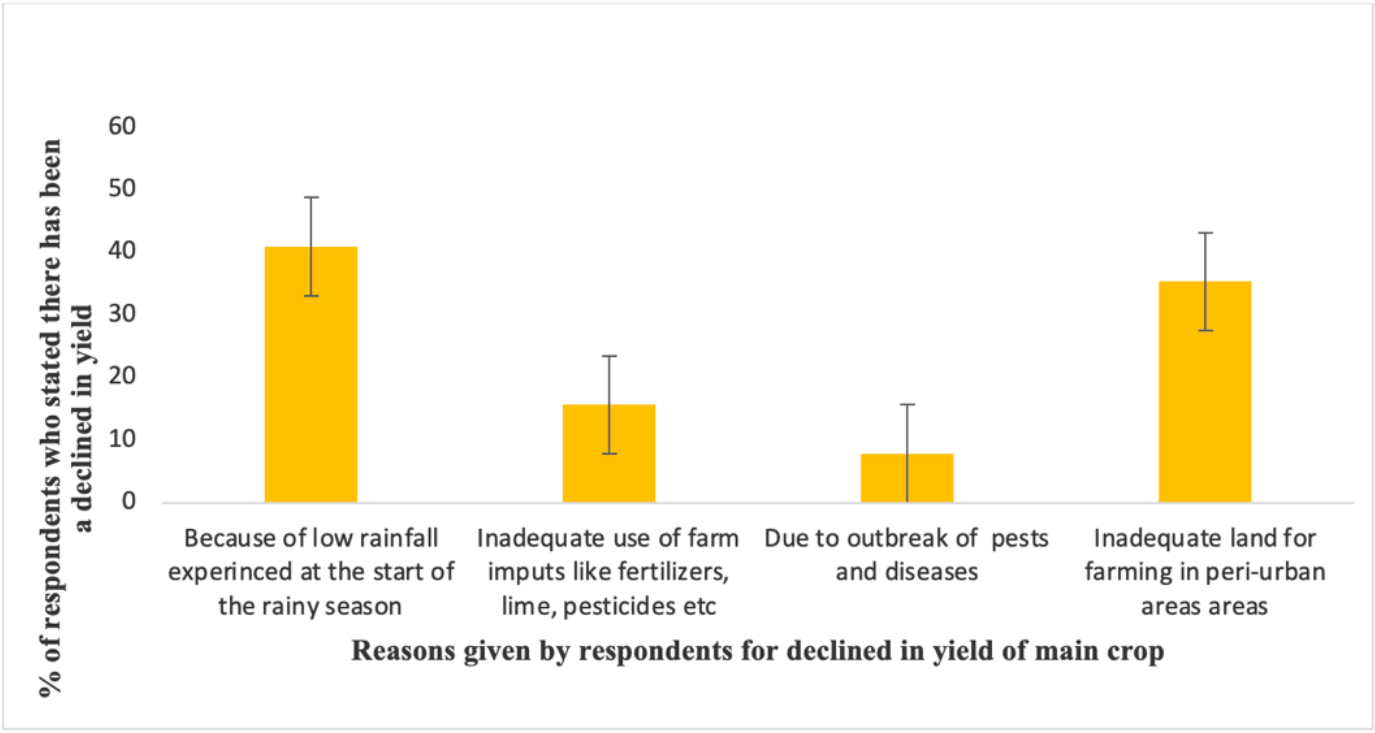


[GDD7]

Figure 6. Distribution of respondents by main reasons for increase in main crop produced between 2014-2023

Forty-two percent (42 %) of the farmers attributed the increase in yield to increased use of fertilizers while 10 % linked it to the use of improved planting materials (Figure 6). This finding is in agreement with that of Morton (2007), who stated that farmers use shortcut methods of cultivation by using chemical and artificial fertilizers as a way of mitigating ecosystems and climate change conditions.

Figure 7, on the other hand, presents the reasons given by farmers who experienced a decline in the in crop yield between 2014 and 2023.

