# Public Perception of Climate Risk and Adaptation in Tanzania: a Systematic Review

**Nyinondi, P.S[1]* and M.E. Sospeter[2]**

[1]Sokoine University of Agriculture. Department of Informatics and Information Technology. P.O. Box 3038, Morogoro. Tanzania
[2]Mbeya University of Science and Technology. Department of Information and Records Studies. P.O. Box 131, Mbeya. Tanzania

*Corresponding author e-mail: *martinuss530@gmail.com*

**Abstract**

*Climate change is a pressing global challenge of the 21st century, with impacts including global warming, drought, famine, floods, tropical storms, and cyclones. One of the biggest challenges to mitigating climate change is people's perception of its risks. This study provides valuable insights on the public perception of climate risk and adaptation in Tanzania through a systematic review of peer-reviewed papers. The search was conducted using keywords related to climate change awareness, knowledge, perception, attitude, and risk adaptation from the Sokoine University of Agriculture Institutional repository (SUAIR) for publications between 2010 and 2022, 48 peer reviewed articles were reviewed. The review found that there is a high level of awareness (87.5%) of climate change, with many (77%) recognizing its impacts on their daily lives in terms of economic activities and gender roles. However, the perception of climate risk varies depending on factors such as gender, location, and socioeconomic status. For example, people living in rural areas perceived climate risks such as floods and drought more than those in urban areas did. Attitudes towards climate change adaptation also vary among different groups, with some people such as farmers more resilient and willing to adapt than pastoralists, people living in urban areas than people living in rural areas. The review identifies knowledge gaps in understanding the causes and impacts of climate change. Overall, this systematic review provides a comprehensive picture of current knowledge and understanding of the public perception of risk adaptation in Tanzania, highlighting areas for further research and policy action.*

***Keywords***: Climate change, Perception, Adaptation, Risk, Tanzania

## Introduction

Climate change is described as change in general weather conditions and increase atmospheric temperature over the long period ranging from 30 year and above (Barnett *et al.,* 2023). It is perceived to be caused by agricultural activities, increasing emission of greenhouse gases, increasing industrial activities and intensive construction of cities (Yusufu, 2017). The ability to adjust according to the changes posed by the climate change and its associated risks, capitalize on the changing climate termed as adoptive capacity is necessary for people to unleash their potential to live the climate changed environment (Kwiyega, 2015).

Climate change has emerged as one of the most pressing global challenges of the 21st century. Its impacts are evident in the increasing occurrences of global warming, drought, famine, floods, tropical storms, cyclones, and the faster melting of glaciers (Sugerman *et al.,* 2021). The rapidly changing climate poses a significant threat to human societies and ecosystems worldwide, and all nations are working tirelessly to mitigate its effects. Although the level of commitment varies among different countries, it is clear that global efforts to address climate change are more crucial than ever before (Jarso, 2012; Barnett *et al.,* 2023).

However, despite these efforts, public scepticism and perception continue to pose challenges to the successful mitigation of climate change. Studies have shown that people's knowledge and understanding of the causes of

climate change, as well as their perception of its risks, are vital in addressing this global issue (Pickson and He, 2021). Individuals' perception towards climate change varies widely across the globe, and this has been attributed to differences in culture, education and socio-economic status (Hornsey and Fielding, 2020).

The level of awareness on climate change is a significant influencing factor in the mitigation process, shaping how they perceive climate change risks and the adaptive approaches taken by specific groups with varying levels of awareness. Knowledge about actions that cause climate change, such as deforestation, overgrazing, and excessive production of greenhouse gases, can help control these actions and mitigate climate change (Thomas *et al.,* 2020). Conversely, if most people are unaware of the changing climate or engage in activities such as deforestation, improper waste disposal, massive livestock keeping, unplanned urbanization, bush burning, and rapidly increasing cultivated land, the climate change mitigation efforts may not succeed (Tuitjer and Dirksmeier, 2021). Climate change awareness determines the adoption capacity and approaches taken by people, while adaptation to climate change reduces vulnerability and increases resilience to the changing climate (Aryal *et al.,* 2020). Perceived risks associated with climate change, such as decreasing crop production, rapid temperature increase, decreased rainfall, massive death of livestock, and increased crop diseases, are all influenced by awareness levels (Thomas *et al.,* 2020).

Studies indicates that people are increasingly recognizing climate change as a significant risk and are taking steps to mitigate its effects. For example, farmers who own farming assets are better equipped to adapt to changing climate conditions and become more resilient (Shirima *et al.,* 2018). Mitigation approaches include diversifying sources of income, increasing female participation in business, adopting irrigation agriculture, crop rotation, planting trees, and using green energy sources (Lalika, 2017). Providing reliable and timely information about climate change can help individuals make informed decisions and take appropriate action. However, other studies have revealed issues with accessing reliable climate change information in developing nations (Tumbo *et al.,* 2018a).

Previous studies conducted in Tabora by Kazoka, (2013) found out that there has been significant increase in temperature, decrease in rainfall hence decrease agricultural yields in for the last 30 years based on the metrological data which was in line with the respondents' perception. The study conducted by Mussa and Mjemah, (2015) in Morogoro reported that climate change have brought an increase in human, crops and livestock diseases. The study conducted in Morogoro by Mussa *et al.,* (2012) reported an increasing drying of water sources and decreasing amount of rainfall and rainy days hence people have adapt to harvesting rain water. The study conducted in seven agro ecological zones in Tanzania by Mkonda *et al.,* (2018) found out that there is general increase in temperature and decrease in rainfall across all seven zones, further explained that all seven zones have experienced climate change for the past 30 years and respondents perceived the climate to have changed. Therefore, this study was conducted to examine public perceptions of climate risks and adaptation in Tanzania, to provide a comprehensive picture on the topic, which is essential for developing effective mitigation and adaptation strategies.

## Methodology

This systematic review represents a rigorous and comprehensive effort to investigate the state of knowledge, awareness, perception, risk mitigation, and adaptation to climate change in Tanzania. The study followed a formal, predefined methodology that is distinct from more conventional literature reviews and enhances transparency and reproducibility (Berrang-Ford *et al.,* 2015).

To ensure rigor in the review process, the systematic review adhered the Preferred Reporting Items for Systematic reviews and Meta-Analyses approach (PRISMA 2020 protocol) and applying clear eligibility and exclusion criteria, this systematic review provides a robust and reliable synthesis of the available evidence on the topic (Moher *et al.,* 2009). This approach enabled the researchers to

synthesize the available evidence on the topic systematically, identify research gaps, and draw conclusions based on the best available evidence. The selection process was rigorous, transparent, and reproducible, as outlined in Figure 1.

**Eligibility criteria**

The study focused exclusively on peer-reviewed journal articles from the Sokoine University of Agriculture institutional repository (SUAIR) that discuss awareness, knowledge, perception, risk mitigation, and adaptation to climate change in Tanzania. The time frame for inclusion was set between January 1, 2010, and December 31, 2022. The eligibility and exclusion criteria were developed with care and applied consistently throughout the review process.

