

Contextual Perspective on Climate-Related Shocks, Coping Strategies and Household Consumption in Sub-Saharan Africa (SSA): Trends and Insights

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ABSTRACT

This research investigated the relationships among climate-related disruptions, adaptive responses, and household consumption patterns in Sub-Saharan Africa. Employing a comprehensive methodology, a total of 1219 papers from 2000 to 2022 were screened across the Web of Science and Scopus databases, with 62 studies undergone rigorous assessment. The methodology involved identifying relevant literature through keyword searches, citation tracking, and hand-searching of journals. Independent reviewers screened studies based on the inclusion criteria. The data extracted covered research design, shock type, coping mechanisms, and their impact on household consumption, nutrition, and food security. Bibliometric and thematic analyses were conducted to examine publication trends, common themes, and collaboration networks among researchers. The findings revealed an increase in the frequency and intensity of climate-induced shocks, particularly droughts and climate change, significantly impacting household consumption and food security in the region. Coping strategies such as livelihood diversification, migration, and climate adaptation were found to be crucial in alleviating the impact of climate shocks on food security and consumption. Bibliometric insights revealed evolving trends in climate research, emphasizing the ongoing necessity to comprehend impacts and mitigation in evolving SSA contexts.

Keywords: Shock-coping mechanisms, Household consumption, Sub-Saharan Africa.

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INTRODUCTION

Sub-Saharan Africa (SSA) is home-based to some of the world's underprivileged households, which are often vulnerable to various shocks that can threaten their well-being and livelihoods.^[1-3] These shocks include natural calamities, such as droughts, floods, and storms, as well as economic and social disruptions, such as conflicts, market fluctuations, and health crises.^[4-6] In response, households in SSA use diverse coping mechanisms to mitigate the impact of shocks and maintain their consumption levels.^[7-9]

Research has shown that households in Sub-Saharan Africa depend heavily on informal coping mechanisms such as borrowing from family and friends,^[10,11] selling assets,^[12] livelihood diversification,^[7,13] and reducing household consumption.^[14,15] Social networks, including extended family and community networks, also play a crucial role in offering

support and resources during times of crisis.^[16,17] In addition to informal coping mechanisms, households in the region also employ formal financial services, including savings accounts, credit facilities, and insurance, to deal with shocks.^[18,19]

Various studies have shown that the usefulness of shock-coping mechanisms in facilitating household resilience and sustainable development in SSA depends on a range of contextual factors, including the social, economic, and cultural settings in which they are employed.^[14,20] For example, how a shock influences household consumption may vary depending on the household's income level, education level, access to credit and markets, social network characteristics, and cultural norms around risk-taking and investment.^[21-23] Furthermore, different authors found that households that adopted a combination of adaptation strategies, such as using drought-resistant crops and diversifying income sources, were more resilient to climate shocks than those that relied on a single strategy.^[18,24,25]

Although a substantial volume of literature exists regarding the use and impact of shock-coping mechanisms in SSA, most studies have focused on individual mechanisms or specific contexts,



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and there is limited synthesis of the overall impact of these mechanisms on household consumption in SSA. Thus, this study conducted a bibliometric analysis and systematic literature review on the influence of shock-coping mechanisms on household consumption patterns in SSA from a contextual perspective. The focus of this study is on the first primary shocks affecting the region, namely, climate-related shocks.^[26-28] Droughts, floods, and other severe weather events, in addition to climate fluctuations, have the potential to result in crop failure, livestock loss, food insecurity, and poverty.^[29,30]

Specifically, this paper addressed the following research question: How do savings, borrowing, remittances, social networks, migration, asset selling, and diversification mechanisms impact household consumption in SSA during climate-related shocks, such as floods, irregular rainfall and droughts? By answering this question, this paper contributes to a better understanding of the complex connections among shock-coping mechanisms, household consumption, and contextual factors in SSA. Apart from the introduction, the second part of this paper comprises the methods, while the third section presents and discusses the results. Finally, the concluding section offers recommendations for future research.

DATA AND METHODOLOGY

Identification of relevant literature

Identification of relevant literature was the first and crucial step in conducting this research. To ensure comprehensive coverage of the literature, multiple search strategies were employed (see Figure 1). The search involved employing a combination of keywords to search electronic databases, including the Web of Science and Scopus platforms, to ensure the wide inclusion of publications in the area of interest. Relevant literature was also identified through the citation tracking of key articles and manual searches of relevant journals.

The search was limited to studies published between 2000 and 2022. First, it allowed for a focus on more recent literature that reflects present issues and trends in the region. In addition, there was a timeframe in which significant changes and challenges, including climate change and economic crises, occurred in the social, economic, technological and environmental landscape of Sub-Saharan Africa.^[31] For instance, climate change has had a disproportionate impact on the most vulnerable individuals and systems in various sectors and regions, including West, Central, and East Africa. The IPCC reported that between 2010 and 2020, the mortality rate resulting from floods, droughts, and storms was significantly greater (15 times) in regions classified as highly vulnerable than in regions with very low vulnerability.^[32]

Finally, it was also a practical consideration, given the large volume of literature available and the need to narrow the search to a manageable scope. Several studies have used comparable

timeframes in their systematic reviews or meta-analyses, such as Ngcamu and Chari 2020^[33] and Menghistu *et al.* 2020.^[34] For the search strategies, we used a combination of keywords to capture the relevant concepts. The Boolean operators "AND" and "OR" were used to combine the search terms and broaden or narrow the search results. The truncation symbol "" is used to capture variations of a term ("drought" OR "flood" OR "heavy rain" OR "climate shock") AND ("household consumption" OR "food security" OR "nutrition") AND ("Africa" OR "Sub-Saharan" OR "SSA" OR "Angola" OR "Benin" OR "Botswana" OR "Burkina Faso" OR "Burundi" OR "Cameroon" OR "Cape Verde" OR "Central African Republic" OR "Chad" OR "Comoros" OR "Congo" OR "Côte d'Ivoire" OR "Djibouti" OR "Guinea" OR "Eritrea" OR "Ethiopia" OR "Gabon" OR "The Gambia" OR "Ghana" OR "Kenya" OR "Lesotho" OR "Liberia" OR "Madagascar" OR "Malawi" OR "Mali" OR "Mauritania" OR "Mauritius" OR "Mozambique" OR "Namibia" OR "Niger" OR "Nigeria" OR "Réunion" OR "Rwanda" OR "Sao Tome and Principe" OR "Senegal" OR "Seychelles" OR "Sierra Leone" OR "Somalia" OR "South Africa" OR "Sudan" OR "Swaziland" OR "Tanzania" OR "Togo" OR "Uganda" OR "Western Sahara" OR "Zambia" OR "Zimbabwe")

Screening the literature

The search results were screened for relevance based on the inclusion criteria, which included studies that focused on climate-related shocks, coping mechanisms, household consumption, and SSAs. Studies that did not fulfill the specified inclusion criteria were omitted. The screening was conducted in two stages, with the first stage involving selecting all papers as long as they met the requirement of having at least two keywords present in either the titles and/or abstracts. The second stage involved screening and selecting publications included in the deep literature review analysis. To ensure the reliability and validity of the screening process, two independent reviewers screened the literature, and any disagreements were resolved through discussion and compromise. Furthermore, a third reviewer was consulted when a consensus could not be reached. Previous studies, including Akinyi *et al.* 2021^[35] and Thompson *et al.* 2010,^[36] have used similar screening processes.

