



Impact of Climate Change on Small Scale Farmers in Samfya District of Luapula Province, Zambia

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Abstract: *Climate Change severely affect rural Zambian communities punctuating severe variation in seasonal weather patterns. Small-scale rural farmers are the worst hit. The study was a case study whose participants were sampled from four villages of Samfya District. The study findings suggest that heavy rainfall, shorter rainfall periods and warmer temperatures were punctuated by climate change leading to crop failure and consequently, to low household food security and income. Small scale farmers in Samfya District had their crops stunted, some were getting rotten, others experience delayed germination leading to low crop yield. New crop and animal diseases emerged as a result of the change in the climatic condition. The study noted that, floods that hit Samfya District during almost every rainy season left a lot of farmers food insecure and their economic instability. This situation was partially exacerbated by poor coping strategies that some of the farmers employed. The study concluded that, climate change had multiple impacts in diverse scale among selected small-scale farming communities. Farmers proposed that government should provide funds for diversification of their economic activities rather than over-depending on farming. They also suggested that, farm inputs should be provided early to allow farmers plant crops early or at the convenient time based on rainfall patterns.*

Keywords: *Climate change, Small scale farmers, Samfya District, Adaptation*

1. BACKGROUND

Climate change is a major challenge impacting all forms of agricultural activities and threatens food security and sustainable development. USEPA (2017) elaborates that globally, there are estimated 475 million smallholder farmers cultivating less than 2 ha of land each. Many of these are poor, experience food insecurity, and live in highly dangerous conditions. Due to the fact that smallholder farmers depend on rain-fed agriculture, they cultivate marginal areas and lack of access to modern technical machinery makes them highly vulnerable to climate change and its impact. The study conducted by Chisha (2018) in Eastern Province points to vulnerability of smallholder farmers to climate change. Adaptation efforts are being hindered by lack of information on how smallholder farmers are experiencing and responding to climate change (Clodine *et al.*, 2021).

Muchanga (2011) also found similar challenges in rural parts of Lusaka that transcends lack of information to lack of contextual learning for climate change adaptation at community level and went on to propose a framework that if implemented, can evoke desired behavioural and social change that can build communities' adaptive capacities. Understanding fundamental impacts of climate change on smallholder farmers and developing appropriate adaptation strategies are critical issues in Zambia because smallholder farmers are highly vulnerable to climate change as their crops are sensitive to rising temperatures and changing rainfall patterns. Rising temperatures and drought conditions have negative impacts on biomass production and yields of maize and beans. Similarly, irregular rainfall patterns, and extreme rain events can significantly reduce yields and exacerbate food insecurity and poverty (Clodine *et al.*, 2021).

In Zambia, Agriculture is becoming an increasingly important sector to its economy since the mineral sector, which was once Zambia's economical pillar between 1964 and late 1980s (Muchinda, 2001). The agriculture sector generates about 18% to 20% of the country's GDP and provides a livelihood for more than 60% of the population. It employs about two-thirds of the labour force (Muchinda, 2001).

Despite its main importance to the people of Zambia, agriculture has been affected by increase in drought frequency and intensity in the last 20 years. The droughts of 1991-92, 1994 and 1997-98 worsened the quality of life for vulnerable groups such as subsistence farmers (Muchinda, 2001).

A study by Mulenga and Wineman (2014) in Zambia demonstrated that lengthened dry spells decreased water levels in streams, dams, rivers, lakes and wells, leading to reductions in the amount of water available for the growing of vegetables during the dry season. Mulenga & Wineman (2014) and Muchanga (2013) also emphasise that livestock farmers in Zambia now walk longer distances to water-points due to water scarcity. In his study, Muchanga (2013) emphasised that, the challenge of travelling longer distances to fetch water mainly affect women and children especially during water stressful periods in southern half of Zambia, leading to decreases in livestock weight and increases in livestock mortality.

Jain (2007) studied the impact of the changes of the climate on rain-fed maize agriculture in Zambia, using the Ricardian method. The method measures the consequence of climate change on the value of farming land. However, Jain (2007) replaced the farm land variable with net farm revenue, because Zambia has abundant free land for subsistence farmers, which would have made it difficult to attach value to the land. In his results, he showed that the increase in temperature by 1°C above mean temperatures of 21.72°C during the germination stage of maize which is November to December could have an adverse impact on the maize yield, resulting in loss of marginal net revenue of US\$ 322.628 per hectare. On the contrary, Jain (2007) also indicates that an increase in temperature by 1 °C in January and February favours crop growth and it has a probable positive effect on crop yield. Chisanga *et al.* (2022) also observed a projected increase in temperature and scarcity amidst changing climate in the next 50 years from 2021.

