

Chapter

The Impacts of Climate Change in Lwengo, Uganda

Shyamli Singh and Ovamani Olive Kagweza

Abstract

Climate Change has become a threat worldwide. Vulnerable communities are at foremost risk of repercussions of climate change. The present study aimed at highlighting a case study of climate change impacts on Lwengo District of Uganda. Out of the total geographical area of the district, 85% hectares are under cultivation and most of its population depends majorly on the rain-fed agriculture sector to meet the food requirement and as a major income source. With the changing climatic conditions, agriculture is the major sector which is being impacted. The region has experienced disasters from some time, usually the second seasons rains used to result in such disasters but since 2016 both seasons have occurred disasters, which majorly include hailstorm, strong wind, long dry spells, pests and diseases. The situation became more severe due to shortage of availability of skilled human resources, quality equipment for disaster management, limited financial resources and weak institutional capacity, which resulted in increasing vulnerability of small farm holders. Some of the adaptation strategies are being taken up by the government but there is a need to understand prospects of decision-making that are site specific and more sustainable for smallholder communities. Climatic changes possess many obstacles to farming communities which require sustainable adaptation to enhance the adaptive capacities of the communities through continued production systems, which are more resilient to the vagaries of weather. Farmers are practising such options which are location specific, governed by policy framework and dependent on dynamism of farmers. This study investigated how these drivers influence farmers' decision-making in relation to climate change adaptations.

Keywords: climate change, agriculture, disaster, vulnerability, adaptation

1. Introduction

The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2014) anticipated quick changes in climate, even if greenhouse gas emissions are condensed [1]. The impact of future climate change can be reduced by mitigation but cannot be stopped altogether. Around 80 percent of the Ugandan population is dependent on agriculture. Uganda's rain fed agriculture is crucial to the masses for consumption and income generation [2]. It thus becomes paramount to scrutinize the change in climate, in terms of overall temperature and precipitation levels, or in terms of variations in seasonality of rainfall as it directly alters the state of revenue and services provided by the ecosystem. Of late, substantial amounts of variations and extreme events are being witnessed. The detrimental effects of anthropological and environmental impacts can surely be fended off by anticipating

and getting accustomed to them. The most vulnerable however, are the marginalized smallholder farmers in Sub-Saharan Africa as their inadequate capacity to adapt keeps them at the receiving end of facing setbacks to farming livelihoods [3]. Hence, it becomes essential to categorize and understand possible adaptation to cope with the impacts of it.

Climate change has a global impact which is evident in the contemporary adversarial changes in climate and can be seen in some of its manifestations in the form of prolonged drought spells, temperature variations [4, 5]. Countless instances of climate change impacting biomes, livelihoods, and human development were recorded and recognized by several studies [6–8]. A risk in the form of biomass loss and runoff is posed due to prolonged drought spells and floods [8–10] that consequently affects the agricultural sector. Moreover, it has been established that Global warming has direct consequences on Global Food security and Agricultural production. [11–14]

As the population of Lwengo, Uganda is dependent on agriculture which is a Climate Sensitive sector. Any change in the Climatic conditions would definitely reflect on the agriculture and would effect the food security of the masses hence it is very important for the population of Lwengo to see the manifestations of Climate Change and to ponder upon the various dimensions of the same.

This in turn affects people's basic livelihood enterprises amounting to great uncertainty [15] especially in places like Sub-Saharan Africa that is predominantly dependent on rain-fed agriculture [16]. Agriculture sector is the backbone of Uganda's economy as the agriculture sector supports over 70% of the people, so the variations in temperature and Climate Change is a real cause of concern for them [17]. Surrounded by a small scale and mixed crop system, the agriculture sector contributes 70% to the country's GDP - wherein 75% of employment is provided to the national workforce by the agro-enterprise niche [18]. The agriculture is however suffering in the hands of hydrometeorological disasters contributing to hunger and death of the livestock. In recent times, new challenges in the form of precipitation have been noticed which makes it urgent to make preparations for necessary and possible adaptation practices in order to avoid economic shocks that could possibly pour out from the agricultural sector [19, 20].