Data extraction

The extracted data included details regarding the research design, types of shocks, coping mechanisms, and effects of these coping strategies on household consumption, nutrition and food security. Previous studies have utilized similar approaches.^[37,38]

Data analysis

In the bibliometric analysis, data analysis was conducted to examine the keywords used in the title, abstract, and keyword sections of the bibliographic records using the R package litsearchr developed by Grames *et al.* 2019.^[39] This provided insights into the main themes and topics covered in the literature.

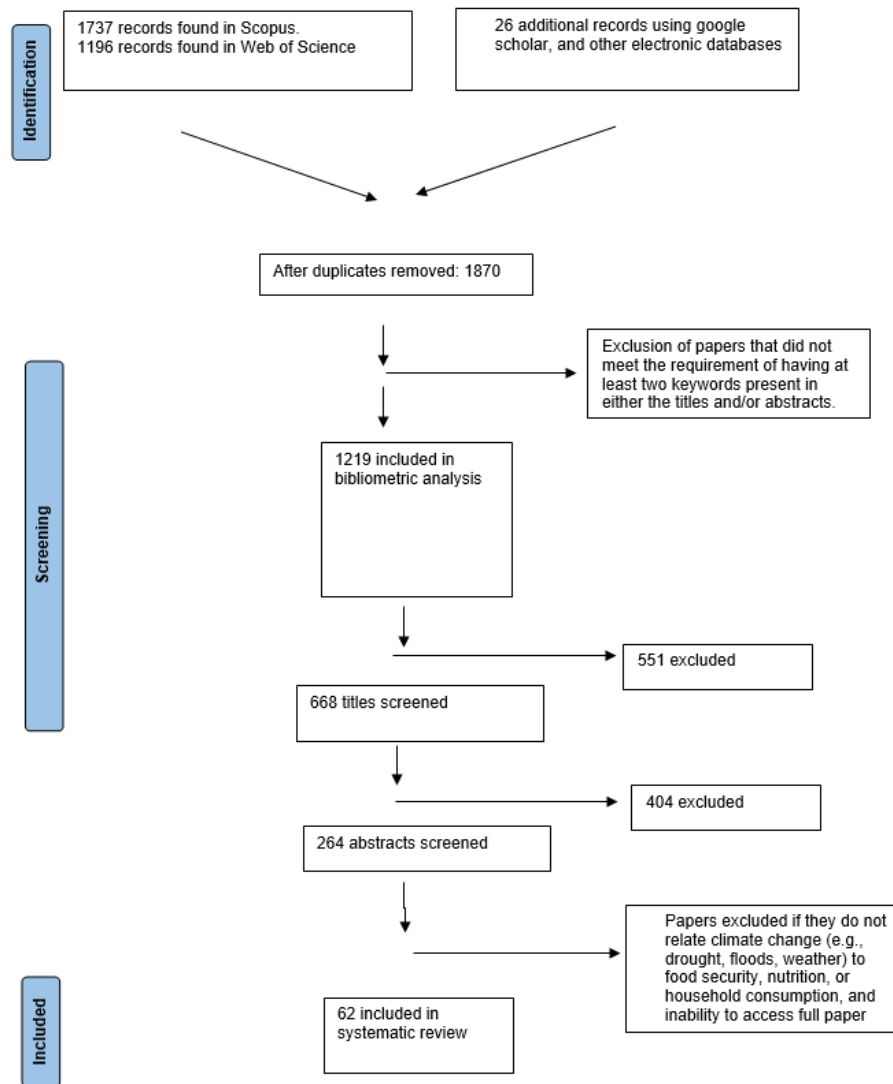


Figure 1: Flow chart depicting articles selected for stage 1 (bibliometric analysis) and stage 2 (systematic review).

Additionally, publication trends were analyzed to understand the growth of research in this area, identifying periods of increased interest or shifts in research focus. Furthermore, co-authorship and collaboration analyses were performed to uncover the networks and relationships among researchers working on this topic using the VOSviewer tool.^[40,41] However, in the in-depth literature review, the data analysis involved thematic analysis. This process identified common themes and patterns across the selected literature, enabling the categorization and grouping of findings based on similarities and differences. Subsequently, a synthesis of the extracted data and thematic analysis were carried out to provide a wide-ranging overview of the main insights from the literature.^[42]

RESULTS AND DISCUSSION

Bibliometric Insights: Unveiling Patterns in Climate-Related Research

Figure 2 shows the trend in publications for the period from January 2000 to December 2022. Three distinct periods can be observed: 2000-2008, 2009-2014, and 2015 to 2022. During the initial period, the research field attracted minimal academic attention, with an average of 11 publications per year. This could be explained by the limited advancement of technology, inadequate networking opportunities, and insufficient collaborative research funding throughout Sub-Saharan African universities.^[43,44] In the second period, the topic becomes more relevant, with an average of almost 36 papers per year. Nevertheless, in the third period, we observed more studies, with an average of 113 per year. These findings could be attributed to the awareness of the region's

vulnerability to various shocks,^[3,45] advancements in technology and improved networking opportunities in Sub-Saharan African institutions.^[46,47]

Table 1 presents the evolution of key research themes over three distinct periods: 2000-2008, 2009-2014, and 2015-2022. Several noteworthy trends were observed in the data (Table 1 and Figure 3). Across all periods, climate change and drought displayed a consistent presence across all periods, demonstrating their sustained relevance in research discourse in SSA. The percentage of articles discussing climate change increased from 9.2% in 2000-2008 to 39.9% in 2015-2022, reflecting a substantial uptrend in addressing this critical concern. Drought, which scored the highest percentage in all periods (91.8% to 83.5%), remains a dominant focus, emphasizing the persistent need to understand its impacts and mitigation strategies.