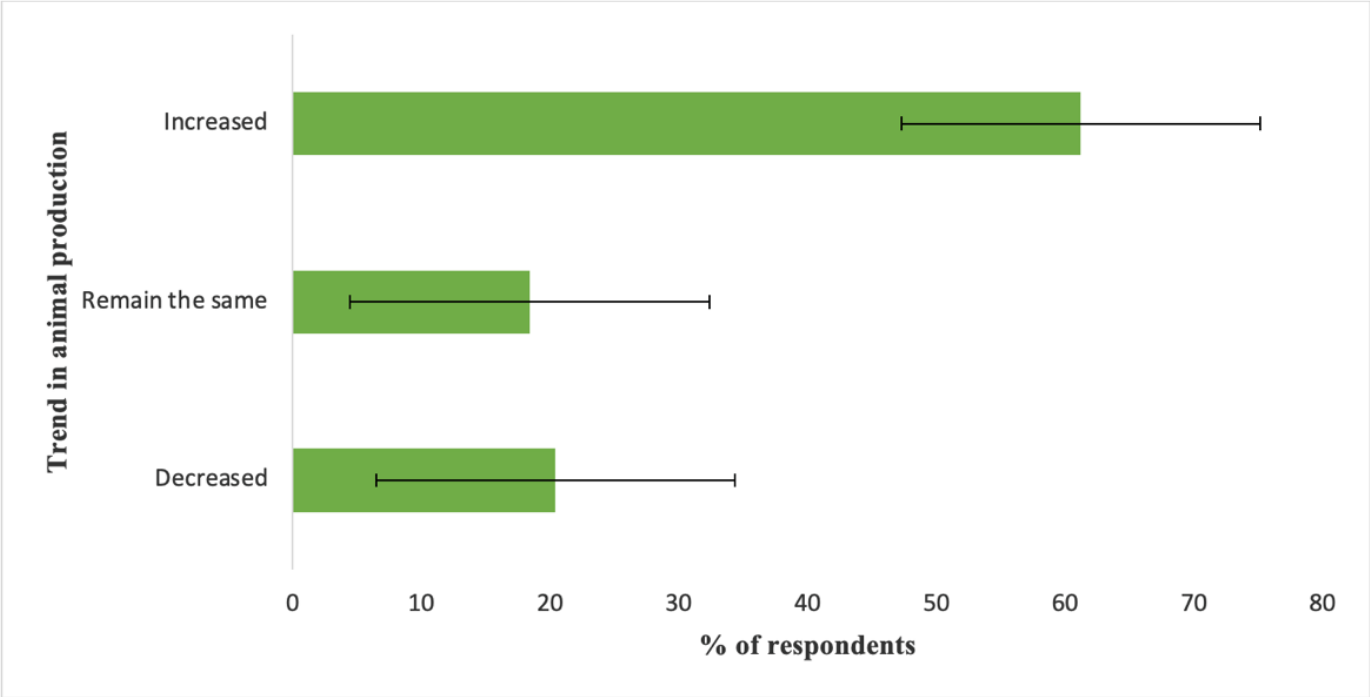


[GDD8]

Figure 7. Distribution of respondents by main reasons for decrease in main crop produced between 2014-2023

Forty-one percent (41%) of respondents attributed the decline in crop yield (especially rice) between 2013-2023 to low rainfall. On the other hand, 7.9% associated the decrease in main crop production to outbreaks of pests and diseases. This finding resonates with that of the World Bank Report (2021) and Ziska et al., (2016), who stated that, climate change can cause the incidences of pests and diseases leading to low crop yields of most staple crops. A similar report was made by the United States Fourth National Climate Assessment (2020), which stated that agricultural productivity was expected to decline in the United States as a result of increases in temperature, water stress, drought, and wildfires.

3.3.2. Farmers' perceptions of the trend in animals production between 2014-2023



[GDD9]

Figure 8. Farmers' perception of the trend in animal production in the study areas between 2014-2023

A little over 60 % of the farmers indicated an increase in the animal production while 18.4 % of the respondents experienced no change in the animal production between 2014 and 2023 (Figure 8). It could therefore be inferred that the were not negatively impacted by climate change. This could be attributable to the breed of animals reared in most of the areas selected for the survey. The main breeds of animals reared include local domestic fowl, ducks, the West African Dwarf goats and sheep, and the Ndama cattle, etc. These animals can withstand some of the adverse effects of climate change (reference, please). This finding contradicts that of the study by Digesa (2024), who reported from Southern Ethiopia that feed shortage, reduced water availability, higher heat stress, and increased diseases are direct impacts of climate change on livestock production leading to increased mortality.

