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The Contribution of Local Civic Society Institutions in Enhancing Smallholder Farmers' Adaptation to Climate Change in Songea District, Tanzania.

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Abstract

This article is a result of a study that sought to examine the contribution of local civic institutions in enhancing smallholder farmers' adaptation to climate change in Songea District, Tanzania. The study employed both quantitative and qualitative research methodologies, with a sample size of 120 respondents. The study findings revealed that local institutions played a significant role in supporting smallholder farmers' adaptation to climate change through the provision of weather forecasts and market information, farm inputs, promoting the use of drought-tolerant crops, and the use of improved seeds. Furthermore, a local civic society institution has managed to promote smallholder farmers' adaptation capacity to climate change. It is recommended that a collaborative endeavour between governmental and non-governmental organisations be undertaken to initiate, promote, and reinforce local civic institutions. This collective effort should aim to enhance the adaptation of smallholder farmers to climate change, as such institutions have demonstrated their effectiveness and viability in facilitating climate change adaptation measures.

Keywords: *local civic institution, smallholder farmers, climate change adaptation, Songea district*

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Introduction

Global and local communities have observed noteworthy and significant climate changes in their respective environments. These changes have a direct impact on the livelihood options available to these communities (Sawe, 2022). The International Panel on Climate Change (IPCC) Fifth Assessment Report provides evidence of declining rainfall and rising temperatures throughout Africa during the past few decades (1PCC, 2020). As a result, these changes have affected farming, which is the most climate-sensitive sector, and on which the majority of the people depend as a major source of their livelihoods (IPCC, 2018). Moreover, climate change has caused significant effects on smallholder farmers in East Africa. The anticipated impacts of climate change include an increase in the frequency and severity of events such as droughts, floods, and heavy rainstorms: all contributing to a decline in crop yields (Shikuku et al., 2017). In East Africa, agriculture—which employs a large proportion of the population—is mainly rain-fed, and highly vulnerable to climate extremes and changes (Oladele et al., 2019).

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Given the localized and more severe impact of climate change on agricultural-dependent communities, it is imperative to take action against climate change impacts at the local level (Nyong et al., 2017). There is a growing realization that local institutions play an important role in the planning and implementation of adaptation activities at the local level (Rodima-Taylor et al., 2011; Amaru & Chhetri 2013; Agrawal, 2019; Agrawal & Perrin, 2020). However, ongoing initiatives towards climate change adaptation have focused more on the national level. The focus has been on the formulation of policies and plans that promote capacity building to smallholder farmers (Sawe, 2022).

A review of Tanzania's National Adaptation Programme of Action (NAPA) shows that the role of local institutions in climate change adaptation has received little attention (Jurjonas & Seekamp, 2018). In Tanzania, the NAPA of 2021 and the National Environmental Management Act of 2004 have identified local civil society institutions—including farmers or agricultural producer organizations, cooperatives, and savings and loan groups—as local units of planning and implementation of adaptation activities. Similarly, scholars in climate adaptation and institutions have emphasized the significant contribution of local institutions in climate change adaptation. This paper recognizes the potential of local civic institutions to drive the improvement of smallholder farmers' adaptation to climate change. However, it does not explicitly investigate the contribution of local civil society in promoting smallholder farmers' adaptation to climate change. In particular, rich experiences from Tanzania's local civil society institutions could be valuable in climate change adaptation. However, it has yet not been understood in detail what local institutions can offer to enhance smallholder farmers adaptation to climate change, especially at the local context; and to what extent their existing activities contribute to smallholder farmers' adaptation to climate change.

Institutional and social factors significantly influence the vulnerability of rural households and communities to environmental risks, and shape their ability to respond to these risks (Agrawal, 2019; Amaru & Chhetri, 2013). Institutions are defined as formal and informal associations through which social structures share decision-making and take collective action (Agrawal, 2019). Agrawal and Perrin (2020) argue that institutions are the leverage points that determine the direction and magnitude of the flow of resources to different social groups. This signifies the importance of the role of local institutions in adaptation planning at the local level. Oladele et al. (2019) reported that understanding the relationship between local civic society institutions and smallholder farmers is of great significant in enhancing farmers' adaptation to climate change. This paper directs attention towards a subset of such relationships, focusing on rural institutions and poor populations in the context of climate change-induced adaptations. It is critically important to understand better the contribution of institutions in shaping adaptation, especially the contribution of local institutions in adaptation to climate change to help the most vulnerable social groups (Mortimore & Adams, 2011; Scoones, 2001).