Among coping mechanisms, diversification and migration in articles remained relatively stable. However, the slight fluctuations might indicate shifts in research focus, possibly influenced by evolving socioeconomic and environmental contexts in SSA. Social network, a relatively recent key term, increased attention, primarily in the last period (1.0%), highlighting its increasing role in climate-related research. Climate crisis-induced impacts on household consumption, especially nutrition and food security, have gained increasing attention from research scholars, policy

makers, and funding agencies. This has led to a considerable number of publications centered on drought and food security in Sub-Saharan African countries.^[48,49]

Table 2 shows the top 10 most productive journals during the period of 2000-2022, with a minimum of 15 total publications, providing valuable insights across a range of fields. It becomes evident that certain journals play a pivotal role in shaping the discourse around climate-related challenges and coping strategies in Sub-Saharan Africa. Food security stands out not only for its significant contribution (8.68% of total papers) but also for its high citation percentage (18.01%), indicating the depth and impact of its published research. This suggests a concentrated focus on substantive issues such as food security and climate resilience within the region. Sustainability, another prominent journal, contributed 16.08% of the total papers, although with a slightly lower citation percentage (14.28%), suggesting a broader array of topics related to sustainability and climate adaptation.

In addition, journals such as Climatic Change (4.82% of total papers, 11.31% citation percentage) reflect a more specialized focus on climate dynamics. Conversely, journals such as World Development and Remote Sensing demonstrate a balanced approach with moderate contributions (both 5.14% of total papers) and citation percentages (2.73% and 4.82%, respectively). The diverse representation of journals indicates

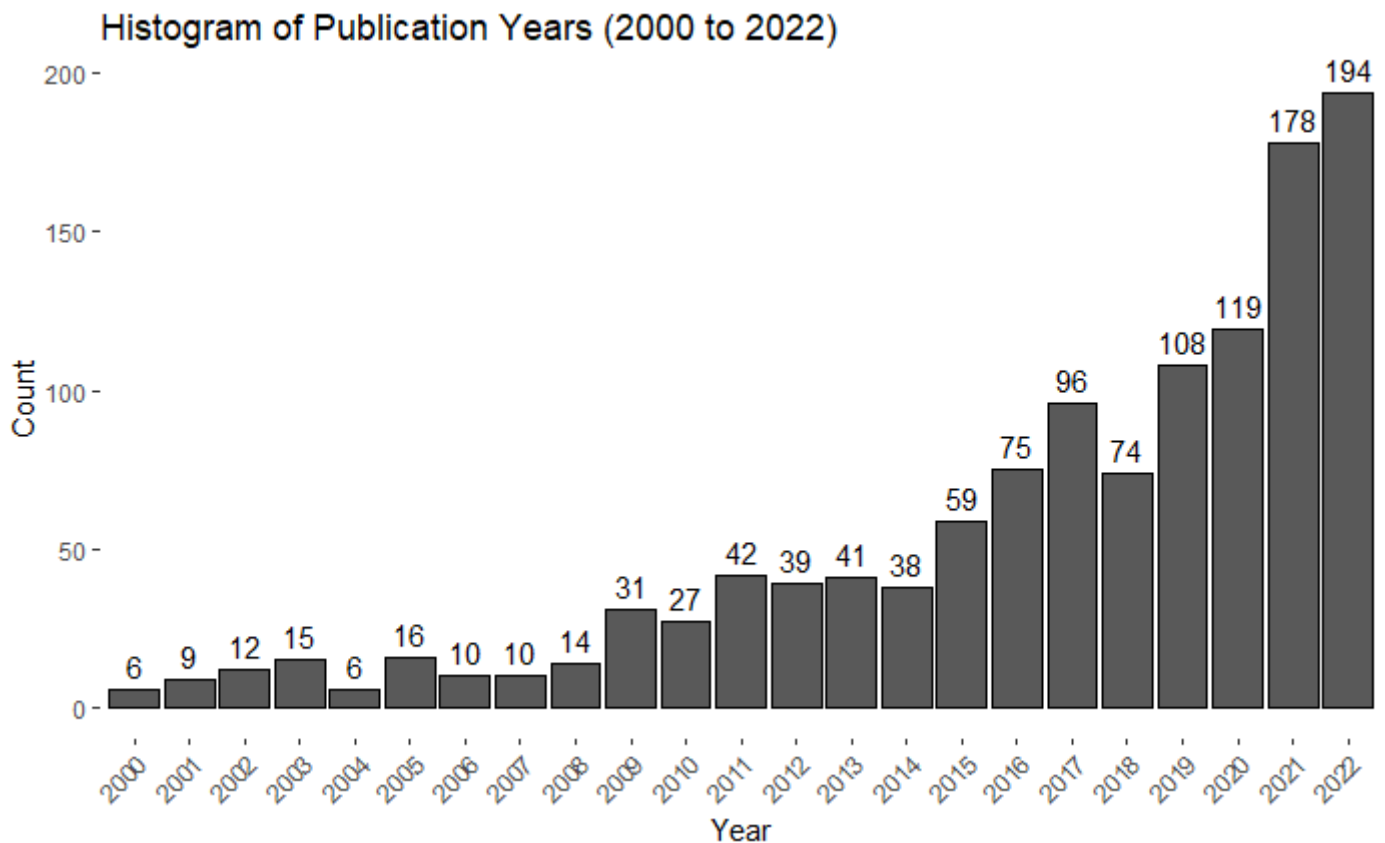


Figure 2: Trend in publications about shock-coping mechanisms, household consumption, and contextual factors in SSA.

surrounding climate-related shocks and household consumption in Sub-Saharan Africa. This collaborative spirit likely promotes interdisciplinary research, allowing for a comprehensive exploration of the challenges faced by households in the region and reflecting the interconnectedness and interdependence within the scientific community addressing this critical topic.

Figure 4 shows a co-authorship analysis generated using VOSviewer. The connections between nodes in the graph represent the co-authorships, with the color of the links indicating the year in which the collaboration between the authors was established. Out of a total of 10094 connections, only 401 connections met the minimum threshold of 3 connections for an author's documents. Notably, authors such as Funk, C., Shukla, S., and Husak, G. were identified as having greater total link strength in terms of collaboration with other researchers.

Table 4 presents a comprehensive overview of the most cited articles in the area. First and foremost, the diversity of the topics covered in these highly cited articles is striking. From agricultural resilience ("Beans (*Phaseolus* spp.)-model food legumes," "Farmers' Perceptions of Climate Change and Agricultural Adaptation Strategies in Rural Sahel") to hydroclimatic alterations ("A westward extension of the warm pool leads to a westward extension of the Walker circulation, drying eastern Africa," "A drought monitoring and forecasting system for Sub-Saharan African water resources and food security"), these studies collectively paint a holistic picture of the multifaceted impact of climate change in the region. This diversity reflects the complexity of the challenges faced and the need for multidisciplinary approaches to address them effectively.