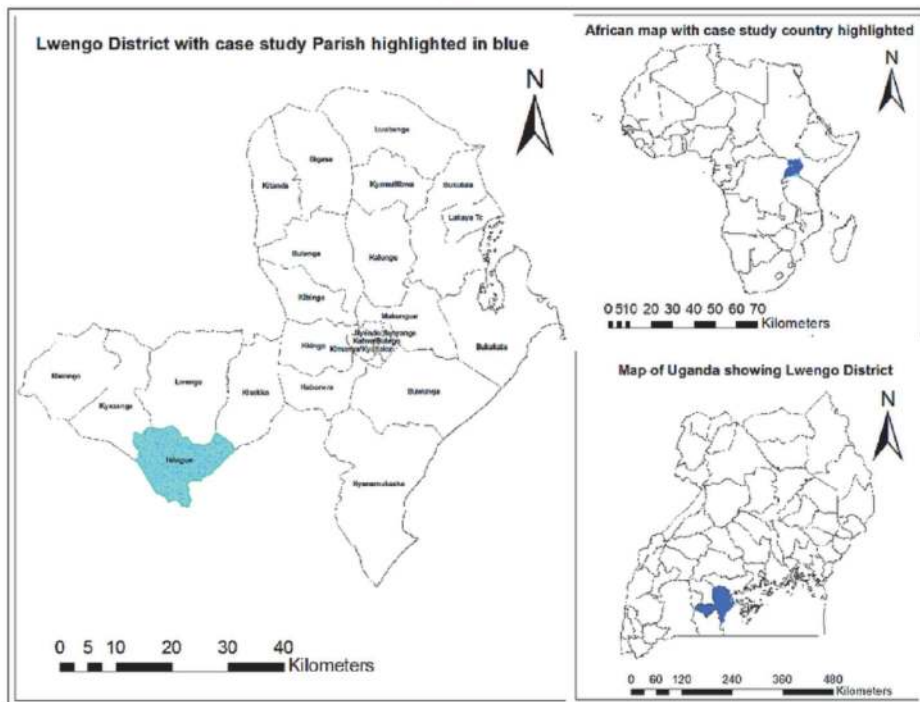
2. Impact of climate change on Uganda

A large population depends on agriculture for their food security and livelihood and eventually becomes susceptible to climate change related consequences [21]. It is likely that Climate change will have an adverse effect on African countries owing to the fact that it is dependent on rain-fed agriculture and there is a shortage of skilled human resources in the domain of disaster management besides limited financial resources and weak institutional capacity [22]. Other than this, poor condition of the soil in Sub-Saharan Africa, along with poor production techniques and lack of appropriate policies with respect to use of inputs (fertilizer) and access to credit only exacerbates the situation [23].

To top it all, Africa's warmer climate increases the chances of pandemic recurrence (e.g., HIV/AIDS), crop and animal pests and other such diseases [24]. The negligent governance of the alarming issue in these countries has widened the income disparity making more and more people economically weak [22].

In the eastern region, the agriculture production supply has started falling lower than the demand to a great extent, worsening the already delicate food security. This has also resulted in increasing vulnerability and rural poverty, further amplifying the impact of droughts that appear to have taken a grave turn in the recent years. [25].

3. General climatic characteristics of the study site: Lwengo district, Uganda



Map of Uganda showing Lwengo

A discussion on hot and cold seasons (**Figure 1**) of Lwengo would not be meaningful as the variation in the temperature of the study area is too little. The type of climate found in Lwengo is moderately hot, humid and misty. The temperature alters over the year ranging from 58°F to 81°F and is seldom below 55°F or above 87°F. A steady fall of water from the sky in significant quantities happens during 31 days in and around April 17 with an average total accumulation of 5.6 inches (**Figure 2**). The lowest rain falls around the month of June 27 accumulating an average total of 1.0 inches [26].

3.1 Key geographical characteristics

Located in the central region of Uganda, its coordinates as 00-24S, 31 25E. With an average altitude of 1150 m above sea level, it is spread over 1,024.3 sq. kms where