Moreover, Malekela and Nyomora (2020) emphasized that adaptation to climate change is locally driven, therefore, its effectiveness depends on the function and ability of local institutions through which incentives for individual and collective action are structured. Not only have existing institutions affected how smallholder farmers responded to climate challenges in the past, but they have also been the fundamental mediating mechanisms that translate the impact of external interventions to facilitate adaptation to climate change (Alli & Sawe, 2022). The way local institutions are structured may facilitate or impede farmers' responses to climate change (Mwamfupe, 2019). Understanding the functioning of climate change and its impacts is essential when designing interventions that can effectively enhance the adaptive capacity and adaptation practices of impoverished populations (Oladele et al., 2019).

There are two distinct categories of local institutions. The first category consists of community institutions that operate at the community level. These are civil society institutions that organize citizens for collective and individual action in enhancing smallholder farmers' adaptation to climate change (Oladele, 2017). The second category comprises local government institutions, which are formal structure with elected representatives. These two have distinct contributions in climate change adaptation and local development (Wisner, 2015).

Civil society institutions are primarily responsible for improving people's livelihoods to meet the demands of their members, whereas local governments coordinate the planning and implementation of development activities at the local level. Local governments that have mechanisms of democratic elections are more accountable to the people, and are the effective and legitimate bodies for planning and implementation of development activities, including climate change adaptation at the local level (Ribot, 2007; Agrawal & Perrin, 2009).

Therefore, in the context of this study, the focus has been put on local civil society institutions because of their prominence in terms of institutional base for adaptation planning and implementation. Existing literature has put forth the argument that local civil society institutions provide a strong institutional foundation for facilitating smallholder farmers' adaptation to climate change (Pokharel et al., 2007). Moreover, there is a growing recognition that local civil society institutions are well-suited for community adaptation planning, and can actively be mobilized for this purpose. Hence, this study employed local civil institutions due to their demonstrated usefulness and experience in supporting smallholder farmers' adaptation to climate change.

It is worth noting that there is a scarcity of information in the existing literature regarding the specific contribution of local civil institutions in enhancing smallholder farmers' adaptation to climate change. Therefore, this study was conducted to cover this knowledge gap. It examines trends and patterns of climate change, types of local institutions operating in the study area, and their activities in enhancing smallholder farmers' adaptation to climate change.

This paper is structured into four distinct sections, namely: the introduction, methods and materials, results and discussions, and conclusion and recommendations.

Theoretical Review for Study

The theoretical approach is informed by the adaptation, institutions, and livelihoods framework (Jurjonas & Seekamp, 2018; Agrawal & Perrin, 2020). Additionally, the approach is also guided by the critical political ecology (Wisner, 2015; Okano et al., 2023); and by a cultural geographic research framework that emphasizes the importance of 'everyday risks', residents' perceptions of these risks, their aspirations (Malekela & Nyomora, 2020), and the role of holistic experience of change in everyday decision-making (Okano et al., 2023). The adaptation, institutions, and livelihoods framework directs attention towards the interplay of three key elements: adaptation, institutions, and livelihoods. These elements have been empirically recognized as prevalent in rural land and resource systems experiencing pressure from climate change.

The empirical overview conducted for the adaptation, institutions, and livelihoods framework identified five primary adaptations to climate change that were commonly observed: mobility, storage, diversification, communal pooling, and market exchange (Agarwal & Perrin, 2020). Local institutions normally promote smallholder farmers in rural area by providing access to resources such as irrigation water and agriculture information, which are very important for farmers' adaptation to climate change (Agarwal & Perrin, 2020).

Moreover, local institutions shape the way that communities respond to climate change by creating incentive structures for individual or collective adaptations, for example, through the creation of physical and social infrastructures that allow access to markets, secure agricultural land, and avail to finance. Finally, institutions serve as intermediaries for access to external resources from central governments or non-governmental organizations. Therefore, the livelihoods framework was considered to be relevant and the best theoretical framework to guide this study.