**Search strategy and selection**

Figure 1 presents the selection process of articles for systematic review after retrieving articles.

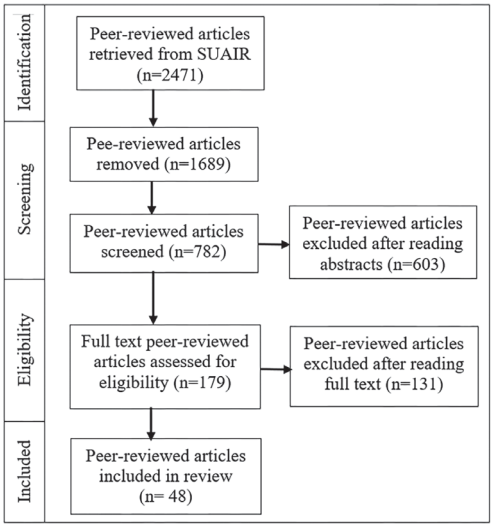


**Figure 1: The flow chart of selection process of articles for systematic review**

A search strategy was developed using various keywords (including 'climate change', 'awareness', 'perception', 'knowledge', 'risk', 'adaptation', and 'mitigation'), truncations, and Boolean operators to identify relevant studies. The keywords selected and used in understanding that some authors used them as interchangeable concepts to mean perception and risks because of its slight difference. The search techniques that allowed truncations and the use of Boolean operators maximized the number of relevant studies while narrowing down the search to articles discussing all the relevant topic. The search yielded 2471 articles, of which 179 met the eligibility criteria after screening. After a full-text reading, 131 studies were excluded based on the predefined eligibility and exclusion criteria, leaving 48 studies included in this systematic review.

**Results and Discussion**

**Geographic coverage of study**

The results presented in Figure 2 reveal the distribution of studies conducted on public perceptions of climate risks and adaptation across different regions in Tanzania. The data shows that the highest percentage of the 48 studies (39.50%) were conducted in the Morogoro region, indicating a significant focus on this area. Singida region accounted for 20.83% of the studies, while the Simiyu region comprised 14.58% of the total.

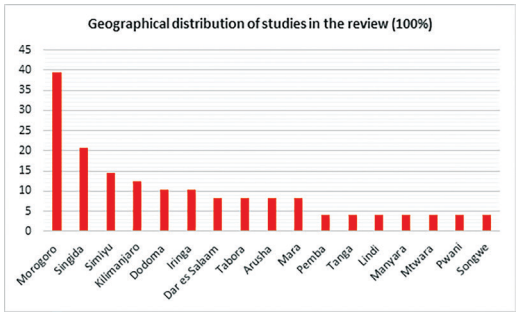


**Figure 2: Geographical distribution of studies in the review**

The review identified a gap in the coverage of studies related to public perceptions of climate risks and adaptation in Tanzania. Explicitly, the main climatic zones, particularly the high rainfall regions, were not adequately represented in the studies examined. This observation raises a concern regarding the representativeness of the research conducted in this field. The lack of studies addressing the high rainfall lake regions implies that the understanding of public perceptions of climate risks and adaptation may be limited in these crucial areas.

Studies in a wider range of climatic zones is required for more comprehensive understanding of public perceptions of climate risks and adaptation throughout Tanzania. This would contribute to the development of targeted strategies and policies to address the unique challenges faced by different regions in the country.

**Research method used**

The findings presented in Table 1 provide valuable insights into the approaches used on Public Perceptions of Climate Risks and Adaptation in Tanzania. The majority of the studies (87.50%) adopted a mixed-method approach, which signifies the recognition of the importance of both qualitative and quantitative data in understanding this complex issue. By combining qualitative methods, such as interviews or focus groups, with quantitative methods, such as surveys or statistical analysis, researchers were able to gather a comprehensive understanding of the public's perceptions and experiences related to climate risks and adaptation.

**Table 1: Approaches Employed in Studies on Public Perceptions of Climate Risks and Adaptation in Tanzania**

| Method | Number | Percentage |
|---|---|---|
| Mixed | 42 | 87.50% |
| Qualitative | 3 | 6.25% |
| Quantitative | 2 | 4.17% |
| Systematic review | 1 | 2.08% |

A smaller proportion of studies (6.25%) focused solely on qualitative methods. This indicates that researchers sought to delve deeper into individuals' experiences, thoughts, and perspectives regarding climate risks and adaptation(Siyao and Sife, 2020). Qualitative methods provided rich and detailed data, allowing for a nuanced exploration of how people perceive and respond to climate-related challenges. In contrast, a limited number of studies (4.17%) relied solely on quantitative methods (Kothari, 2006). These studies likely aimed to collect numerical data to analyse trends, patterns, and statistical relationships related to public perceptions of climate risks and adaptation. Quantitative methods enable researchers to generalize findings to larger populations and identify statistical significance.

Interestingly, only one study (2.08%) employed systematic review methodologies. Systematic reviews are valuable for synthesizing existing research on a specific topic, providing a comprehensive overview of the existing literature. This indicates that while there have been numerous individual studies on public perceptions of climate risks and adaptation in Tanzania, there is still room for more systematic approaches to collating and analysing the available evidence (Kothari, 2006).

These findings underscore the diverse range of approaches employed by researchers to examine public perceptions of climate risks and adaptation in Tanzania. The combination of mixed-method approaches, qualitative methods, quantitative methods, and systematic reviews contributes to a more comprehensive understanding of this critical topic and can inform policy and decision-making processes.

**Temporal distribution of studies**

The findings of the review presented in Figure 3 indicate that a significant number of studies on public perceptions of climate risks and adaptation in Tanzania were conducted in the years 2015 and 2016. Specifically, 29% of the studies were conducted in 2016, while 25% were conducted in 2015. Thus, these two years collectively accounted for more than half of the studies in this area.

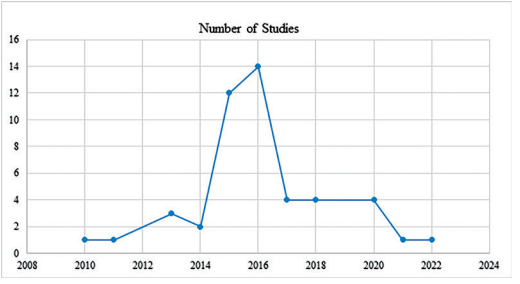


**Figure 3: Temporal distribution of studies**

This concentration of studies in 2015 and 2016, which the peak of publications that were on increase from 2012 may be attributed to the influence of Climate Change Impacts,

Adaptation and Mitigation (CCIAM) project at Sokoine University of Agriculture (SUA). This project likely generated interest and funding, leading to an increased number of studies during that period. It is possible that the presence of CCIAM and its emphasis on climate change research attracted scholars and researchers to explore public perceptions of climate risks and adaptation.