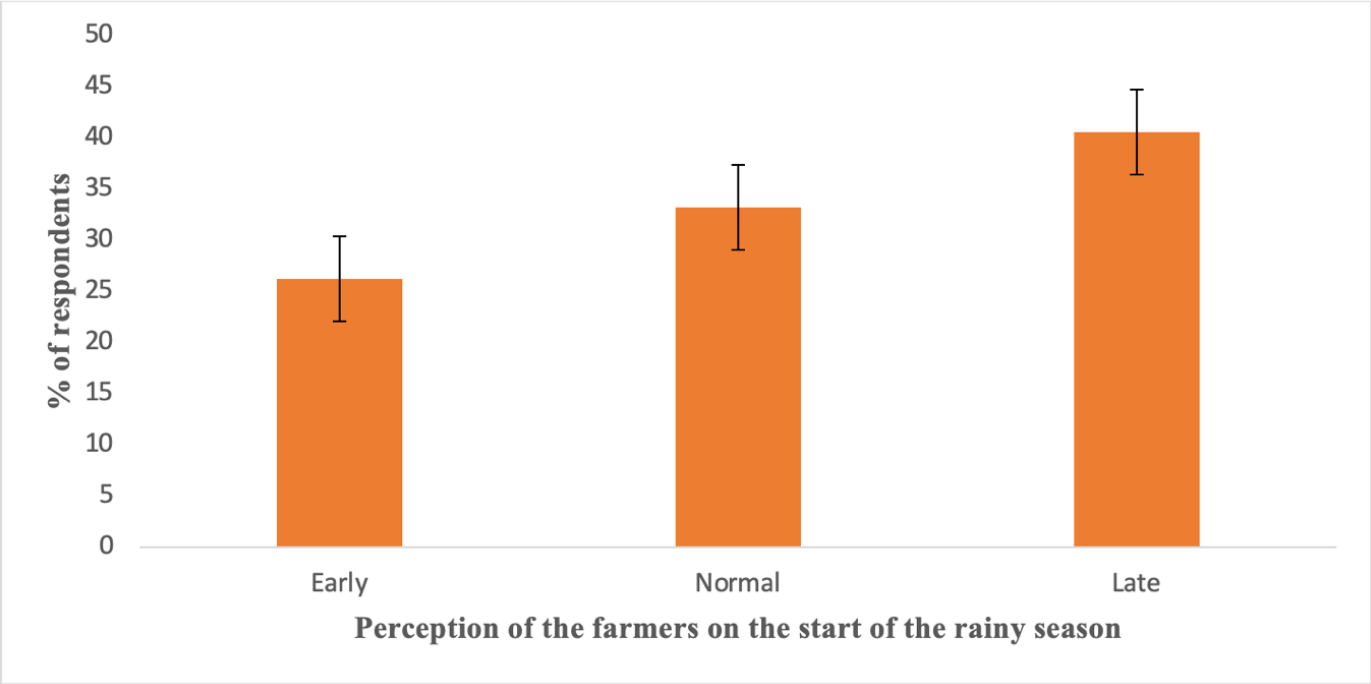
3.4. Farmers' perception of the impact of climate change on farming

This section tries to explore farmers' perceptions of major climate elements on farming in the study areas. The findings are discussed in the subsections below.

3.4.1. Impact of rainfall on farming

3.4.1.1. *Incidence of rainfall from 2014-2023*

The finding is presented in Figure 9 below.



[GDD10] **Figure 9.** Farmers' perception of the start of the rainy season for the past 10 years

Whereas 40.6 % of the respondents perceived delayed rainfall pattern over the 10 years period, 26.2 % of the respondents perceived no change in the rainfall pattern and indicated that the commencement of the rainy season in mid-April still pertains (Figure 9). This finding contradicts that of Johnson et al., (2009), who reported that there used to be unprecedented rainfall in March and April that prevented farmers from burning the brushed farmland and that at that time most farmers would not be able to cultivate the main staple food, which is rice. They would instead plant other crops, thus leading to food insecurity.

According to the farmers, a delay in the commencement of the rains results in the reduction in the growing periods for rice, cassava, pepper, beans, pumpkin, etc., prevalence of diseases, pest infestation, invasion of weeds and unsustainability of domestic animal production. Consequently, farmers incomes are negatively impacted.