2. METHODS AND TOOLS

Samfya is a rural District in south-east of Luapula Province and the south-western of Lake Bangweulu, between 11° 34' 11" 38" S and 29° 53' 29" 57" E. The district is approximately 10,000 Km² out of 50567 Km² of the entire Luapula Province, representing 19.8% of the geospatial extent of the province (Figure 1). Much of Samfya District is lake swamp or floodplain. It covers lake Bangweulu and Bangweulu swamps. The widespread dry land is along its western edge where it borders Milenge and Mansa Districts, (Kalasa *et al.*, 2003). The district has alluvium clay and loamy soils around the lakeshores and has sandy and loamy soil on the highland. The weather is hot to cool and the hot season start from September to November, cold season is from May to August. The district falls in the high rainfall region classified as ecological region- III and experiences heavy rainfall whose average annual oscillates between 1000 to 1500mm.

District has an important ecosystemic and forest diversity including miombo forest and grassland dominated by hyparrheinia. In the dambos the vegetation is low growth grasses and other species with a sporadic presence of a dambo forest known as Mushitu (Kalasa, *et al.* 2003).

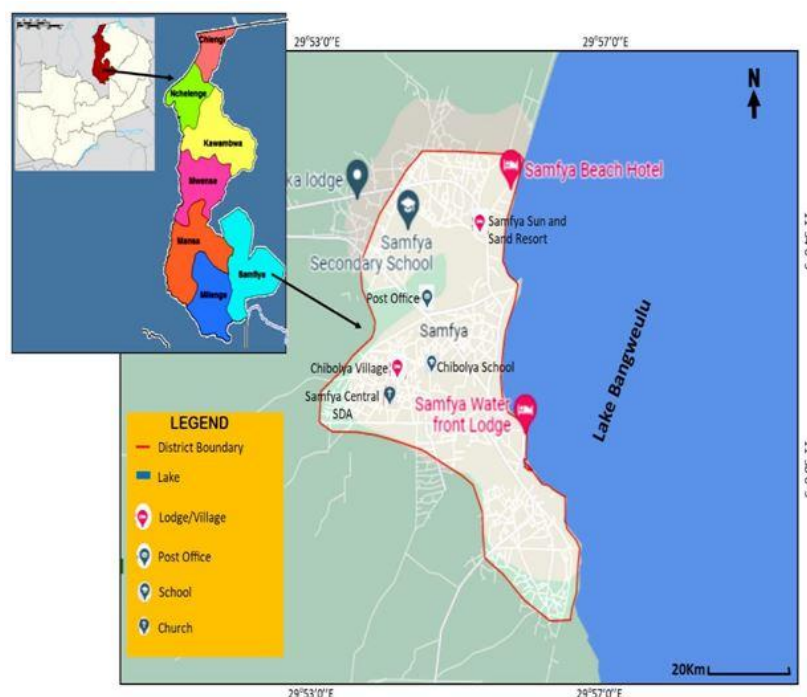


Figure1. General and specific location of Samfya District in Luapula Province.

By the time this study was conducted, statistics showed that Samfya District has an approximate population of 20,470 distributed unevenly around the area. Productive activities are primarily fish farming, traditional rain-fed agriculture involved in growing maize, cassava, groundnuts and sweet potatoes. Additional small-scale economic activities include tourism and small-scale trade, which are of great importance in the area (Zambia vulnerability assessment committee, 2015).

Muchanga (2020) guides that every scientific study should be guided by a well thought out methodological decision informed by succinct philosophic orientation. This study was guided by qualitative case study (Yin, 1994) within the broader paradigmatic lens of hermeneutics, which enabled deeper understanding of experiences, phenomena and context of the impact of climate change. It allowed for questions that could be easily show lived human experience (Ng’andu, 2013). The target population constituted small scale farmers in Samfya District where a sample of 30 participants was constituted using purposive sampling (Bryman, 2008) based on lived experiences with the local climatic changes. Data was collected using semi-structured interviews with farmers. The collected data was analysed using qualitative thematic analysis, which allowed for the grouping of data into themes from which meanings and conclusions were drawn.

3. RESEARCH FINDINGS

Climate change has multiple impacts in diverse scales and affect livelihood in different ways. The study found that, climatic changes had affected crops’ health, growth and eventually yields, which could potentially trigger food insecurity. Livestock was also affected as animals such as goats, chicken got affected with diarrhoea due to high temperatures. Some animals could not survive high temperature; hence, small scale farmers lost their sources of income and food security (Table 1). As a response to the changing climatic conditions, the local communities adopted different adaptation measures which are presented in Table 2. Among them were diversification of crops and animals, harvesting some water and practicing of crop rotation to preserve soil fertility.