Furthermore, the consistent publication of high-impact studies from 2003 to 2019 highlights the enduring relevance of research in this area. The long-term nature of these studies underscores the sustained effort and commitment of researchers to understanding

climate-related issues in Sub-Saharan Africa. This continuity in research demonstrates the persistent need to explore innovative solutions, adapt strategies, and enhance resilience in the face of changing climatic conditions.

Last, the substantial citation counts for these articles signify their significant influence within the academic community. Particularly noteworthy are studies such as "Beans (*Phaseolus* spp.)-model food legumes" and "Warming of the Indian Ocean threatens eastern and southern African food security but could be mitigated by agricultural development," which have attracted considerable attention and recognition. These high citation numbers indicate the substantial impact of these studies on subsequent research, policymaking, and practical interventions, emphasizing their pivotal role in shaping the discourse around climate adaptation, food security, and coping mechanisms in Sub-Saharan Africa.

Table 5 provides a valuable snapshot of the geographic origins of research efforts focused on climate-related challenges in Sub-Saharan Africa. In this subsample drawn from Scopus data, the United States emerges as a major contributor, accounting for a substantial 12.91% of the total papers analyzed. The high citation percentage (20.20%) associated with U.S. research highlights the impactful nature of these contributions. South Africa constituted 12.53% of the total papers, reinforced the continent's internal collaboration, and showed a strong emphasis on local expertise. Additionally, Ethiopia's active participation (6.22%) illustrates the country's dedication to addressing climate-related challenges, emphasizing the regional depth of the research efforts with the challenges faced in the region. Additionally, the diverse insights brought by countries such as the United Kingdom, Germany, and China further enrich the discourse, emphasizing the collaborative and interdisciplinary nature of research in addressing climate-related shocks and coping strategies in Sub-Saharan Africa.

Table 2: Most productive journals.

Journal	Total papers	%	Total citations	%
Sustainability	50	16.08	974	14.28
Food Security	27	8.68	1228	18.01
Water	20	6.43	258	3.78
Frontiers in Plant Science	17	5.47	380	5.57
Plos One	17	5.47	431	6.32
African Journal of Food, Agriculture, Nutrition and Development	16	5.14	68	1.00
Agriculture and Food Security	16	5.14	377	5.53
World Development	16	5.14	186	2.73
Climatic Change	15	4.82	771	11.31
Remote Sensing	15	4.82	329	4.82

Implication of shock-coping mechanisms on food security and household consumption in SSA

The impact of shock-coping mechanisms on food security and household consumption in Sub-Saharan Africa is a critical aspect that has been extensively explored. Over the past two decades, research has consistently highlighted the increasing frequency and intensity of climate-induced shocks, such as droughts, irregular rainfall, and floods.^[27,50]

The quantitative research designs of thirty papers (Table 6) have shed light on the influence of climate-associated shocks on households. Studies by Njeru *et al.* 2022,^[51] Mekuria and Mekonnen 2018,^[52] and Twongyirwe *et al.* 2019^[53] emphasized the significance of agro-pastoral activities, livestock ownership, and access to credit in ensuring household food security. They highlighted the importance of diversified livelihoods in managing food insecurity. Weather-related shocks, such as droughts and irregular rainfall, have been shown by Akampumuza and Matsuda 2016^[54] and Atara *et al.* 2021^[55] to negatively affect household consumption and food security. For example, Akampumuza and Matsuda 2016^[54] reported a 17% reduction in consumption due to weather-related shocks, while Atara *et al.* 2021^[55] noted that 62.4% of surveyed households experienced food insecurity, leading to a significant increase in stunting and obesity. In addition, Ncube *et al.* 2018^[56] and Akampumuza and Matsuda 2016^[54] highlighted

the disproportionate impact of weather-related shocks on households led by women, with female-headed households experiencing more substantial declines in consumption than male-headed households. Weather shocks have exhibited varied effects on vulnerability across different studies. Yuen *et al.* 2022,^[57] Letta *et al.* 2018,^[58] and Montaud *et al.* 2017^[59] have shown that weather shocks, particularly droughts, adversely affect household consumption, prices, and food security. These shocks led to reduced agricultural productivity and increased vulnerability, particularly among rural households. Letta *et al.* 2018^[58] stressed the importance of livestock in rural households, as livestock assets play a vital role in providing income and food security, particularly during times of shocks, such as failed crops. Furthermore, Carter and Lybbert 2012,^[60] Temesgen *et al.* 2022,^[61] and Yuen *et al.* 2022^[57] explored the impact of various coping mechanisms, such as asset smoothing, food security services, migration, and mobile money services, on household consumption patterns and resilience to climate shocks.

Considering multi-quantitative research designs, twelve studies generally agreed on the importance of climate shocks, particularly droughts, and their negative impact on households' welfare, income, and food security. Cash transfers and social capital appeared to be effective coping mechanisms for alleviating the adverse effects of shocks, especially in rural