Materials and Methods

The study was conducted in Songea District, one of five districts of the Ruvuma region of Tanzania. It is bordered to the north by the Morogoro region, to the east by Namtumbo district, to the south by Songea municipal, to the west by Mbinga district, and to the northwest by Iringa region. The district occupies a total area of 16,072km^2, accounting for 25% of the Ruvuma region; and lies between latitudes 10^o 34' 59'' South, and longitudes 35^o 23' 59" East (Figure 1).

The rationale for the choice of the study area was based on the fact that farming is the main source of income for the majority of smallholder farmers in this area. Its rainfall distribution rarely meets crop water requirements, which poses a threat to farming activities. Lundusi, Peramiho A, and Peramiho B villages were selected since, as per the district report, these were the villages most affected by climate change. Moreover, the villages were selected because of the existence of several

local institutions responsible for climate change adaptation, thus providing an opportunity for this study to be conducted.

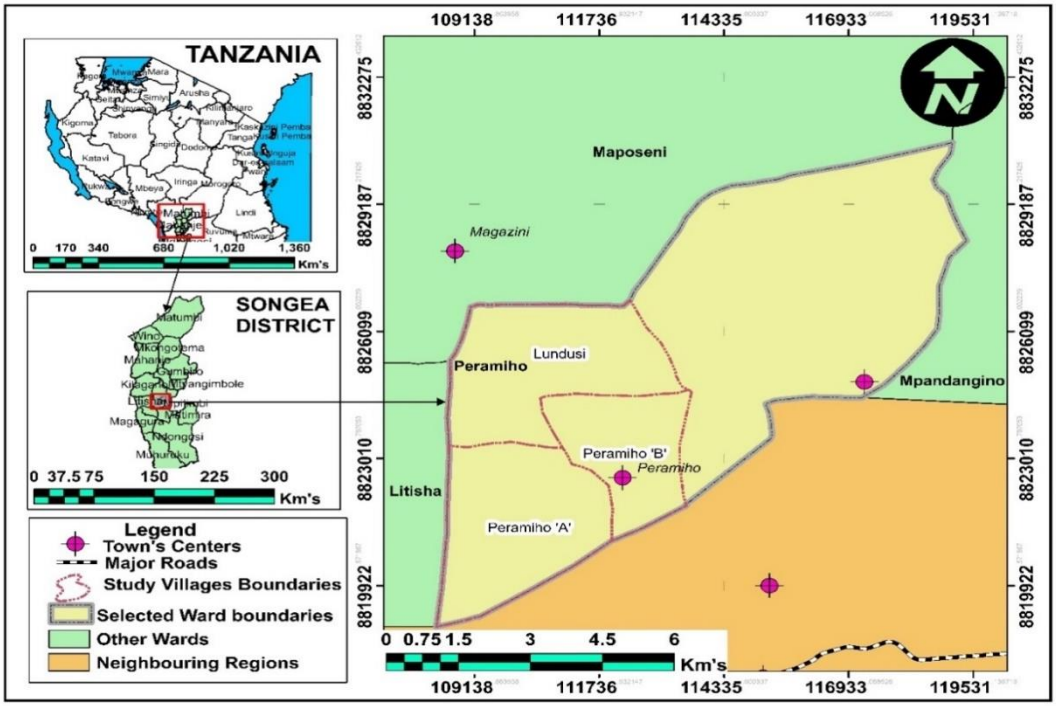

Figure 1: Map of Songea District Showing the Study Villages
Source: Cartography Unit University of Dar es Salaam (2023)

The article employed a mixed research design, incorporating both quantitative and qualitative methods. A sample of 120 heads of household were selected for the study (Table 1). It is these heads of households that were involved in a household survey. This was because, in most cases, heads of households are the decision-makers at the household level, and are believed to be more knowledgeable about the study theme.

Table 1: Distribution of Sample Size in the Study Villages

Ward	Villages	Total Number of Households	Sample Size $\frac{n1}{N}$*n
Peramiho	Lundusi	1065	39
	Peramiho A	1112	41
	Peramiho B	1068	40
Total		**3245**	**120**

Source: Field Data 2023

The estimation of the sample size was conducted using the formula proposed by Yamane (1967) at a 90% confidence level, with a probability (P) value of 0.1, as demonstrated below:

$$n = \frac{N}{1 + N(e)^2}$$

Where; n = sample size
N = population size for households in the sampled villages
e = the level of precision measured by a probability scale of 10%.