Table1. *Effects climate change on Crops and Livestock*

Crops		Livestock	
Theme	Description	Theme	Description
Low rainfall affecting crop growth	Reduction in rainfall has resulted to cassava become stunted and poor growth of maize	Livestock diseases	Animals have a lot of diseases e.g. chicken gets diarrheal, cattle got sores etc. when experiencing higher temperatures
Droughts drying up of some crops	Droughts makes the soya beans dry up	Livestock mortality	Livestock animals especially chicken die when it’s too hot
Reduced yields on crops	Low rainfall leads to less yield on crops	Pasture scarcity	Low or no rainfall leads to no grass for animals hence starvation
Pests and infections	Crops don’t grow health due pests and infections hence leads to poor harvest and productivity		
Delayed germination	Plants delay to germinate now than in the past.		
Rotting of crops	Crops getting rotten such that, only small yields are expected		

Table2. *Adaptation strategies to climate change*

Theme	Description
Relying on different animals	We have adopted animals that are a bit resistant to droughts. In the past it was not like this. We used to have a lot of rainfall, but now, it is not enough. We now keep goats and sheep because they can adapt well to reduced rainfall
Crop diversification	We need to change the crop we grow so that, reduced rainfall doesn’t affect the yields
Practicing irrigation and rainwater harvesting	Since we have high rainfall during selected periods in the rainy seasons, we are thinking about irrigation and also harvesting water using dams. The water in the dams can be useful when there is no rainfall

Intercropping and crop rotation	We are mixing crops that take away nutrients from the soils with those that fix them back so that soil doesn't lose fertility. We are also trying to change the type of crop grown Every year.
Having both early and late maturing crops	When we plant that mature early it means even if the rains go away fast, the crops are ready for harvesting. For example, some types of maize mature earlier so we use them. Those which mature late are adopted when the rainfall delays

4. DISCUSSION

Premised on the study findings, the study suggests that, the popularly market notion of water and agricultural security in Luapula Province as a whole and, Samfya District in particular need s rethink as climatic changes seem to affect this over glorified perception. Climate change ravaged and is still ravaging water resources and eventually, food security at stake given the reduction in crop production and increases in animal diseases due to rising temperatures. Other than climate change, the poor agricultural activities such as monocropping and *Chitemene* system are still prevalent and, under climatic variabilities and changes, soil fertility loss is punctuated, leading to low crop yields. Being a rain-fed crop dependent environment, the district is likely to experience food insecurities as the yields keep plummeting. Mbuli *et al.* (2021) earlier revealed that small-scale farming sector that solely depend on rainfall is more vulnerability to climatic shocks, stress and affects agricultural productivity.

Climate change and variability have a huge impact on small scale farmers' livelihood despite having put across adaptive measures to copy up with its stress. The dry season, which have been observed with excessive heat led to crops drying up resulting to poor harvest and food for livestock becoming scarce. On the other hand, the extreme heavy rainfall that has been an issue in Luapula Province had increased the chances of frequent floods in Samfya District disturbing normal crops and livestock farming. Due to limited copying strategies, small scale farmers found it quite difficult and expensive to cope given their over dependency on rain-fed farming for many years. Sanabria *et al.* (2014) noted similar challenge in South African context, which shows how geospatially distributed the challenge of the climate change and variability. Generally, farmer in rural Samfya depended on rain-fed agriculture and their coping strategies were limited due to limited earnings.

Food insecurity is one of the noticeable effect associated with climate change (Clover, 2003). Like on the Kenyan case study where small-scale farmers experienced food insecurity risks (Clover, 2003), the current also noted with concern about the looming food insecurities due to changing climatic conditions. This implies that children and adults alike may be under-nourished, and poverty may potentially become ubiquitous among small-scale farmers and most rain-fed dependent communities. Food insecurity mostly results from poorly adapted agricultural practices, which affect productivity. The study findings suggest that, the smallholders should navigate away from depending on climate-sensitive farming activities before worsening of climatic changes.

The coping strategies adopted by local farmers were quite practical, but may need further training and education especially with regard to how they can make maximum utility of coping option. The study holds a view that, surface runoff harvesting through construction of dams could offer some potential options for continued water supply during dry seasons when most shallow wells also dry up. Boko *et al.* (2007) Ngigi (2009); and Sichingabula *et al.* (2022) observed that, such an approaches could actually build adaptive capacity during water stressful period. Generally, the best adaptive measure to provide to small scale holder farmers should include building efficient adaptation strategies which would promote education, providing innovative researches on agriculture and stronger governmental and community involvement (Simweene and Muchanga, 2021; Heikkinen, 2017), not merely leaving everything to be driven by the local people.

5. CONCLUSION

The study concludes that climate change is jeopardising to small scale farming especially for communities with compromised resilience and adaptive capacities. The increasing temperatures and declining water supply could spell out more community challenges such as mal-nourishment, loss of means of livelihood, poverty as people keep losing crop yields and livestock productivity. The coping strategies that can best address the cited challenge are those that are community engaged and educational in nature as they would bring about desired behavioural and social change that would loosen the people from their long-upheld farming practices to more climate-resilient ones.

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