International Labour Organization

ILO brief

Research Brief

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Drought, crop losses and employment impacts in Zambia

Key points

- The 2018-2019 drought affected approximately 30 per cent of cropland across Zambia, with the most severe impacts concentrated in Southern and Western provinces, where maize and sugarcane were particularly exposed.
- Drought exposure was associated with an estimated 14 per cent decline in crop productivity in affected wards, based on satellite-derived measures of vegetation productivity.
- Total employment declined by approximately 8 per cent and average wages decreased by approximately 5 per cent in drought-affected wards, with similar effects across male and female employment.
- The findings highlight the need for employment-centred drought responses, including EIIP approaches, climate-resilient agriculture, and policies that integrate employment considerations into climate adaptation and response planning.

Background

Zambia is a water-scarce country where agriculture is almost entirely dependent on rainfall, with an estimated 90 per cent of cultivation rain-fed. This makes rural livelihoods highly vulnerable to climate shocks. In 2018-2019, the country experienced its lowest seasonal rainfall since 1981, with Southern Zambia particularly affected. The drought event left an estimated 2.3 million people facing severe food insecurity and had wide-ranging effects on crops and livestock.

Research questions

This study aimed to address the overall research question:

How did drought affect crop productivity and employment outcomes in Zambia between 2018 and 2021?

This was broken down by answering the following:

1. Which areas of Zambia were most impacted by drought in 2018-2019?
2. Which crop types were most affected?
3. How did drought affect crop productivity?
4. What impact did this have on employment outcomes?

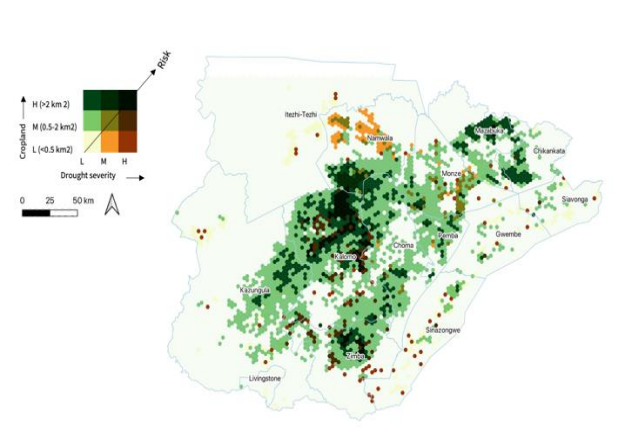
Methods

Satellite-based drought analysis was combined with econometrics using Labour Force Survey (LFS) data. High-resolution Earth observation data (Sentinel-2) was used to detect drought severity and map crop types across Zambia using machine learning classification. The Normalized Difference Vegetation Index (NDVI) and Net Primary Productivity (NPP) are satellite-derived vegetation indices that capture relative changes in vegetation productivity. They provided a proxy for crop yield estimation by converting into biomass production, using the Food and Agriculture Organization (FAO) Water Productivity Open-access Portal (WaPOR) methodology. Ground truth field data was not available for the study.

The analysis took place at the ward level, comparing wards in drought-affected areas to those in unaffected areas. Wards were classified as drought-affected if at least

20 per cent of their area was cropland and they experienced moderate to severe drought conditions based on satellite-derived drought severity (Figure 1).

▶ **Figure 1. Areas of cropland with drought severity, used to define treated wards, Southern province.**



Source: Author's research

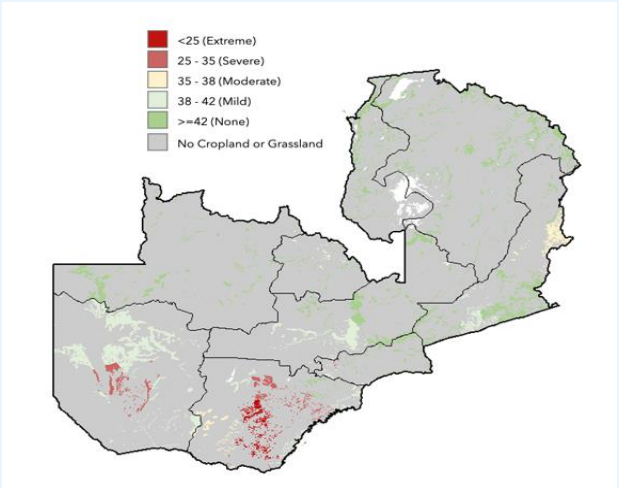
These measures were then combined with LFS data, which allowed an analysis of the effects of drought on employment and wages. This was analysed at the ward administrative level, using a difference-in-differences (DiD) approach, including time and area fixed effects.

Results

Drought exposure and crop mapping

Drought intensity was mapped, taken from the Agricultural Stress Index System (ASIS), a remote sensing-based tool developed by the FAO. These indices showed that around 30 per cent of Zambia's cropland was under moderate to severe drought in 2019 (Figure 2).