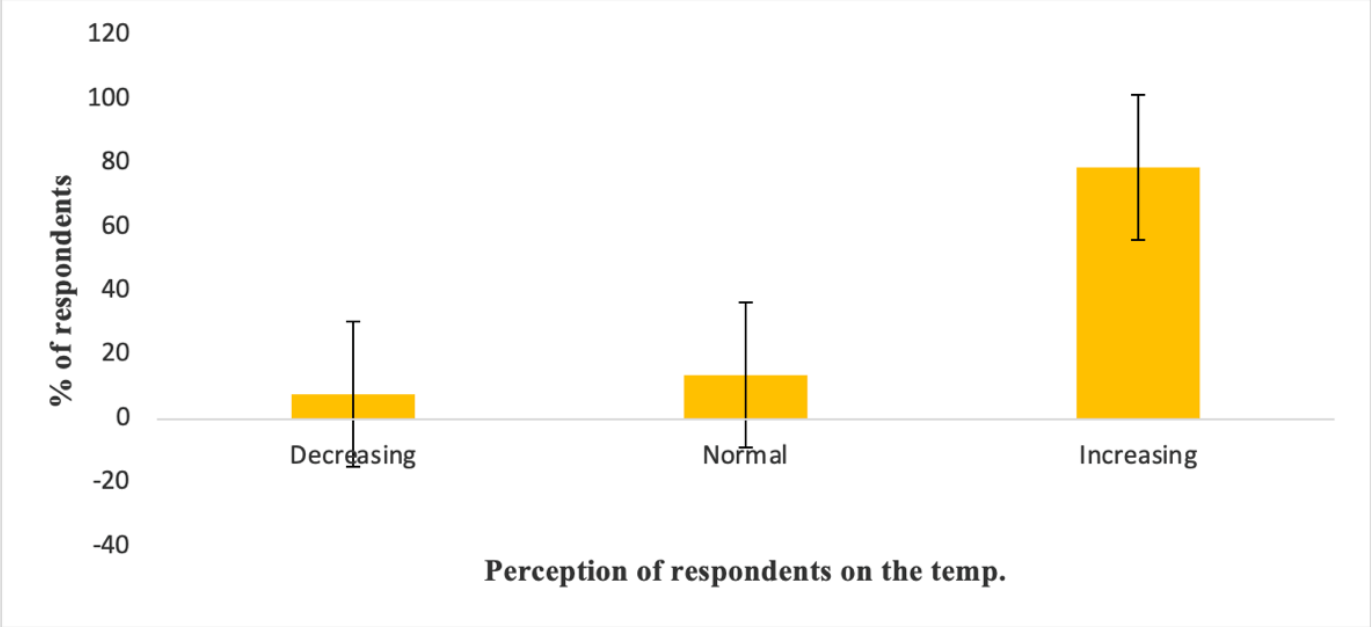
3.4.1.2. *Coping strategies to mitigate early/late and low annual rainfall in farming*

A good number (N=65) in the study area stated that one of the major steps taken to mitigate late rainfall is to adjust their planting time, which is becoming difficult as the rainy season is becoming unpredictable for them. Some (N =20) said they irrigate or water the plants if the farm is not large. Others have said they can only plant crops that can withstand dry weather. A few (N= 9) said they use the swamp for crop production because there is always some amount of water there, which can be used for irrigation or watering.

3.4.2. Impact of temperature on farming

3.4.2.1. *Farmers' perception of the temperature since 2014*

Figure 10 presents the farmers' perception of temperature in the study area since 2014.



[GDD11]

Figure 10. Farmers' perception of the temperature in the study area for the past 10 years

Over three quarters (78.6%) of the respondents agreed that the temperature has been increasing in the study area, while 7.7% hinted that it has been decreasing (Figure 10). This finding is in agreement with the climate data shown in Figure 2, which clearly shows that the temperature has been increasing slowly over the past few years.

3.4.2.2. *Farmers' perceptions of the effect of high temperature on farming*

Farmers indicated that high temperature causes yield reduction and sometimes total crop failure, as well as heat stress and restlessness among the cattle.

3.4.2.3. *Coping strategies adopted by farmers to mitigate the effect of high temperature on farming*

The farmers identified the following as the coping strategies adopted to mitigate the effect of high temperature on farming. Some of the farmers (N= 15) had been adjusting their planting and harvesting times. A good number (N= 78) of the farmers had been watering their plants regularly in order to reduce the heat and drying up of the soil. A moderate number (36) had been practicing mulching of their vegetable gardens. A few (6) planted their crops in between trees, while others (4) move to the swamp, which tends to be cooler.