However, the review also highlights a significant decrease in the number of studies of this nature conducted by SUA scholars in recent years. This decline suggests a shift in research focus or a decrease in funding and support for studies on public perceptions of climate risks and adaptation. It is important to further investigate the reasons behind this decline and explore potential implications for understanding and addressing climate change issues in Tanzania, as it is the part of national climate change strategy to address, adapt and join the global efforts to adapt and mitigate climate change (United Republic of Tanzania-URT, 2012).

**Perceived meteorological changes**

The results of the study indicate that perceptions of climate change in Tanzania are strongly influenced by meteorological changes. People associate changes in rainfall patterns, temperature, and rainy days directly with climate change. This perception is supported by meteorological data, which have shown significant changes over the past 30 years in Tanzania, particularly increase in Temperature and decrease rainfall and rainy days (Mkonda *et al.,* 2018).

Furthermore, the study reveals that public awareness of climate change in Tanzania at is generally high, with an overall awareness level of 84% (Hella *et al.,* 2016; Kigoda, 2016; Kabote, 2018). The awareness is primarily based on observations of meteorological changes.

Gender was found to influence the level of climate change awareness, with men generally being more aware of climate change than women (Ibrahim, 2014; Mollel *et al.,* 2015). The study found that boys had a higher level of awareness compared to girls ($p=0.000<0.05$) (Kira and Komba, 2015). Interestingly, the study also found that there was no significant difference in climate change awareness between students studying in rural areas and those in urban areas (Kira, 2016).

The review highlights the crucial role of meteorological changes in shaping perceptions of climate change in Tanzania. It also underscores the importance of considering gender differences and educational settings when addressing climate change awareness among the public, particularly among women and girls.

**Perceived causes of climate change**

The review of various studies on public perceptions of climate change in Tanzania identified several perceived causes of climate change. Agricultural activities, such as unsustainable farming practices, were commonly identified as one of the causes. The unregulated cutting of trees and overgrazing were also recognized as contributing factors to climate change.

Interestingly, peri-urban studies specifically pointed towards industrial activities as a major cause of climate change in those areas. This highlights the regional differences in perceived causes, indicating that the context and specific activities within a given location can influence public perceptions.

A study conducted in urban areas by Lunyelele *et al.,* (2016), revealed that people were aware of climate change and recognized human activities as the primary driver of climate change. This suggests a general understanding among urban dwellers about the link between human actions and climate change. Similarly, Joseph, (2015) conducted a study in Pemba, which found that the majority of respondents were aware of the causes of climate change and its impacts. This indicates a broader awareness among the population in that specific region.

Furthermore, (Mkonda *et al.,* (2018) found that the availability of authentic and reliable sources of climate change information had a significant impact on respondents' level of awareness regarding the causes, impacts, and strategies for mitigating climate change. This underscores the importance of accessible and accurate information in shaping public awareness and understanding of climate change.

The regional variations, gender and information availability play key role in shaping public awareness and understanding of climate change issues.

**Perceived risk of climate change**

The review findings reveal several interesting insights into public perceptions of climate risk, highlighting the influence of various factors such as location, gender, and socioeconomic status. The majority of individuals surveyed (74%) acknowledged climate change as a significant risk, recognizing its impacts on their daily lives. One notable observation was that farmers specifically identified climate change risks, including decreased crop production and the disappearance of certain crops (Mkonda *et al.,* 2018). This emphasizes the vulnerability of agricultural livelihoods to climate change impacts.

Furthermore, the study found that individuals residing in rural areas were more likely to perceive climate risks such as drought and flooding compared to those in urban areas. This distinction may be attributed to the direct exposure of rural communities to climate-related events and their dependence on agriculture for livelihoods. It also suggests that urban populations might have different perceptions due to varying levels of exposure and economic activities.

Regarding gender differences, the review indicated that females tend to perceive climate change risks more acutely than males. This can be attributed to the active participation of women in agricultural activities, which are disproportionately affected by climate change (Joseph, 2015). The findings highlight the importance of considering gender-specific vulnerabilities and perspectives when addressing climate change impacts.

In peri-urban communities, the review reported that human activities including but not limited to Industrial activities, charcoal burning, deforestation and agricultural activities (Lunyelele *et al.,* 2016) were perceived as contributing to an increase in temperature, floods, diseases, and rainfall fluctuations. This suggests that human-induced factors, such as urbanization and changes in land use patterns, are recognized as significant drivers of climate-related risks in these areas.

The findings underscore the influence of various factors such as location, gender, and socioeconomic status on how individuals perceive and experience climate change impacts. Such insights are valuable for developing targeted and context-specific adaptation strategies to address climate risks effectively.

**Mitigation and adaption strategies**

The review discovered that attitudes towards adaptation varied among different groups, with some individuals displaying greater willingness to adopt new practices. For instance, research conducted by Malekani *et al.,* (2015) and Moshi *et al.,* (2016) in Mtwara region and Regions of Manyara, Arusha, Kilimanjaro and Tanga respectively, highlighted the adoption of intercropping practices, cultivation of drought-resistant crops, and the use of improved crop varieties like hybrids among farmers. The study conducted by (Mwalukasa, 2013, 2020). In Morogoro, showed access to reliable climate change information influenced individuals' attitudes towards adaption, with those having better access being more inclined to embrace adaptive measures.

Furthermore, limited productivity of agricultural technologies, inadequate knowledge, information, and skills were identified as barriers to the effective use of agricultural technology in climate change adaptation (Tumbo *et al.,* 2018). The adoption of climate change strategies also had implications for gender roles within agro-pastoralist communities. It was observed that the adoption of climate change practices led to shared activities between men and women, increased participation of women in business activities, and increased involvement of men in domestic tasks such as milking and collecting firewood (Mollel *et al.,* 2015).

Moreover, the review revealed that rural Tanzanians were perceived to have lower capacity for sustainable adaptation to climate change compared to their urban counterparts (Shirima *et al.,* 2018). Migration to search for more favorable living conditions was also identified as an adaptive strategy to climate change (Kabote, 2018). Farmers were found to

be more resilient compared to pastoralists, and the ownership of farming assets was reported to influence the level of resilience within agro-pastoralist societies (Mollel *et al.,* 2015). It was also noted that men tended to participate more in mitigation efforts compared to women (Joseph, 2015).

The complex dynamics of climate change adaptation in Tanzania is characterised by variations in attitudes, gender roles, socioeconomic factors, and the role of information access in shaping individuals' perceptions and adoption of adaptive strategies.