Therefore,

$$n = \frac{3246}{1 + 3246(0.1)^2} = 120$$

$$n = 120$$

Secondary and primary data sources were used in the study. Secondary data was collected by reviewing literature from a variety of sources, including books, unpublished documents from local government offices, and scientifically published articles found online. The University of Dar es Salaam's main library and the Ministry of Agriculture were also visited. Additionally, climate information was acquired from the Tanzania Meteorological Agency (TMA) located in Dar es Salaam. Primary data was gathered through focus groups discussions (FGDs), in-depth interviews, field observations, and household surveys.

The household survey method was employed through the use of a semi-structured questionnaire to collect quantitative data from the participants. A total of 120 questionnaires were administered to household farmers from the three villages to obtain quantitative data. The questionnaire included both closed- and open-ended questions. Questionnaires were used to obtain information on the perceptions of smallholder farmers on climate change, and the types of local institutions found in the study area. Furthermore, questionnaires were used to collect information on the contribution of local institutions in enhancing farmers' adaptation to climate change. Questionnaires were administered to the heads of households; and if the head of the household was absent, any household member above 18 years of age was interviewed instead.

In-depth interviews with key informants were carried out to uncover qualitative information that would not be revealed through the household survey method. Key informant interviews were conducted using an interview guide that included a list of topics to be discussed during the session. The recruitment of key informants focused on finding individuals who had significant knowledge and experience regarding the topic under investigation. In-depth interviews helped to gather information from a wide range of people, including district agricultural officers, ward agricultural officers, village agricultural officers, village executive officers,

three village elders, three local institutions officers, and village extension officers from the study villages. Information was collected by recording both on a tape recorder and a notebook.
FGDs were also used to collect qualitative data. The focus groups consisted of 9 participants per group. A checklist with guiding questions was used as a tool for the discussions. One group was formed in each village comprising of smallholder farmers, consisting of both men and women, youths and elders. Additionally, field observations were conducted to capture and validate issues raised in FGDs and in-depth interviews. These observations included identifying the types of crops grown under mixed cropping, and examining the challenges arising from the adoption of mixed cropping. Generally, in-depth interviews and FGDs were conducted to complement quantitative information from the household survey.

The researcher employed participant observation to observe smallholder farming systems, the impacts of climate change, and the adaptation strategies adopted with the support of local institutions. The observation method was used during the data collection process to determine critical aspects of farming phenomena, farming systems and the environment. During observation, different photographs were taken to understand the current situation of the household farmers. These photographs were meant to represent different phenomena that could support and explain the findings. The study area also revealed various farm input suppliers and institutions fulfilling distinct roles. For example, the researcher organized a visit to institutions such as MAPEPA (AMCOS) to observe their distinct roles.

Data Analysis and Presentation
Qualitative data from key informants, interviews, and focus group discussions were analysed through content analysis, and presented through descriptive statements and direct quotations. Quantitative data collected from the household survey was coded, processed, and analysed using the Statistical Package for Social Sciences (SPSS IBM, version 23). Climate data for rainfall and temperature were analysed using Excel to generate graphs showing patterns of temperature and rainfall as components of climate change. Moreover, a simple regression analysis was done to determine the trends of rainfall and temperature. Results for quantitative data were presented by figures and tables.

Results and Discussion
Demographic Characteristics of Respondents
The findings in Table 2 indicate that out of 120 respondents, 53.3% were male and 46.7% were female. This implies that despite different global and national efforts to empower women, still males are the main households decision-makers. Men were responsible for providing household information, although actual activities were done mostly by women. The majority of the respondents were aged between 45–54 (37%), and 35–44 (32.1%) years. Furthermore, the majority of the respondents (79.1%) were married, while 9.2% were single; 4.2% were separated, and 7.5% were widowed. In terms of education level, most of the respondents (88.3%) had primary

education. Regarding household size, the majority (53.3%) had a household size of between 4–6 members. Crop farming was the main livelihood activity in the study area as reported by 86.5% of the interviewed respondents.