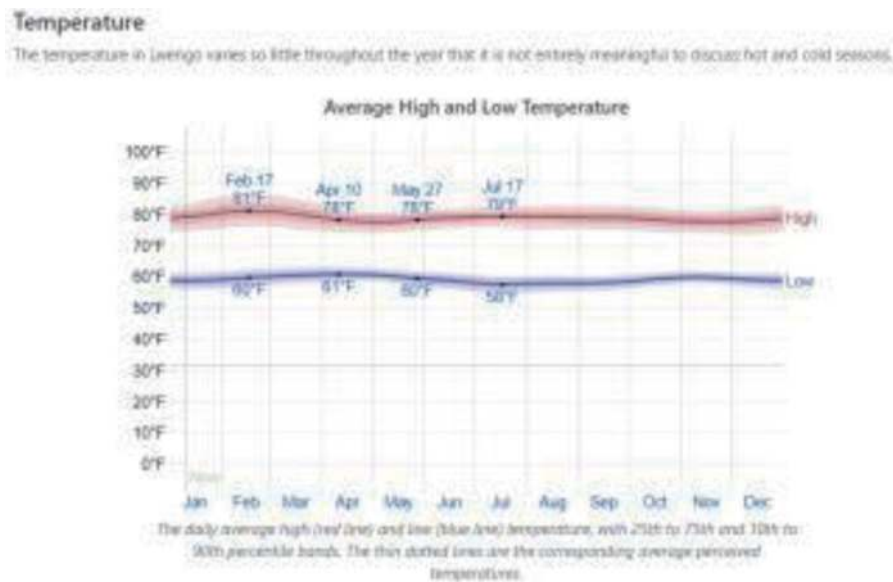


Figure 1.
Average high and low temperature, Lwengo. Source: <https://weatherspark.com/y/96871/Average-Weather-in-Lwengo-Uganda-Year-round> as accessed on 13 January, 2020.

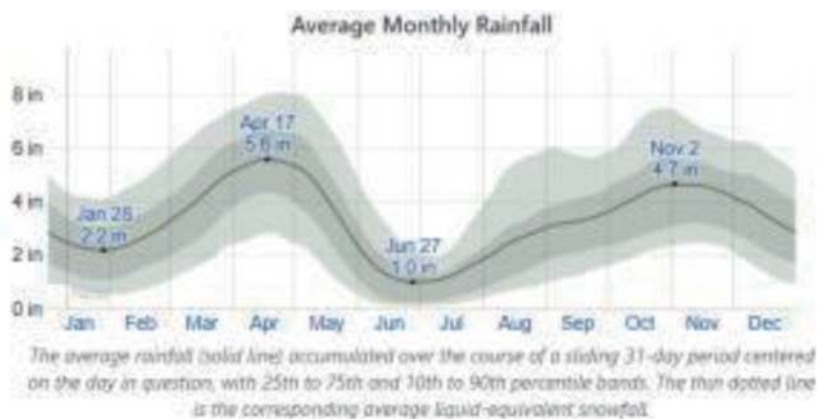


Figure 2.
Average monthly rain. Source: <https://weatherspark.com/y/96871/Average-Weather-in-Lwengo-Uganda-Year-round> as accessed on 13 January, 2020.

the land occupies area of 1,013.46 sq. km. The population density is 269 sq. kilometers per person.

The district adjoins Sembabule District to the North, Bukomansimbi District to the North -East, Masaka District to the East, Rakai District to the South, and Lyantonde District to the West. (Lwengo district, 2020). Its district headquarters is situated in Nyenje zone Church ward Lwengo Town council. The nearest largest city is Masaka, which is 45 kilometers away from the Lwengo.

Lwengo became a separate district on 1st July 2010, prior to which it was a part of the Masaka district. According to the National Population and Housing Census released in 2014, Lwengo has a population of approximately 275,450 which comprises of 53% males and 47% females. The district has total three

constituencies, four town councils *viz.* Kyazanga, Kinoni, Lwengo and Katovu, six sub counties namely, Kkingo, Lwengo, Kisekka, Ndagwe, Kyazanga and Malongo, one town board, forty-two parishes and four hundred and fifty-four villages.

In the sub counties of Kkingo, Kisekka and Lwengo, the water flows through rivers and streams of swamps, predominantly in rainy season. On the other hand, the sub counties of Kyazanga, Malongoand, Ndagweare face dry spells as they are situated in a dry corridor. Other than this, no permanent lakes exist in the region.

The total area of Lwengo District is about 1,023.7 sq. kilometers, most part of which are dotted with bear hills. The landscape and topography are by and large rolling and falling with valley bottom swamps including streams flowing to swamps. The texture of the soil is different at different places and is largely productive. It ranges from red literate to sandy loam and loam.