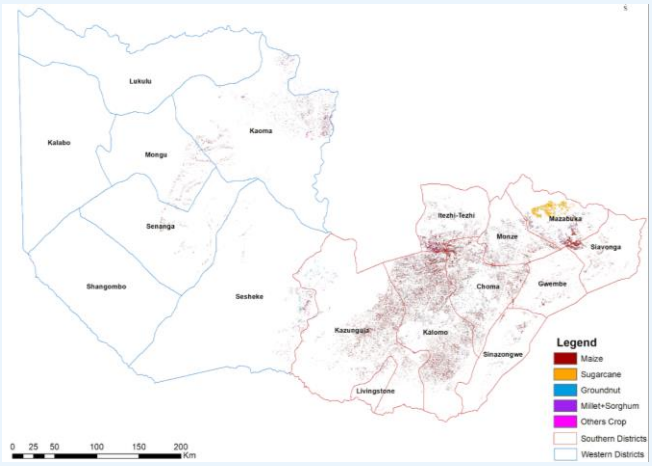
▶ **Figure 2. Drought severity in Zambia, year 2019.**



Source: Author's research

From the Sentinel data, the Normalized Difference Vegetation Index (NDVI) was applied as a measure of vegetation productivity. This was matched with the crop calendar for Zambia, to map major crops across the country. The results confirmed that maize is the dominant crop type, especially in the Southern and Western provinces (Figure 3). Maize, along with crops like sorghum and groundnut, is almost entirely rain-fed, making them highly vulnerable to dry spells.

▶ **Figure 3. Crop type map of Southern and Western provinces.**



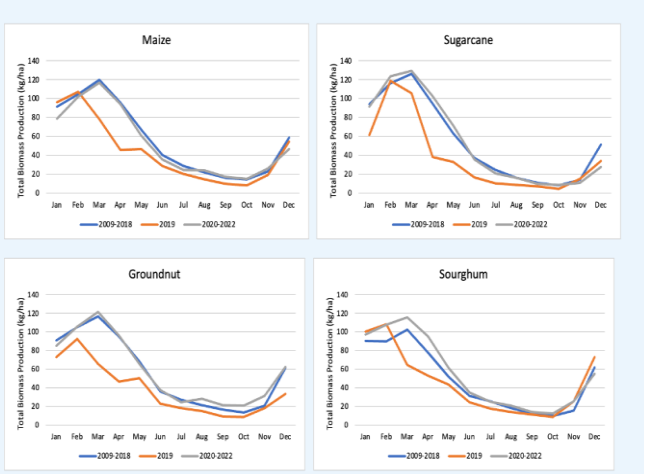
Source: Author's research

Crop productivity

A cross-sectional regression compared drought-affected wards with unaffected wards within the same districts, controlling for underlying agro-ecological differences. Wards exposed to drought in 2019 experienced a statistically significant decline in crop yields (NPP). On average, treated wards had an NPP an estimated 14 percent lower than unaffected wards, indicating a significant reduction in agricultural productivity due to drought.

Analysing the NPP values for all the classified crops, distinct patterns of productivity decline emerged. Certain crops exhibited a more pronounced reduction in NPP, such as maize and sugarcane, indicating severe yield losses attributable to the drought conditions (Figure 4).

▶ **Figure 4. Biomass production for different crop types across the years of study, with 2019 in orange.**



Source: Author's research

Employment impacts

Reductions in crop productivity translated into measurable labour market impacts. Using ward-level Labour Force Survey data and a difference-in-differences approach, the analysis finds that:

- **Overall employment** declined by an estimated 8 per cent in drought-affected wards during the drought year relative to comparable unaffected wards.
- **Gender-disaggregated** estimates of employment show that the decline in employment affected both men and women, with similar magnitudes across genders.
- **Average daily wages** declined by approximately 5 per cent in drought-affected wards.

Estimates for employment in the agricultural sector and hours worked were not statistically significant. However, the observed declines in employment and wages are consistent with drought-induced reductions in agricultural productivity, which decrease labour demand and lower incomes from reduced crop production. In predominantly rain-fed systems, drought-related yield losses can affect both smallholder farmers and agricultural wage workers, with knock-on effects for local labour markets. Reduced agricultural output may also constrain income opportunities in related activities, contributing to broader employment and wage pressures at the local level.

Recommendations

The findings demonstrate that drought-related productivity shocks translate into measurable employment and income losses at the local level. Addressing these impacts requires a combination of anticipatory policies, employment-centred responses, and longer-term resilience-building measures. The following recommendations are suggested:

1. **Strengthen employment-centred drought response at policy level:** National drought and climate adaptation strategies should explicitly integrate employment considerations, ensuring that early warning and response mechanisms address job and income losses alongside production impacts.

2. **Use employment-intensive investment approaches as response and mitigation measures:** Employment-intensive public employment and investment programmes in drought-prone areas can provide short-term employment to those most affected by income and job losses, while also mitigating future drought impacts by building productive and climate-resilient assets, particularly in water management, rural infrastructure, and nature-based solutions.

3. **Support climate-resilient agricultural practices:** Promoting a transition to climate-resilient agricultural practices can help to ensure that livelihoods in agriculture are protected and improved.

4. **In parallel promote livelihood diversification:** Through skills development and promoting non-farm activities and employment opportunities to reduce dependence on rain-fed agriculture and strengthen resilience to climate shocks.

5. **Use integrated data systems to guide employment-sensitive climate policy:** Integrating Earth observation data with labour force surveys can help governments identify drought-related employment risks, improve targeting of drought responses, and monitor labour impacts of climate shocks over time.

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