Table 2: Demographic Characteristics of the Respondents

Gender	**Male**	**Female**			**Total**
	53.3.%	**46.7%**			**100**
Age	25-34	35-44	45-54	55+	100
	15.9%	32.1%	37%	15%	
Marital status	Married	Single	Separated	Windowed	100
	79.1%	9.2%	4.2%	7.5%	
Education level	None	Primary	Secondary	Diploma and above	100
	1.70%	88.3%	7.5%	2.5%	
Household size	1-3	4 – 6	7 – 9	10+	100
	22.5%	53.3%	11.7%	12.5%	
Socio-economic activities	Farming	Livestock	Employed	Agro-pastoralist	100
	86.5%	1.7.%	1.5%	10.3%	

Source: Field Data, 2022

Respondents' Perceptions on Climate Change

The findings in Table 3 indicate that smallholder farmers perceived climate change through changes in rainfall and temperature. Concerning changes in rainfall, the findings indicate that about 93.3% of the respondents reported that rainfall had decreased, 1.6% claimed rainfall had increased, 5% reported that there were no changes in rainfall, and 6.7% reported that they had not noticed any changes in rainfall. Those who had not noticed any changes were newcomers; therefore, they were unaware of the changes that had occurred in the study area. These findings align with those of a research by Sawe (2022) in Manyoni, which revealed that approximately 98% of the respondents reported a decrease in rainfall. Furthermore, the findings are in line with Deressa et al. (2015), whose study in Ethiopia found that about 88% of the respondents were aware that rainfall was decreasing.

Table 3: Farmers Perception on Trends of Rainfall

Farmer's Perception	**Frequency**	**Percentage**
Increased rainfall	02	1.6
Decreased rainfall	112	93.4
Not changing	06	5
Total	**120**	**100**

Source: Field Data, 2022.

The findings from recorded data indicate that the farmers' general concern about decreased amounts of rainfall was supported by long-term rainfall data from the Songea Meteorological Station, collected by the Tanzania Meteorological Agency (TMA); and which covered the period between 1992 and 2021 (Figure 2). The analysis was done using a simple regression model. The results indicate a significant decrease in the trend of rainfall as shown by y = -11.277x +1096.4mm.

The decrease in the trend is explained by 3.4% of the variance observed in the Manyoni district ($R^2 = 0.3855$).

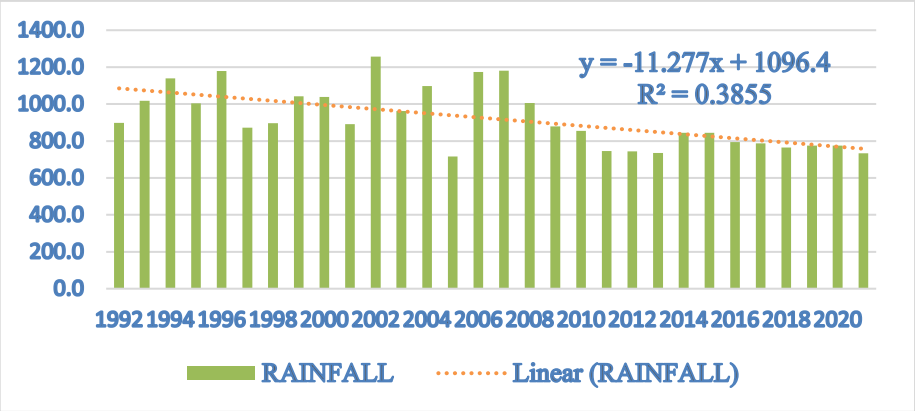

Figure 2: Average Annual Rainfall Trend in Songea District
Source: Tanzania Meteorological Agency, 2022.

Besides, farmers were requested to give their perceptions of the trends of temperature within the past thirty years. The findings in Table 4 show that about 90.8% of the respondents said that the temperature was increasing, 9.3% responded that the temperature was fluctuating, while none reported that the temperature was decreasing. This means that the majority of respondents in the studied village had a consensus opinion that the temperature was increasing. These findings correspond with Sawe (2022), Malekela and Nyomora (2020), and Mwamfupe 2019): all of them observed that temperature is increasing with the recurrent droughts and frequent food shortages.