**Research gaps in climate change perceptions**

The review conducted on public perceptions of climate risk and adaptation in Tanzania has brought to light several significant knowledge gaps that warrant attention. One prominent gap pertains to the geographic distribution of studies conducted in the country. It was found that certain regions, such as Kagera, Mwanza, Mbeya, Ruvuma, and Mtwara, have not been adequately covered in the existing research (Kabote, 2018). To comprehensively assess the perception of climate risks and adaptation in Tanzania, it is crucial to include these regions in future studies. By incorporating these areas, a more comprehensive understanding of the climate challenges faced by the people residing there can be obtained (James and Emmanuel, 2017).

Another knowledge gap identified in the review relates to the disparity in understanding between men and women regarding climate change. The findings suggest that men tend to have a higher level of understanding compared to women (Kira and Komba, 2015). This knowledge gap not only underscores the need for targeted efforts to improve women's awareness and understanding of climate change but also emphasizes the importance of gender-responsive approaches in climate change adaptation initiatives (Mollel, 2015). Bridging this understanding gap can lead to more effective and inclusive strategies that address the specific needs and perspectives of both men and women.

Furthermore, the review highlights the disproportionate impact of climate change on rural areas in Tanzania. Given that rural communities heavily rely on agriculture as their primary source of income, they are particularly vulnerable to the adverse effects of climate change (Chingonikaya and Salehe, 2021). Therefore, it is imperative to prioritize and allocate more resources and efforts to address climate change challenges in rural areas. This could involve implementing sustainable agricultural practices, providing access to climate information and technologies, and supporting alternative livelihood options to enhance resilience and adaptive capacity(Tumbo *et al.,* 2018b; Mwalukasa, 2020).

This review brings attention to key knowledge gaps related to the geographic distribution of studies, the gender disparity in understanding climate change, and the need for focused efforts in rural areas (Shirima *et al.,* 2018). By addressing these gaps, policymakers, researchers, and practitioners can work towards a more comprehensive understanding of climate risks and adaptation in Tanzania and develop contextually appropriate strategies to promote sustainable and resilient communities.

**Conclusion**

The review of studies on public perceptions of climate risks and adaptation in Tanzania reveals that there is a significant concentration of studies in few regions, indicating a need for more research in other regions, particularly those not adequately covered. The majority of studies adopted a mixed-method approach, combining qualitative and quantitative methods to gain a comprehensive understanding of public perceptions. However, there is room for more systematic reviews to synthesize existing research.

The perceptions of climate change in Tanzania are strongly influenced by meteorological changes, and public awareness is generally high, with differences observed between genders. Agricultural activities and human-induced factors are recognized as major causes of climate change in Tanzania, with regional variations in perceived causes. The public perceptions of climate risks vary based on location, gender, and socioeconomic status, highlighting the vulnerability of rural areas and the importance of considering gender-specific

vulnerabilities. Additionally, attitudes towards adaptation and mitigation strategies vary among different groups, with access to information playing a significant role.

There are research gaps in terms of geographic coverage, gender disparities in understanding, and the need for more focus on rural areas. Addressing these gaps can contribute to a more comprehensive understanding of climate risks and adaptation in Tanzania and inform targeted strategies for resilience and sustainability.

**Acknowledgement**

Authors acknowledge Sokoine University of Agriculture, its Academicians and Researchers for their endless effort aiming at addressing and mitigating climate change in Tanzania.

**References**

Ajuaye, A. (2010). Analysis of farmers' adaptation to climatic change in kilimanjaro region. Available at: http://epa.sagepub.com/content/15/2/129.short%0Ahttp://joi.jlc.jst.go.jp/JST.Journalarchive/materia1994/46.171?from=CrossRef.

Aryal, J.P. *et al.* (2020). Climate change and agriculture in South Asia: adaptation options in smallholder production systems, Environment, Development and Sustainability. Springer Netherlands. doi: 10.1007/s10668-019-00414-4.

Bakari, M.S. (2015). Climate change impacts and adaptation strategies of small scale agriculture production in micheweni district Pemba, Tanzania.

Barnett, J. *et al.* (2023). '"Winga Is Trying to Get in": Local Observations of Climate Change in the Tiwi Islands', Earth's Future, 11(3), pp. 1–18. doi: 10.1029/2022ef002808.

Chingonikaya, E. and Salehe, F. (2021). 'Perceived existence of farmer-pastoralist conflicts in relation to climate Change in Kilosa District, Tanzania'. Available at: http://suaire.suanet.ac.tz/handle/123456789/3735 (Accessed: 27 March 2023).

Faustine, E.M. (2016). Coping Strategies and Household Resilience to Food Insecurity in Chamwino and Manyoni Districts, Tanzania.

Fwaya, N. (2022). Recession farming practices and their linkages to hydro-climatic risks in the kilombero valley.

Hella, J. *et al.* (2016). 'Climate change, smallholders farmers' adaptation in Pangani Basin and Pemba implications for redd+ initiatives', in.

Hornsey, M.J. and Fielding, K.S. (2020). 'Understanding (and Reducing) Inaction on Climate Change', Social Issues and Policy Review, 14(1), pp. 3–35. doi: 10.1111/sipr.12058.

Ibrahim, A. (2014). Gendered Analysis of the Determinants of Adaptive Capacity to climate change among smallholder farmers in Meatu and Iramba Districts, Tanzania.

James, N. and Emmanuel, C. (2017). 'Household's Vulnerability to Climate Change Among Farmers in Meatu and Iramba Districts, Tanzania' *Agricultural Journal,* 12(11–2), pp. 1–10.

Jarso, J.F. (2012). 'The East African Community and theClimate Change Agenda: An Inventory of theProgress, Hurdles, and Prospects', Sustainable Development Law & Policy, 12(2 (2012)), pp. 19–24, 56–62.

Joseph, J.P. (2015). Effectiveness of climate change mitigation interventions on crop productivity in morogoro district, Tanzania.

Kabote, S.J. *et al.* (2017). 'Perceived and measured climate variability and change in semi-arid environments in Tanzania: Experiences from Iramba and Meatu Districts', *International Journal of Environment and Sustainable Development,* 16(1): pp. 1–24. doi: 10.1504/IJESD.2017.080836.

Kabote, S.J. (2018). 'Farmers' Vulnerability to Climate Change Impacts in Semi-arid Environments in Tanzania: A Gender Perspective', Arid Environments and Sustainability. doi: 10.5772/intechopen.72108.

Kapinga, A.G. (2015). Impacts of REDD+ activities to rural communities' livelihoods: evidence from Kondoa advancing REDD+ in Kolo hills forests project in Tanzania. Available at: http://suaire.suanet.ac.tz/handle/123456789/702 (Accessed: 27

March 2023).

Kashaigili, J.J. *et al.* (2014). 'Analysis of Climate Variability, Perceptions and Coping Strategies of Tanzanian Coastal Forest Dependent Communities', *American Journal of Climate Change,* 03(02), pp. 212–222. doi: 10.4236/ajcc.2014.32020.

