

Welfare effects of prolonged droughts and household coping mechanisms in rural Tanzania

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Key messages

Drought does not significantly reduce household spending, but households cut food quality or portion sizes to cope with it.

Drought exposure has increased the risk of food insecurity by up to 25% over the past year.

Many households rely on asset sales, savings depletion, or external aid, with 43–50% having no formal coping plan.

Drought reduces crop yields, limiting market participation and driving food price spikes

Introduction

Climate change poses a significant threat to rural Tanzania, where rain-fed agriculture forms the backbone of livelihoods and sustains household incomes. Smallholder farmers and pastoralists rely heavily on rainfall and natural resources such as arable land, water, and pasture, making them highly vulnerable to climatic variability. Recent trends, including prolonged droughts, irregular rainfall, and excessive floods, have worsened vulnerabilities by reducing agricultural productivity, lowering household incomes, driving up food prices, and raising the risk of food insecurity, particularly among the most vulnerable rural households. Like many other countries in the Global South, Tanzania has experienced severe and recurring drought spells over the last 30 years. In some years, as Table 1 indicates, the severity of drought conditions was very high. These droughts have had significant negative effects on the economy, especially on the agriculture sector (crops and livestock), as well as on water and energy resources.

The 2010/11 drought was one of the worst in decades, affecting around 2.1 million people directly, causing an estimated economic loss of \$140 million due to reduced yields of staple crops and killing nearly 60% of livestock, forcing pastoralists to migrate and many households to sell assets as a coping mechanism, mostly in the northern part of the country. In terms of coverage, 56 districts in 16 regions countrywide experienced acute food scarcity due to the drought.

Table 1: Incidents of Drought Events in Tanzania (1984–2020)

Year	Affected regions	People affected (Million)
1984	-	1.9
1988	Lindi	0.1
1996	Kagera, Mara, Mwanza, Geita, Shinyanga, Arusha, Kilimanjaro, Tanga, Dar es Salaam, Pwani, Lindi, Mtwara	3.0

2003	Kaskazini Unguja, Mjini Magharibi, Kusini unguja, Singida, Dodoma, Shinyanga, Mwanza, Tabora, Kagera, Kigoma	1.9
2004	Arusha, Kilimanjaro, Manyara, Tanga, Pwani, Dar es Salaam	0.3
2006	Arusha, Manyara, Kilimanjaro	3.7
2010/11	Arusha (Ngorongoro, Longido, Monduli), Manyara (Simanjiro), Kilimanjaro (Same, Rombo, Mwanga)	2.1

Source: Arslan et al., (2018). Note: (-) stands for 'no data.'

Despite growing evidence on the impacts of climate variability in Tanzania, there is limited empirical research quantifying the causal effects of prolonged droughts on rural household welfare using nationally representative panel data. Most of the existing studies, such as Arouri et al. (2015), Hallegatte et al. (2015), Ngcamu and Chari (2020), Wu et al. (2022), and Randell et al. (2022), focus on emerging market economies or provide descriptive accounts of drought impacts, leaving gaps in understanding how droughts affect household consumption, income, food security, and adaptive behaviours over time.

This brief, therefore, examines how exposure to severe droughts affects various measures of rural household welfare and the potential channels through which drought shocks affect livelihoods. The findings aim to inform policy interventions that strengthen rural household resilience, enhance food security, and reduce vulnerability to climate-induced shocks.

Methodology

This study employs a quantitative approach using secondary data from the Tanzania National Panel Survey (NPS) to examine the welfare effects of prolonged droughts on rural households. The analysis focuses on a nationally representative sample of rural households across drought-prone regions, including Kagera, Mwanza, Kilimanjaro, Arusha, Tanga and Dodoma regions. Households were selected using a stratified multistage sampling strategy, ensuring representation across diverse agro-ecological zones and socio-economic contexts. Panel data estimation with fixed effects was used to control for unobserved heterogeneity and potential selection bias. To further strengthen causal inference, Propensity Score Matching (PSM) was applied to estimate the effects of drought exposure by pairing drought-affected households with comparable non-affected households based on observed characteristics.

Findings

The analysis reveals that prolonged droughts have significantly affected rural household welfare in Tanzania, with results showing measurable impacts on consumption, food security, and the adaptive strategies households employ to cope with climate shocks.

Welfare effects of drought on food consumption

The findings suggest that while drought exposure is associated with a decline in both food and total household consumption, the estimated effects are not statistically significant (see Table 2). This implies that, on average, households did not experience a measurable reduction in real consumption expenditure because of droughts during the study period. Even among agricultural-dependent households, the results remain negative but insignificant, indicating that drought shocks may not have translated directly into lower consumption levels. This outcome may reflect the existence of short-term consumption-smoothing mechanisms, such as income diversification and reliance on non-farm activities, within rural communities, which help buffer the immediate welfare effects of climatic shocks.