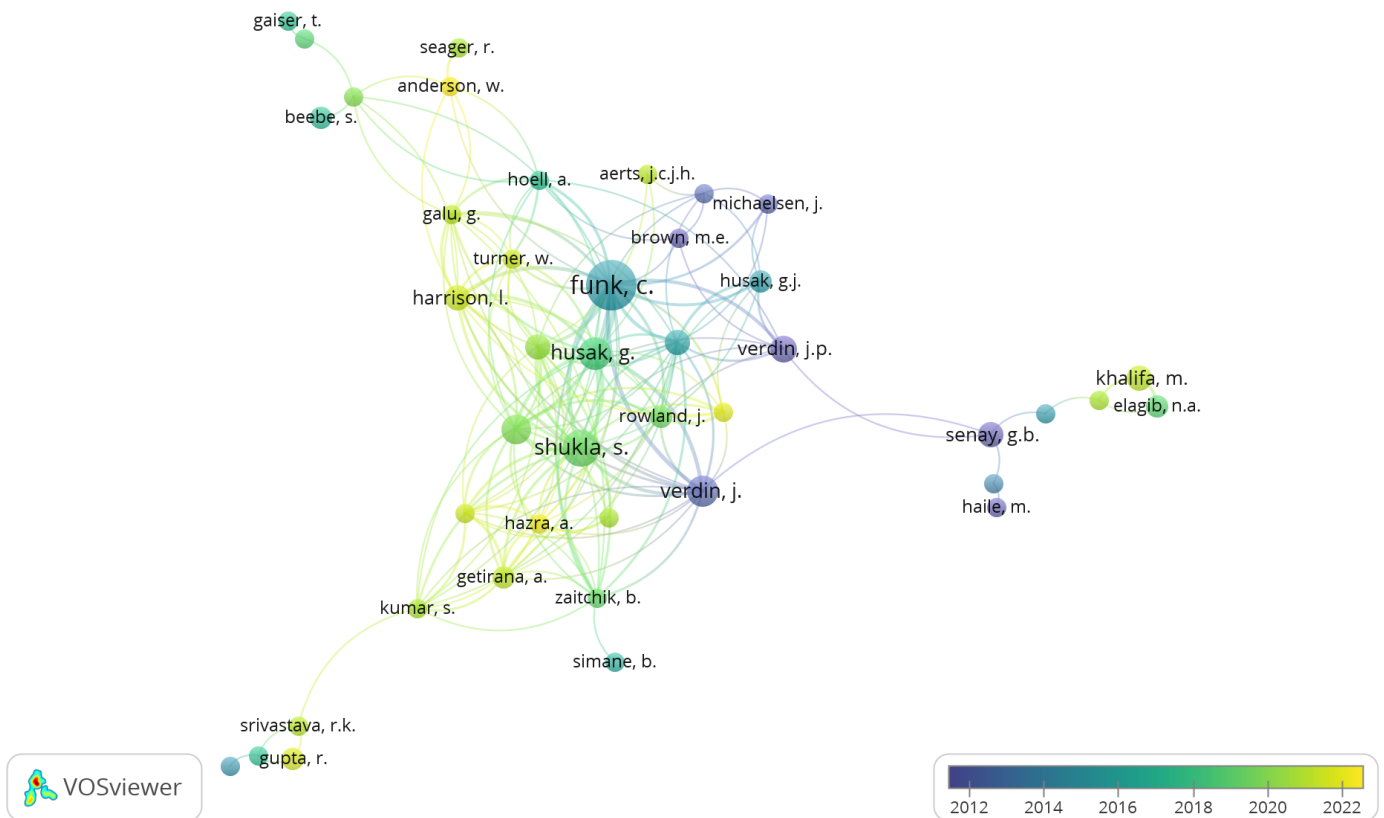


Figure 4: Co-authorship and collaboration analysis.

Table 3: Most productive authors.

Authors	Total papers	%	Total citations	%
Funk, C.	96	1.26	9471	1.79
Shukla, S.	63	0.83	2282	0.43
Magadzire, T.	57	0.75	1805	0.34
Verdin, J.P.	54	0.71	4013	0.76
Badu-Apraku, B.	46	0.60	1207	0.23
Cisse, N.	44	0.58	5208	0.99
Husak, G.J.	44	0.58	1077	0.20
Tesfaye, K.	43	0.57	2947	0.56
McNally, A.	42	0.55	1343	0.25
Beebe, S.	41	0.54	974	0.18

Table 4: Most cited articles in the area.

Sl. No.	Authors	Title	Year	Citations
1	Broughton <i>et al.</i> ,	Beans (<i>Phaseolus</i> spp.) -: model food legumes.	2003	841
2	Saleh <i>et al.</i> ,	Millet grains: Nutritional quality, processing, and potential health benefits.	2013	524
3	Ponce Campos <i>et al.</i> ,	Ecosystem resilience despite large-scale altered hydroclimatic conditions.	2013	420
4	Williams and Funk	A westward extension of the warm pool leads to a westward extension of the Walker circulation, drying eastern Africa.	2011	390
5	Lelieveld <i>et al.</i> ,	Effects of fossil fuel and total anthropogenic emission removal on public health and climate.	2019	382
6	Mertz <i>et al.</i> ,	Farmers' Perceptions of Climate Change and Agricultural Adaptation Strategies in Rural Sahel.	2009	370
7	Masih <i>et al.</i> ,	A review of droughts on the African continent: a geospatial and long-term perspective.	2014	357
8	Funk <i>et al.</i> ,	Warming of the Indian Ocean threatens eastern and southern African food security but could be mitigated by agricultural development.	2008	342
9	Sheffield <i>et al.</i> ,	A drought monitoring and forecasting system for sub-Saharan African water resources and food security.	2014	334
10	Misra	Climate change and challenges of water and food security.	2014	333

areas. In addition, these studies recognized the significance of livelihood diversification and agricultural productivity in building resilience against shocks. The positive impacts of cash transfers on household consumption and coping mechanisms have been shown in several studies.^[62,63] The results from Amare *et al.*^[64] and Baffour-Ata *et al.*^[65] underlined the need for adaptation mechanisms such as the use of drought-resistant crop diversity and diversification to enhance resilience among agro-pastoral communities. For instance, Giannini *et al.*^[63] and

Porter^[13] highlighted the impact of extreme rainfall fluctuations on consumption, indicating that households struggle to smooth their consumption against such shocks. Furthermore, Premand and Stoeffler^[62] and Mueller *et al.*^[66] found that cash transfers and social capital, respectively, play crucial roles in enhancing households' resilience to climate shocks. Moreover, Lokonon^[67] and Belle *et al.*^[68] highlighted the importance of neighborhood involvement and financial resources in drought preparedness and resilience-building. In contrast, Baffour-Ata *et al.*^[65] and Mueller

Table 5: Most productive countries in the area.

Country	Total papers	%	Total citations	%
United States	139	12.91	5856	20.20
South Africa	135	12.53	2203	7.60
Ethiopia	67	6.22	948	3.27
Kenya	57	5.29	1498	5.17
United Kingdom	43	3.99	1181	4.07
Germany	39	3.62	1311	4.52
China	26	2.41	1135	3.91
Nigeria	26	2.41	329	1.13
Ghana	24	2.23	385	1.33
Zimbabwe	23	2.14	603	2.08

et al.^[66] reported contrasting findings regarding the impact of climate shocks on rural and urban out-migration, respectively, challenging the narrative that the main effect of climate change will be on the rates of out-migration from rural regions.

In the context of multi-qualitative methods research design, the key findings of the five papers are compared. All five papers recognized drought as a major climate shock affecting rural communities. They noted the negative consequences of drought, such as crop failure, water scarcity, food scarcity, and loss of livestock. These studies emphasized the adoption of strategies to cope with and adapt to changes in food consumption habits, crop-livestock integration, knowledge sharing through community organizations, and the acquisition of new knowledge about early warning systems. All the studies discussed drought as a significant shock; two of them, Hawkins *et al.*^[69] and Mdemu^[70] focused primarily on drought, while the other two studies, Liru and Heinecken^[71] and Afriyie *et al.*^[72], addressed flooding. Liru and Heinecken^[71] specifically concentrated on women's coping strategies, highlighting their use of indigenous knowledge, social capital, and agency to adapt to climate change. Mdemu^[70] emphasized how vulnerability to drought is linked to a household's social context, involving aspects such as resource ownership and income streams. The studies by Afriyie *et al.*^[72] and Okunlola *et al.*^[73] extensively discussed policy implications, including the need for gender-sensitive interventions and targeted policies to address vulnerable segments of society.