3.2 Climate: rainfall, temperature, humidity and winds

Being adjusted by help and proximity to Lake Victoria, the climate of the district is tropical in nature. The region witnesses long droughts between May and August, and January to March making the precipitation design bimodal. The two periods of downpour happen in the long stretches of March and April, and September to December. Chiefly, the region lies in dry-cattle passage with low dampness levels and wrecking twists consequently delayed times of dry spell.

3.3 Vegetation

85% hectares are under cultivation out of the absolute geological zone of the District (1,023.7 sq. km.) The area gazetted to the forest estate is about 21 hectares (Lwengo Local Forest Reserve) comprising about 0.021% of the absolute land territory of the region.

Summary of administrative units in Lwengo District

| | Name of Sub-County / Town Council | Parish Name | Number of Villages |
|--------|-----------------------------------|-------------|--------------------|
| Bukoto | Kkingo sub county | Kagganda | 10 |
| | | Kasaana | 11 |
| | | Kiteredde | 10 |
| | | Kisansala | 9 |
| | | NkoniSsenya | 9 |
| Bukoto | Kisekka sub county | Busubi | 8 |
| | | Kikenene | 10 |
| | | Kinoni | 9 |
| | | Kankamba | 7 |
| | | Ngereko | 10 |
| | | Kiwangala | 9 |
| | | Nakateete | 7 |
| | | Nakalembe | 10 |
| Bukoto | Lwengo sub county | Kito | 18 |
| | | Kyawagonya | 17 |
| | | Mbirizi | 3 |
| | | Musubiro | 11 |
| | | Nkunyuu | 13 |
| | | Nakenyeni | 16 |
| | | Kalisizo | 12 |
| | | Lwengo | 03 |

| | Name of Sub-County / Town Council | Parish Name | Number of Villages |
|--------|-----------------------------------|----------------|--------------------|
| Bukoto | Ndagwe sub county | Makondo | 14 |
| | | Nanywa | 20 |
| | | Ndagwe | 26 |
| | | Mpumude | 18 |
| Bukoto | Malongosubcounty | Kalagala | 18 |
| | | Katovu | 20 |
| | | Kigeeye | 16 |
| | | Malongo | 15 |
| Bukoto | Kyazanga sub county | Kakooma | 18 |
| | | Bijaaba | 14 |
| | | Lyakibirizi | 16 |
| | | Katuulo | 14 |
| Bukoto | Lwengo Town council | Kabalungi ward | 3 |
| | | Church ward | 3 |
| | | Central ward | 2 |
| | | Lwengo ward | 4 |
| | | Mulyazaahoward | 3 |
| Bukoto | Kyazanga Town council | Kitooro ward | 4 |
| | | Lwentale ward | 4 |
| | | Central ward | 2 |
| | | Nakateete ward | 3 |

4. Detailed demographic profile

The demographic of Lwengo District stands at 275,450 people, with an annual population growth rate of 3.1 percent, as per the 2014 National Population and Housing Census results. Out of the total population, 48% are men, while 52% are women. The number of inhabitants is 61,923 and 54 percent of its population is over 16 years of age. The density of population was then 192 people per square kilometers, 96% of the populace lived in rural areas, 5 people were the average family size, 22% of the households were headed by women while 51.1% of the population was below the age of 18 years. The allocation of the population across sub-counties and town councils with their respective households and demographics over 16 years is shown in the following table (**Figure 3**).

Demographic characteristics of Lwengo District

| Sub-county | Male | Female | Total | Households | Above 16 years |
|-----------------------|---------|---------|---------|------------|----------------|
| Kisekka | 23,467 | 25,718 | 49,185 | 11,710 | 26560 |
| Kkingo | 16,674 | 17,673 | 34,347 | 8,061 | 18547 |
| Kyazanga | 16,953 | 17,794 | 34,747 | 7,269 | 18763 |
| Kyazanga Town Council | 7,366 | 8,165 | 15,531 | 3,745 | 8387 |
| Lwengo | 24,092 | 25,840 | 49,932 | 11,094 | 26963 |
| Lwengo Town Council | 7,259 | 8,268 | 15,527 | 3,561 | 8385 |
| Malongo | 18,030 | 19,875 | 37,905 | 8,151 | 20469 |
| Ndagwe | 18,356 | 19,920 | 38,276 | 8,332 | 20669 |
| District | 132,197 | 143,253 | 275,450 | 61,923 | 148,743 |

Source: UPHC 2014.