Kazoka, H.M. (2013). Farmers' adaptations to rainfall related climate variability risks and their implications on food security in the semi-arid Sikonge district, Tanzania. doi: 10.1088/1751-8113/44/8/085201.

Kigoda, K.J. (2016). Climate change, gender roles and perceived biting risk from tsetse flies: a case of communities neighboring ikorongo and grumeti game reserves in serengeti district, Tanzania, Early Human Development. doi: 10.1016/j.earlhumdev.2006.05.022.

Kihupi *et al.* (2015). 'Smallholder Farmers ' Adaptation Strategies to Impact of Climate Change in Semi-arid Areas of Iringa District Tanzania', *Journal of Biology, Agriculture and Healthcare,* 5(2): pp. 123–132.

Kihupi, M. lujabiko (2016). 'Effectiveness of smallholder farmers' adaptation strategies in improving well-being in light of climate change in Iringa district Tanzania'.

Kihupi, Mahonge, C. and Chingonikaya, E. E. (2016). Effectiveness of smallholder farmers' adaptation strategies in improving well-being in light of climate change in Iringa district Tanzania.

Kira, E. (2016). 'Secondary school students knowledge level of the concepts of meteorology and Environmental education between rural and urban Morogoro in Tanzania', Global Journal Of Advanced Research, 3(3), pp. 207–221.

Kira, E. and Komba, S. (2015). 'Comparison between the Understanding Levels of Boys and Girls on the Concepts of Environmental Degradation, Meteorology and Climate Change in Tanzanian Secondary Schools', *Journal of Education and e-Learning Research,* 2(4), pp. 79–86.

Kitasho, N., Abdallah, J.M. and Zakayo, R. (2020). 'Adaptive capacity to climate change of pastoralists in Kilosa District, Tanzania', *Tanzania Journal of Forestry and Nature Conservation,* 89(1): pp. 25–46.

Kothari, C.R. (2006). Research Methodology.

Kwiyega, Jonathan Lucas (2015). Role of community-based institutions, partnerships and practices in enhancing climate change adaptation in Mwanga district, Kilimanjaro, Tanzania. Available at: http://41.73.194.142/handle/123456789/784 (Accessed: 27 March 2023).

Kwiyega, J.L. (2015). Role of community-based institutions, partnerships and practices in enhancing climate change adaptation in Mwanga district, Kilimanjaro, Tanzania. Available at: http://www.suaire.sua.ac.tz/handle/123456789/784%0Ahttp://www.suaire.sua.ac.tz/bitstream/handle/123456789/784/JONATHAN LUCAS KWIYEGA.pdf?sequence=1 (Accessed: 21 March 2023).

Lalika, M.C.S. (2017). Potential for payments for watershed services and climate change adaptation in Pangani River Basin, Tanzania, (Doctoral dissertation, Universiteit Antwerpen). Available at: http://suaire.suanet.ac.tz/handle/123456789/4787 (Accessed: 21 March 2023).

Lunyelele, S.P. *et al.* (2016). 'Awareness of Peri-urban Farmers on the Concept of Climate Change : A Case of Temeke District , Dar es Salaam Region', *Journal of Environment and Earth Science,* 6(7): pp. 24–34.

Malekani, A., Chailla, A. and Wamunza, A. (2015a). 'Application of indigenous agro-biodiversity knowledge for climate change adaptation and its effects on food security and cash income among local communities in Masasi and Nachingwea districts, Tanzania', (May), pp. 72–75.

Malekani, A., Chailla, A. and Wamunza, A. (2015b). 'Application of indigenous agro-biodiversity knowledge for climate change adaptation and its effects on food security and cash income among local communities in Masasi and Nachingwea districts, Tanzania', pp. 72–75. Available at: http://suaire.suanet.ac.tz/handle/123456789/850 (Accessed: 21 March 2023).

Mkonda and He, X. (2016). 'Production Trends of Food Crops: Opportunities, Challenges and Prospects to Improve Tanzanian

Rural Livelihoods', Natural Resources and Conservation, 4(4), pp. 51–59. doi: 10.13189/nrc.2016.040402.

Mkonda, M.Y., He, X. and Festin, E.S. (2018). 'Comparing smallholder farmers' perception of climate change with meteorological data: Experience from seven agroecological zones of Tanzania', Weather, Climate, and Society, 10(3), pp. 435–452. doi: 10.1175/WCAS-D-17-0036.1.

Mlagala, E.H. (2020). Farmers' adaptation to climate change: are they willing to pay for the drought tolerant maize seed varieties?

Mollel, R. (2015). Adaptation and Coping Strategies to Climate Change among Agro-Pastoralists Community in Mvomero District, Tanzania, Rural Planning Journal. Available at: https://repository.irdp.ac.tz/bitstream (Accessed: 21 March 2023).

Mollel, R., Jeckonial, J. and Mahoo, H. (2015). 'Adaptation and Coping Strategies to Climate Change Among Agro-Pastoralists Community in Mvomero District, Tanzania', *Rural Planning Journal,* 17(1).

Moshi, A., Isinika, A. and Hella, J. (2016). 'Climate Variability and Farm Technology Adoption Decisions among Smallholder Farmers in Pangani River Basin', *Journal of Economics and Sustainable Development,* 7(2), pp. 18–24.

Mussa, K.R. and Mjemah, I.C. (2015). 'Indigenous Knowledge Systems for Climate Change Detection and Adaption Planning in Mountainous Areas in Tanzania', *Journal of Resources Development and Managemen,* 13, pp. 90–98.

Mussa, K.R., Mjemah, I.C. and Malisa, E.T. (2012). 'The role of development projects in strengthening community-based adaptation strategies : the case of Uluguru mountains Agricultural development project', *International Journal of Agricultural Sciences* ISSN: 2167-0447, 2(6): pp. 157–165.

Mwalukasa, N. (2013). 'Agricultural information sources used for climate change adaptation in Tanzania', Emerald. doi: 10.1108/LR-12-2011-0096.

Mwalukasa, N. (2020). Mobile Phone Use in Accessing Rice Information for Adaptation To Climate Change in Kilosa and Kilombero Districts, Morogoro, Tanzania, Global Knowledge, Memory and Communication. Available at: http://www.suaire.sua.ac.tz/handle/123456789/3493%0Ahttps://www.suaire.sua.ac.tz/bitstream/handle/123456789/3493/NICHOLAUS MWALUKASA.pdf?sequence=1&isAllowed=y.

Mwasha, D.I. (2016). Farmer-pastoralist conflict in kilosa disrtict, tanzania: a climate change orientation.

Nyangas, J.A. *et al.* (2016). 'Perceptions on resilience to climate change variability among farmers in Meatu and Iramba districts , Tanzania', *Journal of Humanities And Social Science,* 21(11), pp. 36–48. doi: 10.9790/0837-2111023648.