Within the domain of mixed research design, the main emphasis is placed on comparing the key findings of fifteen studies that have incorporated both quantitative and qualitative methods in their investigations. The prevalence of food insecurity varied among the studies, with rates ranging from 21% to 92.9%. The differences may be attributed to variations in the study populations, locations, and methodologies used. For instance, Bahta^[74] and Asefawu^[75] both examined coping mechanisms for food insecurity in the face of agricultural drought. Bahta^[74]

described various coping mechanisms utilized by smallholder livestock farming households, including selling livestock, using alternative land, storing food, and seeking alternative employment. Asefawu^[75] identified coping strategies such as food aid, the use of traditional cereals and drought-tolerant crops, and livelihood diversification. In addition, Hilemeleket *et al.*^[76] and Mavhura *et al.*^[77] both examined the influence of the changing climate and its fluctuations on household food security. Hilemeleket *et al.*^[76] highlighted the importance of access to training, access to credit, farm size, and extension advisory services in determining farmers' climate change adaptation options. Moreover, Mekonnen *et al.*^[78] demonstrated that access to climate instability adaptation technologies and the size of farmland significantly influenced the food security status of households. Finally, Ngure *et al.*^[79] and Mushore *et al.*^[80] focused on specific adaptation strategies to address climate instability and food insecurity. Both studies emphasized the importance of localized and targeted adaptation measures to enhance food security.

Recent findings from research design employing perspectives in the setting of agriculture, shocks, coping mechanisms, food security, and household consumption have shown common trends and unique insights. All the research designs highlighted the increasing frequency and intensity of climate-driven shocks, particularly droughts, and their detrimental impact on household welfare and food security. Coping strategies, such as seeking nonfarm employment, borrowing, diversifying livelihoods, and adopting climate adaptation options, are identified across studies to manage the effects of shocks on household consumption. Overall, these studies collectively highlighted the importance of context-specific interventions to enhance resilience and food security in SSA. The findings from these diverse research designs contribute to our understanding of the complex implications of climate change and offer valuable insights into the obstacles associated with food security and adaptation in vulnerable regions in SSA.

Table 6: Implication of shock-coping mechanisms for food security and household consumption in SSA.

Sl. No.	Research design	Studies	Shocks	Coping mechanisms	Key findings
1	Quantitative	30	Agricultural drought, irregular rainfall patterns, and temperature variations. Additionally, other shocks include pest infestations, and land degradation.	Nonfarm employment, remittances, borrowings, and reallocating expenditures. Additional measures involve purchasing food from neighboring communities, selling or exchanging livestock for grain, cultivating drought-resistant crops, and engaging in small irrigation gardens. Collecting wild foods, relying on food aids, and using traditional practices and modern technologies for livestock husbandry are also employed.	Household consumption expenditure declined following weather-driven shocks, and particularly households led by women experiencing a substantial decline in consumption due to resources constraints. During droughts, women often reduced the frequency of meals. Sustainable agricultural practices, including crop diversification and integrated livestock rearing, contribute to improved food security, while monoculture farming is susceptible to droughts and pests. Resilience capacity positively affected household nutritional variety and food consumption, emphasizing the importance of access to essential services, asset accumulation, and adaptive capacity. Mobile money services enabled households to prevent a drop in consumption after rainfall shocks, contributing to food security.
2	Multi-quantitative	12	Climate-induced shocks and variability (droughts, floods, livestock epidemics, crop disease, high prices).	Cash transfers, off-farm activities, agricultural diversification, and constructing integrated crop and livestock portfolios. There is a focus on reducing food consumption and relying on drought-resistant crops. Access to extension services and weather forecasts is promoted to support these efforts.	Small regular cash transfers positively impact household consumption, especially for households facing drought shocks. Climate-induced shocks have direct biophysical impacts and indirect negative consequences through distress coping mechanisms, leading to prolonged poverty. Climate variability significantly affects staple food crop yields, necessitating adaptation practices and investment in drought-tolerant crop varieties. Farm households exhibit varying degrees of vulnerability to climate shocks, highlighting the importance of tailored resilience strategies based on specific characteristics and agro-ecological zones. Deviations in climate conditions, such as extreme temperature increases and rainfall decreases, influence temporary migration patterns in East African countries, with urban areas experiencing more pronounced impacts.

Sl. No.	Research design	Studies	Shocks	Coping mechanisms	Key findings
3	Multi-qualitative	5	Changes in weather patterns, floods, and droughts, Prolonged droughts, longer dry seasons, humidity, excessive dryness, and high wind intensity.	Selling assets, taking loans, sending children to work, and adjusting dietary habits. Initially, absorptive coping strategies are used, followed by adaptive strategies and eventually transformative strategies using agency and social capital. Investments are made to improve the resource base and water access. Farming practices are diversified, and new knowledge about early warning systems is acquired, combining indigenous and modern knowledge systems.	Drought impacts on rural smallholder farmers, led to changes in food consumption habits with potential long-term health implications. Short-term coping mechanisms were common, but long-term adaptation mechanisms required external support and knowledge. Combining short- and longer-term adaptation measures was emphasized to improve resilience in drought-affected regions. Changes in weather patterns significantly affected women farmers.
4	Mixed	15	Agricultural drought, Drought, Insufficient precipitation, Rainfall variability, Climate change and variability, Climate shocks.	Selling livestock, storing food, migration, raising drought-tolerant breeds, alternative employment, savings and investments, conservation farming, beekeeping, handicrafts, off-farm work, training from aid organizations, seasonal migration, eating adjustments, assistance from government or aid agencies, soil and water conservation, crop diversification, agro-forestry, small-scale irrigation, camel management, intercropping, water harvesting, kitchen gardens, organic pesticides, traditional vegetable cultivation, afforestation, reforestation, avoiding veld fires, preserving wetlands, and barter trade.	Selling chickens is strongly correlated with improved nutrition, benefiting from local social networks and demand. Seasonal migration contributes to improved food security for migrant households but negatively domestic agricultural yield due to the moving of workers to urban areas. Climate change negatively affects household food security over the past three decades. Factors like age, family size, cultivated land, and rainfall significantly influence food security status.
	Total	62			

CONCLUSION

In conclusion, this bibliometric systematic literature review illuminates the profound impact of climate-related shocks and coping mechanisms on household consumption in Sub-Saharan Africa. By integrating newly formulated theoretical contributions, our study not only underlines the severity and frequency of climate-induced shocks but also emphasizes the critical role of coping strategies in mitigating their effects on food security and consumption patterns. Through a comprehensive analysis of 1219 papers from 2000 to 2022, this research provides valuable insights into the evolving trends and persistent challenges faced by communities in the region.