3.4.3. Impact of humidity on farming

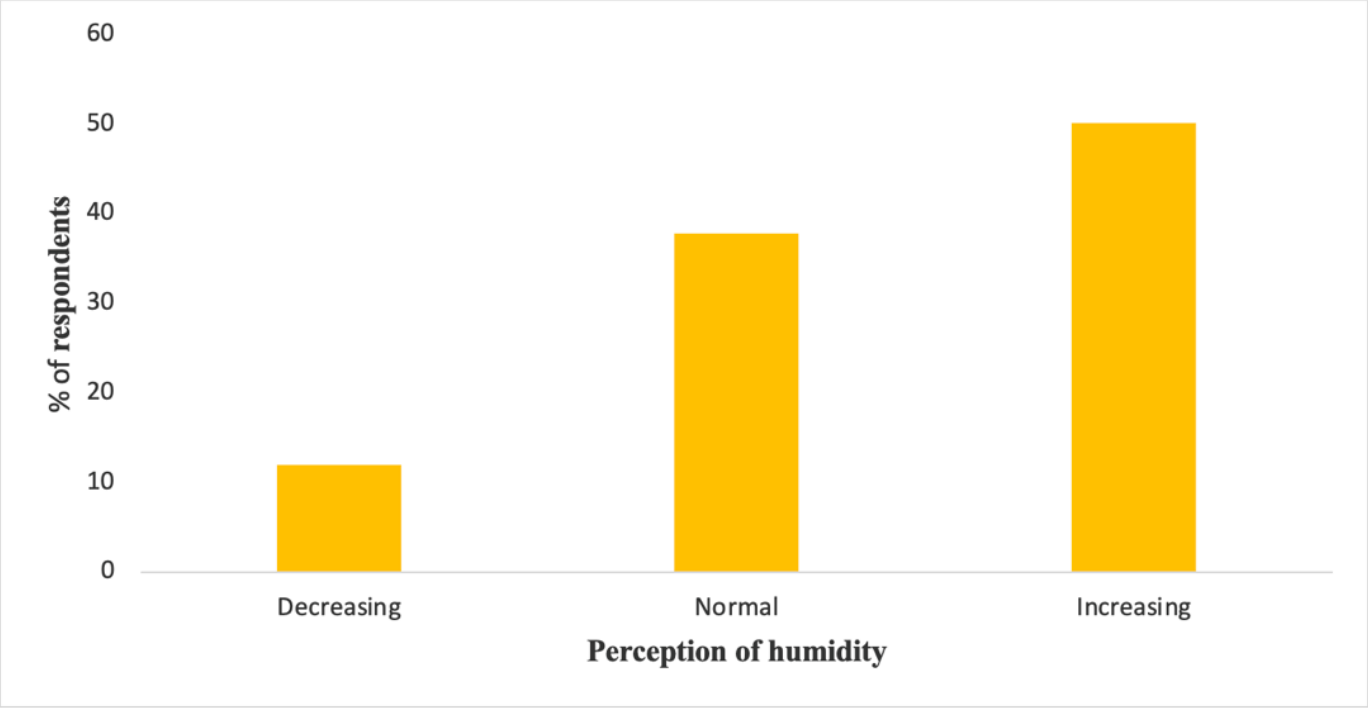


Figure 11. Farmers' perception of relative humidity in the study area since 2014.

Figure 11 reveals that slightly above half (50.2%) of the respondents hold the perception that humidity has been increasing in the study area in the past 10 years, while a small number (12%) of respondents noted that it has been decreasing. When the farmers were further quizzed on whether humidity has been affecting farming in the communities, 35.6 % responded in the affirmative, while 30.5 % in the negative. However, 33.9% were indifferent since they had no knowledge about the subject matter.

To better understand those farmers that stated that humidity has been affecting farming in the study area, the farmers were asked to describe the effects. The findings are discussed below:

They stated that high humidity induces more rain for farming, while low humidity negatively affects the crops. They further stated that low humidity increases evapotranspiration thus rendering plant mortality. Finally, they noted that high humidity increases diseases in both plants and animals, thus leading to death (please reference).