Phillipo, F., Bushesha, M. and Mvena, Z.S.K. (2015). 'Adaptation strategies to climate variability and change and its limitations to smallholder farmers. A literature search', *Asian Journal of Agriculture and Rural Development,* 5(3), pp. 77–87.

Pickson, R.B. and He, G. (2021). 'Smallholder Farmers' Perceptions, Adaptation Constraints, and Determinants of Adaptive Capacity to Climate Change in Chengdu', SAGE Open, 11(3). doi: 10.1177/21582440211032638.

Shadrack, S. (2011). Hunter-gatherers' coping strategies on climate change in Iramba and Mbulu districts, Tanzania. Available at: http://www.ainfo.inia.uy/digital/bitstream/item/7130/1/LUZARDO-BUIATRIA-2017.pdf.

Shirima, A.O., Mahonge, C.P. and Chingonikaya, E.E. (2018). 'Climate change effects and perceived sustainability of adaptive capacity resources among smallholder farmers in Manyoni District, Tanzania', *Journal of Co-operative and Business Studies,* 1(1), pp. 1–10.

Siyao, P.O. and Sife, A.S. (2020). 'Access to and Use of Climate Change Information covered in Tanzania Newspapes - A case of selected peri-urban newspaper readers in Tanzania', East African Journal of Social and appliedSciences.

Thomas, A. *et al.* (2020). 'Climate change and

small island developing states', Annual Review of Environment and Resources, 45, pp. 1–27. doi: 10.1146/annurev-environ-012320-083355.

Tuitjer, L. and Dirksmeier, P. (2021). 'Social media and perceived climate change efficacy: A European comparison', Digital Geography and Society, 2, p. 100018. doi: 10.1016/j.diggeo.2021.100018.

Tumbo, S. *et al.* (2015). Assessing the impacts of climate variability and change on agricultural systems in Eastern Africa while enhancing the region's capacity to undertake Intergrated assessment of vulnerabilities to future changes in climate. doi: 10.13140/RG.2.1.2056.4000.

Tumbo, S.D. *et al.* (2018a). 'Exploring information seeking behavior of farmers' in information related to climate change adaptation through ICT (CHAI)', International Review of Research in Open and Distance Learning, 19(3), pp. 299–319. doi: 10.19173/irrodl.v19i3.3229.

Tumbo, S.D. *et al.* (2018b). 'Exploring information seeking behavior of farmers' in information related to climate change adaptation through ICT (CHAI)', International Review of Research in Open and Distance Learning, 19(3), pp. 299–319. doi: 10.19173/irrodl.v19i3.3229.

Tumbo and Sanga, C. (2015). Impacts of climate change on agriculture: What, when, where and how? Available at: https://kebijakankesehatanindonesia.net/images/2019/policy_brief_penguatan_kbk_dalam_meningkatkan_mutu_rujukan_non_spesialistik.pdf.

Urassa, J.K. *et al.* (2016). 'Climate change and its variability on crop production in semiarid areas of Iramba and Meatu Districts , Tanzania', African Development, 32 (Special Issue), pp. 10–19.

URT (2012). United Republic of Tanzania Vice President's Office National Climate Change Strategy.

Yusufu, M.S. (2017). Effects of Climate Change to Pastoral Communities in Mvomero District, Tanzania.

Zakayo, R. (2015). Pastoral adaptive capacity in the changing climate in kilosa district.

| | Supplementary information1. Summary of Reviewed Studies | | | | | |
|---|---|---|---|---|---|---|
| SN | Author | Tittle | Key Findings | Geographical focus | Method | Sample size |
| 1 | (Kihupi *et al.*, 2015) | Smallholder Farmers' Adaptation Strategies to Impact of Climate Change in Semi-arid Areas of Iringa District Tanzania | -Adoption of Drought resistant crop<br>-crops rotation and diversification | Iringa | Mixed | - survey (n=240)<br>-Interviews (undisclosed)<br>-Focused Group Discussions (FGDs) |
| 2 | (Kihupi et al., 2016) | Smallholder Farmers' Perception of Climate Change Versus Meteorological Data in Semi-arid Areas of Iringa District | -Increase in temperature and decrease in rainfall, increase in crop disease and pests<br>-perceived climate change as a serious risk | Iringa | Mixed | -240 survey<br>-Interviews (undisclosed)<br>-FGDs(undisclosed) |
| 3 | (Joseph, 2015) | Effectiveness of climate change mitigation interventions on crop productivity in Morogoro district, Tanzania | . High level of awareness (95.8%) on climate change<br>. Male participated in climate change mitigation than female. | Morogoro | Mixed | -survey (n=120)<br>- key informants (n=10) |
| 4 | (Kira, 2016) | Secondary school teachers' knowledge level of the concepts of environmental education in Morogoro, Tanzania | -The teachers were aware of climate change.<br>-The major causes of climate change. | Morogoro | Qualitative | -Interviews (n=24) |
| 5 | (Mkonda et al., 2018) | Comparing smallholder farmers' perception of climate change with meteorological data: Experience from seven agro-ecological zones of Tanzania | . Increase in temperate and decrease in rainfall<br>. respondents had good knowledge of climate change<br>. adaptation of new farming practices<br>. perceived climate change as a serious risk | Tanga, Mara, Singida, Tabora, Iring a, Kilimanjaro Morogoro | Mixed | -survey (n=440)<br>-FGD participants (n=147)<br>-interviews (n=35) |
| 6 | (Bakari, 2015) | Climate change impacts and adaptation strategies of small-scale agriculture production in michewezi district Pemba, Tanzania | . Decrease of rainfall for the past 10 years, adoption of new crops<br>And high-level awareness of climate change impact (98%) | Pemba | Mixed | -survey (n=90)<br>- Interview (n=45)<br>FGD (undisclosed) |
| 7 | (Mkonda and He, 2016) | Production Trends of Food Crops: Opportunities, Challenges and Prospects to Improve Tanzanian Rural Livelihoods | -Decrease in crop production and rainfall.<br>-Challenging climate change adaptation | Tanzania | Systematic review | -54 published Papers |
| 8 | (Zakayo, 2015) | Pastoral adaptive capacity in the changing climate in kilosa district | -High level of awareness of climate change<br>-planting trees to protect soil cover (85%)<br>- Limited resources to cope with climate change | Morogoro | Mixed | -survey (n=104)<br>FGD (undisclosed)<br>Interviews (undisclosed) |
| 9 | (Nyangas *et al.*, 2016) | Perceptions on resilience to climate change variability among farmers in Meatu and Iramba districts, Tanzania | -positive perception of climate change household resilience<br>-farmers perceived climate change resilience highly than pastoralists | Singida and Simiyu | Mixed | survey (n=183)<br>FGDs (n=3) |
| 10 | (Kihupi, 2016) | Vulnerability assessment of the livelihoods in Tanzania's semi-arid agro-ecological zone under climate change scenarios | -high level of climate vulnerability<br>-larger piece of land deserted for unproductivity,<br>adoption of drought resistance crop, crop rotation | Dodoma | Mixed | -survey (n=400)<br>-climate data from Tanzania Metrological Agency (TMA) from 1980-2015 |
| 11 | (Shadrack, 2011) | Hunter-gatherers' coping strategies on climate change in Iramba and Mbulu districts, Tanzania | -decrease in rainfall<br>-inability to cope with climate change, food insecurity | Babati | Mixed | 100 surveys<br>10 key informants |
| 12 | (Ajuaye, 2010) | Analysis of farmers' adaptation to climatic change in kilimanjaro region | -high level of awareness (95%) of climate change<br>-changing farming practices<br>- human activities major cause of CC | Kilimanjaro | Mixed | -175 Survey<br>-Documents review |
| 13 | (Lunyelele *et al.*, 2016) | Awareness of Peri-urban Farmers on the Concept of Climate Change.; A Case of Temeke District , Dar es Salaam Region | -high level of awareness (97%) on climate change<br>-human activities was the root cause of climate change | Dar es Salaam | Mixed | -240 surveys<br>-40 FGDs participants<br>-interviews |
| 14 | (Kira and Komba, 2015) | Comparison between the Understanding Levels of Boys and Girls on the Concepts of Environmental Degradation, Meteorology and Climate Change in Tanzanian Secondary Schools | -Level of awareness on climate change of boys was higher than girls ($p=0.000<0.05$) | Morogoro | Mixed | 480 surveys<br>.4 FGDs |
| 15 | (Kazoka, 2013) | Farmers' adaptations to rainfall related climate variability risks and their implications on food security in the Semi-Arid Sikonge District, Tanzania | -adopting new and cheap food<br>-rainwater harvesting<br>-adopting early maturing varieties<br>-crop rotations | Tabora | Mixed | -120 surveys<br>-Secondary data from Sokoine National Agricultural Library (SNAL) |
| 16 | (Tumbo and Sanga, 2015) | Impacts of climate change on agriculture: What, when, where and how? | -Extreme weather condition<br>-Poor agricultural production<br>-adopt the use of fertilizers | Morogoro, Dodoma | Mixed | 168 surveys<br>-Data from TMA |
| 17 | (Kigoda, 2016) | Climate change, gender roles and perceived biting risk from tsetse flies: A case of communities neighbouring Mkomazi and Grumeti game reserves in Serengeti district, Tanzania | -high level of awareness (60%) on climate change<br>-positive perception of climate change | Mara | Mixed | -108 respondents<br>-10 interview<br>-24 GFDs |