Our findings reveal a concerning increase in the frequency and intensity of climate-induced shocks, particularly droughts, floods, and irregular rainfall, significantly impacting household consumption and food security. The sustained relevance of climate change and drought across different periods underscores the pressing need to address these critical concerns in Sub-Saharan Africa. Additionally, the emergence of coping mechanisms such as livelihood diversification, migration, and climate adaptation measures highlight the resourcefulness and adaptability of communities in the face of environmental challenges.

Importantly, this study contributes to new knowledge in the domain by clarifying variations in the effectiveness of coping strategies across different contexts and regions in Sub-Saharan Africa. By emphasizing the significance of gender-specific vulnerabilities and coping capacities, particularly for female-headed households, our research highlighted the importance of tailored interventions to address the diverse needs of vulnerable populations. Furthermore, the identification of livestock ownership, rural diversification, and credit access as resilience-building factors adds to our understanding of effective coping mechanisms in the region. The integration of newly formulated theoretical contributions enriches the scholarly discourse on climate-related challenges and coping strategies in Sub-Saharan Africa. By synthesizing insights from bibliometric and thematic analyses, our study offered a comprehensive overview of the complex dynamics shaping household consumption patterns in the region. Moreover, our research highlighted the need for interdisciplinary approaches to address the multifaceted impacts of climate change on food security and consumption in SSA.

Moving forward, our findings strongly motivate the academic community toward actionable and practically engaged scholarship by highlighting the need for collaborative research endeavors that bridge disciplinary boundaries and leverage local expertise to develop context-specific solutions. However, it is important to note that this study considered only papers published in journals; therefore, further research could explore a wider range of sources, such as book chapters, conference proceedings, and other scholarly materials, to provide a more

comprehensive analysis of the subject. Nonetheless, this study provides a significant contribution to the literature by offering insights into the relationships between climate change, coping strategies, and household welfare.

For policymakers in the government, the implications of this study are crucial. First, the need for developing climate-resilient infrastructure, such as flood control measures, and drought-resistant agricultural practices. These initiatives are essential in mitigating the adverse effects of climate shocks on household consumption and food security. Second, recognizing the gender-specific vulnerabilities, especially among female-headed households, government policies should focus on creating and implementing targeted support programs. Such programs could include training in diversified livelihoods, and the provision of social safety nets to enhance their resilience against climate-induced shocks. For Non-Governmental Organizations (NGOs) and development agencies, the focus should be community-based adaptation programs that promote livelihood diversification and climate adaptation measures. These programs should leverage local knowledge and resources to develop sustainable coping strategies that can be scaled and adapted to different regions within Sub-Saharan Africa. Furthermore, academic and research institutions also play a pivotal role in addressing the multifaceted impacts of climate change by promoting interdisciplinary research initiatives that bring together experts from various fields, including climate science, economics, sociology, and agriculture. Collaborative research can lead to the development of holistic and effective interventions for improving food security and household welfare.

However, it is important to note that this study considered only papers published in journals; therefore, further research could explore a wider range of sources, such as book chapters, conference proceedings, and other scholarly materials, to provide a more comprehensive analysis of the subject. Nonetheless, this study provides a significant contribution to the literature by offering insights into the relationships between climate change, coping strategies, and household welfare.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Appendix A: Summary of reviewed studies.

No	References	Region or Country coverage	Title
1	Premand and Stoeffler 2022	Niger	Cash transfers, climatic shocks and resilience in the Sahel.
2	Bahta 2022	South Africa	Nexus between Coping Strategies and Households' Agricultural Drought Resilience to Food Insecurity in South Africa.
3	Akampunguza and Matsuda 2017	Uganda	Weather Shocks and Urban Livelihood Strategies: The Gender Dimension of Household Vulnerability in the Kumi District of Uganda.
4	Diwakar and Lacroix 2021	Niger, Tanzania, and Uganda	Climate shocks and poverty persistence: Investigating consequences and coping strategies in Niger, Tanzania, and Uganda.
5	Ncube <i>et al.</i> 2018	Zimbabwe	Assessing vulnerability and coping capacities of rural women to drought: A case study of Zvishavane district, Zimbabwe.
6	Bailey <i>et al.</i> 2019	Eswatini	Climate-driven adaptation, household capital, and nutritional outcomes among farmers in Eswatini.
7	Asefawu 2022	Ethiopia	Seasonal migration and household food security status in the drought-prone areas of Northeast Ethiopia.
8	Yuen <i>et al.</i> 2022	Somalia	Exploring the temporal patterns and crisis-related risk factors for population displacement in Somalia (2016-2018).
9	Suckall <i>et al.</i> 2017	Malawi	Reduced migration under climate change: evidence from Malawi using an aspirations and capabilities framework.
10	Atuoye <i>et al.</i> 2021	Tanzania	Who are the losers? Gendered-migration, climate change, and the impact of large-scale land acquisitions on food security in coastal Tanzania.
11	Hilemeleket <i>et al.</i> 2021	Ethiopia	Climate change and variability adaptation strategies and their implications for household food Security: The case of Basana Worena District, North Shewa zone, Ethiopia.
12	Mubiru <i>et al.</i> 2018	Uganda	Climate trends, risks and coping strategies in smallholder farming systems in Uganda.
13	Hänke and Barkmann 2017	Madagascar	Insurance Function of Livestock: Farmer's Coping Capacity with Regional Droughts in South-Western Madagascar.
14	Atara <i>et al.</i> 2021	Ethiopia	Assessment of food security situation of the rural households: the case of Boricha Woreda of Sidama Zone, Ethiopia.
15	Murendo <i>et al.</i> 2020	Malawi	Resilience capacities and household nutrition in the presence of shocks. Evidence from Malawi.
16	Ngure <i>et al.</i> 2021	Kenya	Scaling up crop diversification among farming communities for food security under climate change: A case study of the Kanyan pelis programme.
17	Mango <i>et al.</i> 2018	Malawi	The role of crop diversification in improving household food security in central Malawi.
18	Njeru <i>et al.</i> 2022	Kenya	Agrobiodiversity and perceived climatic change effect on family farming systems in semiarid tropics of Kenya.
19	Baffour-Ata <i>et al.</i> 2021	Ghana	Effect of climate variability on yields of selected staple food crops in northern Ghana.
20	Mushore <i>et al.</i> 2021	Zimbabwe	Climate Change Adaptation and Mitigation Strategies for Small Holder Farmers: A Case of Nyanga District in Zimbabwe.
21	Teshager Abeje <i>et al.</i> 2019	Ethiopia	Exploring drivers of livelihood diversification and its effect on adoption of sustainable land management practices in the upper Blue Nile basin, Ethiopia.