Below are some of the practices the farmers have been using to mitigate the effects of low or high humidity: planting more trees in the communities, reducing bush burning and other wildfires, using seeds that can withstand low humidity, drying harvested crops before storage, and using chemicals for diseases control.

3.4.4 Impact of wind movement on farming

3.4.4.1. *Perception on wind movements*

Figure 12 presents the perceptions of the respondents on wind movement in the study area since 2014.

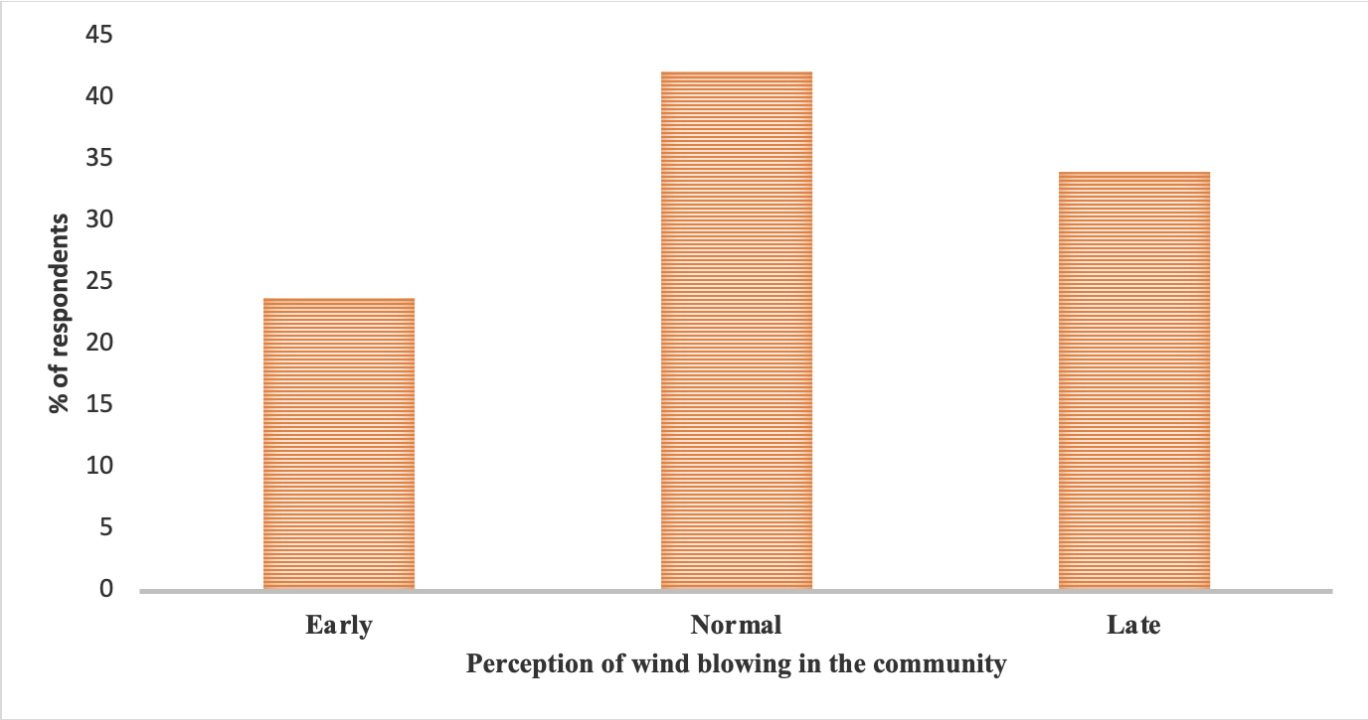


Figure 12. Farmers' perception of wind movement in the study area since 2014.

In Figure 12, slight over two-fifths (42.2%) of the respondents agreed that wind movement has been normal in the study areas, while slight over one-fifth (23.8%) of the respondents stated that the winds have been blowing early. Those who stated that the wind has been blowing as normal as before agreed that they have been getting the winds bellowing during the dry season as well as during the rainy season. Those who said that the winds are late in coming said so because they now have late rains, as they believed that the winds bring the rains.[GDD12]

3.4.4.2. *Effect of wind on farming*

Whereas 39.3 % of the respondents indicated no effect of wind at all, 58.7 % are indifferent while only 2.1 % indicated otherwise. The respondents with the view that wind had an effect on farming, indicated breaking of branches of tree crops at very high speed, damaging crops before harvesting, inducement of rains with accompanying floods in low-lying plains, spreading of wildfires as well as drying up of soil during the dry season, as some of the effects.