| | | | | | | -2448 tsetse flies |
|---|---|---|---|---|---|---|
| 18 | (Phillipo et al., 2015). | Adaptation strategies to climate variability change, and its limitations to smallholder farmers. a literature search | -Crop rotation and diversification<br>-adaptation of mulching technique | Sub Saharan Africa | Qualitative | Documents review |
| 19 | (Mollel et al., 2015) | Adaptation and Coping Strategies to Climate Change among Agro-Pastoralists Community in Mvomero District, Tanzania | -Adopting keeping few livestock<br>-timing of planting seasons<br>-adoption of high yields varieties | Morogoro | Mixed | -135 Survey<br>-Interviews<br>-FGD |
| 20 | (Urassa *et al.*, 2016) | Climate change and its variability on crop production in semiarid areas of Iramba and Meatu Districts, Tanzania | -Changing amount of rainfall<br>-increasing number of rainfall and drought<br>-declining crop yields | Singida and simiyu | Mixed | -150 surveys<br>-secondary data from TMA<br>-FGD |
| 21 | (Lalika, 2017) | Potential for payments for watershed services and climate change adaptation in Pangani River Basin, Tanzania | -Irrigation has significant impact on production in climate changed environment<br>-Human activities a key factor for CC | Kilimanjaro and Arusha | Mixed | -360 surveys<br>-FGM<br>-Interviews |
| 22 | (Mvasha, 2016) | Farmer-pastoralist conflict in kilosa district, tanzania: a climate change orientation | -eruption of diseases<br>-increase in temperature | Morogoro | Mixed | -surveys (n=120)<br>FGDs (undisclosed)<br>-Interviews (n=12) |
| 23 | (Chingonikaya and Salehe, 2021) | Perceived existence of farmer-pastoralist conflicts in relation to climate Change in Kilosa District, Tanzania | -shortage of water<br>-Climate induced shortage of pasture | Morogoro | Mixed | -Survey (n=120)<br>-FGD and interview (undisclosed) |
| 24 | (Sivao and Sife, 2020) | The role of Newspapers in the dissemination of climate change information in Tanzania | -High level of awareness on climate change<br>- | Morogoro and Dar es Salaam | Mixed | 153 surveys |
| 25 | (J L Kwivega, 2015) | Role of community-based institutions, partnerships and practices in enhancing climate change adaptation in Mvanga district, Kilimanjaro, Tanzania | -Decrease in rainfall<br>-Adoption of market exchange of goods<br>-Migration | Kilimanjaro | Mixed | 60 surveys<br>20 interviews<br>-FGDs<br>-Documents review |
| 26 | (Kira, 2016) | Secondary school students' knowledge level of the concepts of meteorology and Environmental education between rural and urban Morogoro in Tanzania | -Similar level of awareness on climate change between rural and urban respondents | Morogoro | Mixed | 480 surveys<br>12 FGD |
| 27 | (Kihupi et al., 2016) | Barriers in implementation of climate change adaptation strategies among smallholder farmers in semi-arid areas of iringa district Tanzania | -Unreliable source of information on weather forecast and climate change.<br>-Limited (61%) ownership of farming assets. Limited capital (97%) | Iringa | Mixed | -240 survey<br>-Interviews<br>-FGDs |
| 28 | (Mollel et al., 2015) | Agro-pastoralists' Perception on Climate Change in Mvomero, District: A gendered Perspective | -Men had high level of awareness on climate change than women<br>-men perceived climate to changing highly than women | Morogoro | Mixed | 135 surveys<br>-Interviews<br>-FGDs |
| 29 | (Yusufu, 2017) | Effect of climate change to pastoral communities in Mvomero District, Tanzania | -High level (98%) of awareness on climate change,<br>perceived rainfall to decreasing<br>-reduction of grazing land | Morogoro | Mixed | 90 surveys<br>-Interviews<br>-FGDs |
| 30 | (Kitasho et al., 2020) | Adaptive capacity to climate change of pastoralists in Kilosa District, Tanzania | -diversification of livelihood means<br>-decrease in pasture, drought<br>- seasonal migration | Morogoro | Mixed | -104 surveys<br>-FGDs<br>-Interviews |
| 31 | (Kabote, 2018) | Farmers' Vulnerability to Climate Change Impacts in Semi-arid Environments in Tanzania: A Gender Perspective | -Migration in search for better living place<br>-Increase of animals and crops diseases<br>-high level of awareness on climate change | Singida and simiyu | Qualitative | 9 FGDs |
| 32 | (Mvalukasa, 2013) | Agricultural information sources used for climate change adaptation in Tanzania | -high level of awareness on climate change<br>-Neighbours the major source of climate change adoption information | Morogoro | Mixed | -100 survey<br>-30 FGD |
| 33 | (Magala, 2020) | Farmers' adaptation to climate change: are they willing to pay for the drought tolerant maize seed varieties? | -High level (97%) of awareness on drought tolerant crops<br>-Respondents were willing to pay for drought tolerant seeds | Songwe | Mixed | -124 survey<br>-Documents reviews from SNAL, TOSCI |
| 34 | (Tumbo *et al.*, 2018b) | Exploring information seeking behavior of farmers' in information related to climate change adaptation through ICT (CHAI) | -The farmers searched information for seed diversification, Crop rotation. And drought resistant crops | Morogoro | qualitative | 1148 words |
| 35 | (Faustine, 2016) | Coping Strategies and Household Resilience to Food Insecurity in Chamwino and Manyoni Districts, Tanzania | -Adaptation of crop diversification strategy<br>- seasonal migration<br>-receiving food aids. | Dodoma and singida | Mixed | -200 Survey<br>-FGDs<br>-Interviews |