Table 2: Effects of exposure to severe droughts on food consumption

	Panel 1		Panel 2	
	(1)	(2)	(3)	(4)
	FC	TC	FC	TC
All Sample:				
Exposure to Drought	-0.017 (0.029)	-0.003 (0.027)	-0.000 (0.034)	0.015 (0.031)
Controls	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
F-statistics	14.166	15.101	3.167	5.772
P-value	0.000	0.000	0.000	0.000
Observations	3518	3518	3345	3350
Agricultural Dependent Sample:				
Exposure to Drought	-0.020 (0.036)	-0.014 (0.034)	-0.002 (0.045)	-0.008 (0.040)
Controls	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes
F-statistics	12.343	12.497	1.642	3.272
P-value	0.000	0.000	0.063	0.000
Observations	2420	2420	2225	2227

Source: Author estimates using NPS data (waves 2, 3, 4, and 5). **Notes:** FC and TC denote food consumption and total consumption

Effects of exposure to drought on food security

In contrast to the insignificant effects of drought on household consumption, the fixed effects estimate in Table 3 reveals a strong and statistically significant relationship between drought exposure and household food insecurity. These results indicate that households exposed to drought were substantially more likely to experience food shortages, both in the short term (past seven days) and over the longer period (past twelve months). Specifically, exposure to drought increased the likelihood of food insecurity by 6.7 per cent and 11.5 per cent in Panels 1 and 2, respectively. The magnitude of the effect is even higher for food insecurity experienced over the past twelve months, rising to 10.2 per cent on Panel 1 and 24.7 per cent on Panel 2, suggesting that the impact of drought on household welfare becomes more pronounced and persistent over time. Similarly, the fixed effects estimate for the reduced Coping Strategy Index (rCSI) are positive and statistically significant, further confirming that drought exposure exacerbates household vulnerability to food insecurity.

Table 3: Effects of Exposure to Drought on Household Food Security: Fixed Effects

	Panel 1			Panel 2		
	(1)	(2)	(3)	(4)	(5)	(6)
	FS-7D	FS-12M	rCSI	FS-7D	FS-12M	rCSI
Exposure to Drought	0.067** (0.026)	0.102*** (0.027)	0.770* (0.361)	0.115*** (0.028)	0.247*** (0.029)	1.492*** (0.407)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	2.269	12.606	1.130	3.613	11.687	2.581
P-value	0.002	0.000	0.316	0.000	0.000	0.001
Observations	3556	3556	3556	3350	3350	3349

Source: Author estimates using NPS data (waves 2, 3, 4, and 5). **Notes:** (i) FS-7D and FS-12M denote food insecurity for the last 7 days and 12 months, respectively. (ii) Standard errors are in parentheses. (iii) *, **, and *** denote significance at 5%, 1% and 0.1 %, respectively.

Conclusions and recommendations

Prolonged droughts continue to pose a serious threat to the welfare of rural households in Tanzania, particularly those dependent on rain-fed agriculture. The findings show that while households are often able to smooth short-term consumption, drought exposure significantly worsens food security and weakens livelihoods through reduced farm production, declining incomes, and rising food prices. Further findings reveal an insignificant effect of drought exposure on real per capita consumption, for both total and food consumption. This negligible effect may reflect households' coping strategies and adjustments in response to higher food prices. Exposure also correlates positively with a reduced Coping Strategy Index, further highlighting the strain on household food security. Further assessment of potential channels indicates that drought significantly reduces agricultural productivity, particularly crop yields, which in turn lowers farming income.

These findings underscore the need for targeted policy interventions to strengthen rural resilience, including social protection programmes and strategies that support both adaptation and mitigation in the face of climate shocks. Three recommendations are made:

First, Expanding and Targeting Social Protection Programmes: Safety nets such as cash transfers, food assistance, and emergency support for households most vulnerable to drought should be strengthened, ensuring timely aid to reduce reliance on unsustainable coping strategies like asset depletion.

Second, Promoting Climate-Smart Agriculture and Diversified Livelihoods: Rural households should be supported with resilient agricultural practices, drought-tolerant crops, improved irrigation, and income diversification opportunities to reduce dependence on single crops and enhance household adaptive capacity.

Third, Integrating Food Security Monitoring into Policy Planning: Systematic monitoring of food security indicators, dietary quality, and coping strategies should be implemented to inform proactive policy responses and ensuring interventions address both consumption adequacy and nutritional well-being.

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