3.4.4.3 *Mitigation of the effects of wind on farming by farmers*

The following are some practices by farmers to mitigate the impact of wind: planting trees to serve as windbreaks, early harvesting of crops, and migrating to low-lying plains for farming.

Farmers advocate for capacity building on climate change. These findings are in agreement with Lahai et al. (2024), who reported that farmers in Bonthe District in Sierra Leone have been supported to plant trees around their communities in order to mitigate the impact of climate change on their communities.

3.5. Conclusion

This study was undertaken to understand and explain the impact of climate change on farming in Sierra Leone. In Sierra Leone, limited studies on climate change have been undertaken in the past. So, this study on climate change on farming was undertaken to fill such a gap. The study was achieved by asking the following research questions: What are the crops and animals reared in the study area? What has been the trend in the yield of crops and the number of animals produced between 2024 and 2023? How have climatic parameters like temperature, rainfall, humidity, and humidity been impacting farming in the study area? What have been the coping strategies adopted by the farmers to reduce the impact of climate change on farming in the study area.

Data was collected from 315 respondents in seven districts across the country using a semi-structured questionnaire. Rainfall and temperature data were also collected from 3 weather stations, namely SLARI (Mile 91), Njala University (Njala), and Kenema weather station. Participants for the survey were selected by purposive and simple random sampling. The purposive sampling technique was used in selecting only farmers who had engaged in farming for the past 10 years in the study communities. If the number was large, simple random sampling was then used to select a total of 45 farmers for the interview. Data was analysed using the Statistical Package for the Social Sciences, version 26 (SPSS). The data was reported using graphs and tables.[GDD13]

Findings revealed that farmers grew mainly food crops like rice, root crops like cassava, and vegetables. Few farmers grew tree crops like cocoa and oil palm. The main animals reared by farmers are poultry, cattle, and goats. The yield of the main food crops grown by farmers was increasing between 2014 and 2017 but remained constant between 2017 and 2020. However, yields started increasing again between 2021 and 2023. The increases in the yield, according to the farmers, are using more fertilizer to improve soil fertility and expansion of their farmlands, especially those in the rural areas. The reasons for the decline in yield of the main crops, according to other farmers, include erratic and low rainfall at the start of the rainy season, and inadequate land, especially in peri-urban areas, for farming. Animals reared in the study communities are increasing in number, though climate change in the form of high temperature and humidity has had some impact on them.

The study reveals that the the rains delay in recent times, according to a good number of the farmers as compared to 10 years ago. This has led to a reduction in the growing periods of some varieties of rice and cassava. The farmers also agreed that diseases and pests are on the increase and strange weeds have invaded the farmlands when the rains are erratic. Some farmers have been experiencing poor harvests because of erratic rainfalls, and others have lost their crops due to too much rain. The farmers have been mitigating late rainfall by adjusting the planting times, planting crops that can withstand drought, and some farmers have to relocate to available swampy areas , especially during the dry season.

Temperatures have been increasing according to the farmers' perception and data collected from three weather stations across the study areas. Farmers believed that high temperatures have been affecting the normal growth of their crops leading to yield reduction and sometimes total crop failure, as well as heat stress and restlessness among the cattle. Coping strategies adopted by farmers include adjusting planting and harvest times, watering the plants regularly to reduce withering, mulching seed beds, planting crops among trees that do not have big branches, and finally, farming in the

swampy terrains.

Most farmers agreed that humidity has been increasing resulting in diseases in both the plants and animals. The farmers have been mitigating the effects of low or high humidity through planting more trees in the communities, reducing bush burning and other wildfires, using seeds that can withstand low humidity, drying harvested crops before storage, and using chemicals for diseases control.

Farmers believed that, comparatively, weather elements like rainfall and temperature seriously affected farming activities than wind speed. However, other respondents believed rainstorms have been causing wind-thrown of tree crops on the farms. The challenge expressed by some of the farmers included wind inducing rains with accompanying floods in low-lying plains, spreading of wildfires as well as drying up of soil during the dry season. Planting trees to serve as windbreaks, early harvesting of crops and migrating to low-lying plains for farming are some of the mitigation strategies employed by farmers.

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