| | | | | | | |
|---|---|---|---|---|---|---|
| 36 | (Shirima et al., 2018) | Climate change effects and perceived sustainability of adaptive capacity resources among smallholder farmers in Manyoni District, Tanzania | -Loss of motivation to cultivate crops (94%)<br>-majority (60%) of respondents perceived to have low sustainability adoptive capacity to climate change | singida | Mixed | 240 survey<br>-13 Interviews<br>-8 FGDs |
| 37 | (Ibrahim, 2014) | Gendered Analysis of the Determinants of Adaptive Capacity to climate change among smallholder farmers in Meatu and Iramba Districts, Tanzania | -Men had slightly high level of awareness on climate change compare to women<br>- CC perceived to reduce crops production<br>-keep larger number of animals were perceived to cause climate change | Simiyu and Singida | Mixed | - surveys (n=120)<br>-FGDs (=2)<br>- Interviews (n=120) |
| 38 | (Moshi et al., 2016) | Climate Variability and Farm Technology Adoption Decisions among Smallholder Farmers in Pangani River Basin | -adoption of improved crop varieties such as hybrids<br>-adoption to the use of inorganic fertilizers | Arusha, Kilimanjaro,Tanga | Quantitative | - surveys (n=420) |
| 39 | (Kazoka, 2013) | Farmers' adaptations to rainfall related climate variability risks and their implications on food security in the semi-arid Sikonge district, Tanzania | -cultivation of drought tolerant crops, early maturing and high yields crops<br>-Reduction of number of livestock | Tabora | Mixed | - Surveys (n=120)<br>-Documents reviews from TMA |
| 40 | (Kashaigili *et al.*, 2014) | Analysis of Climate Variability, Perceptions and Coping Strategies of Tanzanian Coastal Forest Dependent Communities | -Decrease in yielding of agricultural traditional crops<br>-increasing crop diseases<br>-Decrease in soil fertility<br>-high level of awareness on climate change | Dar es salaam and Pwani | Mixed | -Surveys (n=150)<br>-FGDs (unclosed)<br>-Interview (undisclosed) |
| 41 | (James and Emmanuel, 2017) | Household's Vulnerability to Climate Change Among Farmers in Meatu and Iramba Districts, Tanzania | -decrease in farm yields<br>-access to climate change information improves adaptive capacity | Simiyu and Singida | Mixed | Surveys (n=183)<br>FGDs (n=6) |
| 42 | (Malekani et al., 2015) | Application of indigenous agro-biodiversity knowledge for climate change adaptation and its effects on food security and cash income among local communities in Masasi and Nachingwea districts, Tanzania | -Adoption of intercropping practices (97%)<br>--cultivation of drought resistant crops | Lindi and Mtwara | Quantitative | -surveys (n=230) |
| 43 | (Kapinga, 2015) | Impacts of REDD+ activities to rural communities' livelihoods: evidence from Kondoa advancing REDD+ in Kolo hills forests project in Tanzania | -significant relationship between improved agriculture and maize production | Kondoa | Mixed | -115 survey<br>-10 FGD<br>- 86 Interview |
| 44 | (Mwalukasa, 2020) | Mobile Phone Use in Accessing Rice Information for Adaptation To Climate Change in Kilosa and Kilombero Districts, Morogoro, Tanzania | -use of drought resistant crops<br>-majority of respondents accessed information of rice varieties | Morogoro | Mixed | -400 surveys<br>- 8 FGDs |
| 45 | (Hella *et al.*, 2016) | Climate change, smallholders farmers' adaptation in Pangani Basin and Pemba implications for redd+ initiatives | High level of awareness on climate change<br>-increase in floods, hurricanes<br>-Crop failure, change in cropping pattern<br>- adaptation of irrigation farm plots | Pemba | Mixed | 387 surveys<br>40 interview |
| 46 | (Nyangas *et al.*, 2016) | Perceptions on resilience to climate change variability among farmers in Meatu and Iramba districts , Tanzania | -farmers were perceived to more resilient than pastoralists<br>-significant relationship between household land ownership and resilience | Singida and Simiyu | Mixed | 183 surveys<br>3 FGDs |
| 47 | (Tumbo *et al.*, 2015) | Assessing the impacts of climate variability and change on agricultural systems in Eastern Africa while enhancing the region's capacity to undertake Intergrated assessment of vulnerabilities to future changes in climate | -Climate change affecting crop production negatively<br>-climate change adoption increased crop production | East Africa | Mixed | 1469 survey |
| 48 | (Fwaya, 2022) | Recession farming practices and their linkages to hydro-climatic risks in the kilombero valley | -Major Perceived Climate change variability risks were Flood and Drought<br>-Maize were the dominant crop | Morogoro | Mixed | -120 surveys<br>-4 FGDs |
| 49 | (Mollel et al., 2015) | Agro-pastoralists' Perception on Climate Change in Mvomero District: A gendered Perspective | -Men were more aware of climate change than women were.<br>-Climate change has brought shared activities, influenced women in business | Morogoro | Mixed | -135 surveys<br>-FGDs<br>-Interviews |
| 50 | (Kabote *et al.*, 2017) | Perceived and measured climate variability and change in semi-arid environments in Tanzania: Experiences from Iramba and Meatu Districts | -Farmers perceived rainfall to be decreasing<br>-increased climate variability from 1970s<br>-climate change perception was the same between men and women ($p<0.05$) | Singida and simiyu | Mixed | -388 surveys<br>-7 FGDs |

Source: Sokoine University of Agriculture Institution Repository, 2023.