Figure 3.
Population by parliamentary constituency, LWENGO district. Source: <https://www.ubos.org/wp-content/uploads/publications/2014CensusProfiles/LWENGO.pdf> as accessed on 13 January, 2020.

5. Natural resources endowment

5.1 Wetlands

Wetlands are a vital part of the ecosystem and one of the most important natural resources that contribute to the district's environmental health and socio-economic stability. They retain a tremendous amount of fresh water and provide buffering capacity against pollution, flooding and siltation. In order to assess their area of coverage, a final inventory and demarcation of wetlands in the Lwengo District becomes essential. In Kkingo and Kyazanga sub-County, there are Kyojja and Kiyanja Wetlands, both of which can be created for various economic benefits, such as through craftmaking and bird watching activities.

5.2 Social economic infrastructure

The district of Lwengo is blessed with a healthy atmosphere as well as an industrious population. The District's key economic profile includes agriculture and husbandry, fishing and trade, and pit sawing. Life standards indicators; employment patterns; patterns of human settlement; productive capital and district economic activities are a part of social economic infrastructure of the place.

Other than this, a lot of economic activities take place as well. Agriculture, livestock keeping, and trade are the major ones, as mentioned, with agriculture being the most significant element in terms of the District's revenue contribution. Employment income amounts to the District's second highest portion of revenue, followed by trade, property income tax, and the cottage industry eventually contributes the least.

6. LWENGO district and disaster

For some time, Lwengo district has suffered disasters, normally the second seasons of rain used to cause such disasters, but disasters have occurred since 2016. In Lwengo, hailstorms, heavy winds, long dry spells, pests and diseases are the main types of disasters (**Figures 4–7**).



Figure 4.
After a short heavy down pour these are patches of snow that were left behind.



Figure 5.
Banana plants destroyed by strong wind.

On 9 January 2020, a powerful hailstorm hit several villages in Lwengo sub county inflicting the impact on several villages that further affected numerous crops, including coffee, mangoes, passion fruits, banana, maize and cassava. Leaves of innumerable plants were broken, stems uprooted further mangoes, bananas, cherries and other fruits in a detrimental state (**Figure 8**).

7. Conclusion

There is a missing link for a socio-economic assessment of what defines the capacity and initiative for adaptation among smallholder farming communities to



Figure 6.
Banana plants destroyed by heavy wind.



Figure 7.
A heap of snow around a banana plant after a heavy down pour.

adopt climate change adaptation practices. Since, farming communities are very sensitive to climate change in the Ugandan region, it was noticed over the past three decades, that the temperature rises and low rainfall have been a fundamental issue for farmers trying to boost seasonal farm yields.

Other barriers in the form of knowledge shortages, lack of finance for implementing improved technologies, the absence of irrigation and the short supply of labour are problematic for climate change management and adaptation in the area. Owing to this, Smallholder farmers can come up with adaptation strategies such as soil conservation, mixed cropping, change of planting dates, tree planting/



Figure 8.
Maize plants destroyed by strong wind.

agroforestry, and furrow irrigation. This sustainable adaptation would help the ongoing on-farm practices that farmers modify on a seasonal basis to cope with climate change with the goal of improving yield and land productivity. Such activities are location-specific, regulated by policy structures, have a temporal aspect, and are based on farmers' dynamism. On one hand, the use of adaptation practices and behavior, which are imposed without recognizing the historical environmental characteristics of a region, is often presented as re-active to the immediate response to climate change events. For example, sometimes urgent steps taken by the authorities and others in cases of droughts and floods to reinstate an 'equilibrium' within that environment. Higher-level organizations are also required to prepare for adaptation in an anticipatory manner by formulating legislation, proposing adaptation projects, such as Climate Smart Agriculture, and most recently, through the National Action Plans for Adaptation (NAPAs). The NAPAs have for the most part been developed by countries by giving limited attention to factors that drive farmers' decision-making around implementation [27]. As a result, smallholder farmers are therefore practicing different adaptation strategies on their farms, including sub-optimal ones, with the option of adaptation measures that are known to be influenced by different factors including, sex, age, farming experience, family size (household members), membership (Group affiliation of members), Shock floods, Land size, Farm inputs, Landscape position, Level of Education, Crop yield, and Farm income [28–31]. This study explores how these drivers affect the decision-making of farmers in relation to adaptation to climate change. Understanding the relative value of these parameters would allow farmers to use viable adaptation practices easily and to address famine and major constraints on crop production.

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