No	References	Region or Country coverage	Title
22	Amare and Simane 2018	Ethiopia	Does adaptation to climate change and variability provide household food security? Evidence from Muger sub-basin of the upper Blue-Nile, Ethiopia.
23	Wako <i>et al.</i> 2017	Ethiopia	Camel management as an adaptive strategy to climate change by pastoralists in southern Ethiopia.
24	Giannini <i>et al.</i> 2017	Mali	Climate risk and food security in Mali: A historical perspective on adaptation.
25	Getaneh <i>et al.</i> 2022	Ethiopia	Food security status and determinants in North-Eastern rift valley of Ethiopia.
26	Mekuria and Mekonnen 2018	Ethiopia	Determinants of crop-livestock diversification in the mixed farming systems: Evidence from central highlands of Ethiopia.
27	Tora <i>et al.</i> 2021	Ethiopia	Drought vulnerability perceptions and food security status of rural lowland communities: An insight from Southwest Ethiopia.
28	Nébié and Giannini 2021	Senegal	Food security and climate shocks in Senegal: Who and where are the most vulnerable households?
29	Hawkins <i>et al.</i> 2022	South Africa	Dietary and agricultural adaptations to drought among smallholder farmers in South Africa: A qualitative study.
30	Randell <i>et al.</i> 2022	Tanzania	Climatic conditions and household food security: Evidence from Tanzania.
31	Liru and Heinecken 2021	Kenya	Building resilience: the gendered effect of climate change on food security and sovereignty in kakamega-kenya.
32	Belle <i>et al.</i> 2017	Zimbabwe	Assessing communal farmers' preparedness to drought in the Umguza District, Zimbabwe.
33	Lokonon 2022	Benin	Multiple shocks and households' choice of coping strategies in Benin: The relative importance of climate shocks.
34	Mdemu 2021	Tanzania	Community's Vulnerability to Drought-Driven Water Scarcity and Food Insecurity in Central and Northern Semi-arid Areas of Tanzania
35	Drysdale 2021	South Africa	Coping through a drought: The association between child nutritional status and household food insecurity in the district of iLembe, South Africa.
36	Okunlola <i>et al.</i> 2019	Nigeria	Effects of climate change and coping strategies among crop farmers in South West, Nigeria.
37	Twongyirwe <i>et al.</i> 2019	Uganda	Perceived effects of drought on household food security in South-western Uganda: Coping responses and determinants.
38	Mavhura <i>et al.</i> 2015	Zimbabwe	Adaptation to drought in arid and semi-arid environments: Case of the Zambezi Valley, Zimbabwe.
39	Akwango <i>et al.</i> 2017	Uganda	Effect of drought early warning system on household food security in Karamoja subregion, Uganda.
40	Riley 2018	Tanzania	Mobile money and risk sharing against village shocks.
41	Arsene and Nkulu Mwine Fyama 2021	D.R.Congo	Potential threats to agricultural food production and farmers' coping strategies in the marshlands of Kabare in the Democratic Republic of Congo
42	Amoah and Simatele 2021	South Africa	Food Security and Coping Strategies of Rural Household Livelihoods to Climate Change in the Eastern Cape of South Africa.

No	References	Region or Country coverage	Title
43	Aryal and Marenya 2021	Ethiopia, Kenya, Tanzania, Malawi, and Mozambique	Understanding climate-risk coping strategies among farm households: Evidence from five countries in Eastern and Southern Africa.
44	Rakotobe <i>et al.</i> 2016	Madagascar	Strategies of smallholder farmers for coping with the impacts of cyclones: A case study from Madagascar.
45	Zampaligré and Fuchs 2019	Burkina Faso	Determinants of adoption of multiple climate-smart adaptation practices in Sudano-Sahelian pastoral and agro-pastoral production systems.
46	Mekonnen <i>et al.</i> 2021	Ethiopia	Climate change impacts on household food security and farmers adaptation strategies.
47	Sewando 2022	Tanzania	Efficacy of risk reducing diversification portfolio strategies among agro-pastoralists in semi-arid area: A modern portfolio theory approach.
48	Montaud <i>et al.</i> 2017	Niger	Potential socio-economic implications of future climate change and variability for Nigerien agriculture: A countrywide dynamic CGE-Microsimulation analysis.
49	Ansah <i>et al.</i> 2021	Ghana	Shock interactions, coping strategy choices and household food security.
50	Afriyie <i>et al.</i> 2018	Ghana	'The floods came and we lost everything': weather extremes and households' asset vulnerability and adaptation in rural Ghana.
51	Amare <i>et al.</i> 2018	Nigeria	Rainfall shocks and agricultural productivity: Implication for rural household consumption.
52	Carter and Lybbert 2012	Burkina Faso	Consumption versus asset smoothing: testing the implications of poverty trap theory in Burkina Faso.
53	Gao and Mills 2018	Ethiopia	Weather Shocks, Coping Strategies, and Consumption Dynamics in Rural Ethiopia.
54	Günther and Harttgen 2009	Madagascar	Estimating Households Vulnerability to Idiosyncratic and Covariate Shocks: A Novel Method Applied in Madagascar.
55	Hisali <i>et al.</i> 2011	Uganda	Adaptation to climate change in Uganda: Evidence from micro level data.
56	Lawson and Kasirye 2013	Uganda	How the extreme poor cope with crises: Understanding the role of assets and consumption.
57	Letta <i>et al.</i> 2018	Tanzania	Temperature shocks, short-term growth and poverty thresholds: Evidence from rural Tanzania.
58	Lokonon 2019	Benin	Farmers' vulnerability to climate shocks: insights from the Niger basin of Benin.
59	Mueller <i>et al.</i> 2020	Eastern Africa	Temporary migration and climate variation in eastern Africa.
60	Paumgarten <i>et al.</i> 2020	South Africa	Prepare for the unanticipated: Portfolios of coping strategies of rural households facing diverse shocks
61	Porter 2012	Ethiopia	Shocks, Consumption and Income Diversification in Rural Ethiopia.
62	Temesgen <i>et al.</i> 2022	Ethiopia	Rural households' vulnerability to covariate and idiosyncratic shocks using multilevel longitudinal model: evidence from Ethiopia.