Table 4: Farmers' Perception on Trends of Temperature

Perception	Frequency	Percentage
Increasing	107	90.8
Fluctuating	11	9.2
Decreasing	0	0.0
Total	**120**	**100**

Source: Field Data 2022.

An analysis of temperature patterns and trends was necessary to determine whether the observed trend was statistically significant. Moreover, an analysis of the meteorological data was done to check the consistency between farmers' perceptions of climate change and the recorded meteorological data observation for Songea district. The annual mean maximum temperature and annual mean minimum temperature were analysed using the Microsoft Excel software. The results shown in Figure 3 indicate that both the average annual maximum and minimum temperatures have increased. The average annual maximum

temperature has increased by $y = 0.18x+23.496$, with a coefficient of determination $R^2 = 0.7971$; while the average minimum temperature has increased by $y = 0.1699x+14.877$, with a coefficient determination of $R^2 = 0.8145$.

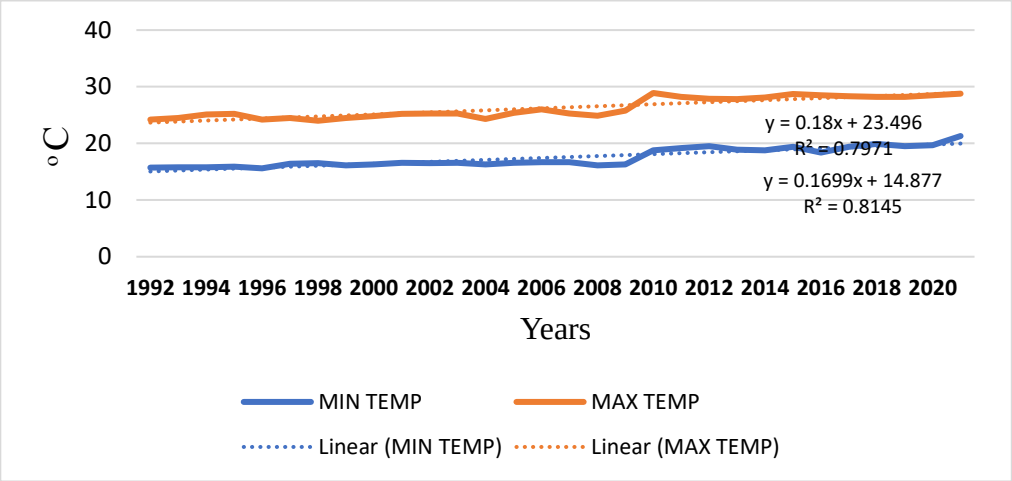

Figure 3: Average Annual Maximum and Minimum Temperature Trend in Songea District

Source: Tanzania Meteorological Agency, 2022

Effects of Climate Change on Smallholder Farmers

With regards to the impact of climate change on smallholder farmers, findings in Table 5 indicate that 37.5% of the respondents experienced drying of crops, 32.5% saw an increase of pests and diseases, 21.7% indicated a decline in water supply, and 8.3% mentioned the decline in soil fertility. These findings imply that climate change is a severe threat to smallholder farmers as it contributes to the decline in crop production, and consequently household food insecurity. The problem is aggravated by the emergence of climate-related diseases and pests attacking crops. The reported pests included insects, birds and rats which were attacking crops during and after seed germination. The most affected crops include maize and paddy. This concurs with Mwamfupe (2019), who discovered that an increase in temperature reduces soil moisture, influences the prevalence of crop pests and diseases, and affects plant development. Furthermore, this finding is also supported by Gosbert et al. (2022), who reported that there has been an increase in pests and diseases that affect crop production in warmer humid climatic regions. A similar observation is found in a study by Lutzili (2020), who affirmed that there has been an increase in pests and diseases that affect crop production in warmer humid climatic regions.

Table 5: Effects of Climate Change on Smallholder Farmers

Effects of Climate Change	Frequency	Percentage
Drying of crops	45	37.5
Increase pest and diseases	39	32.5

Decline in water supply	26	21.7
Decline in soil fertility	10	8.3
Total	**120**	**100**

Source: Field Data, 2022

Contributions of Local Institutions to Smallholder Farmers' Adaptation to Climate Change

As stated earlier, this paper aimed to examine the contribution of local institutions in facilitating smallholder farmers' adaptation to climate change. The paper made use of the agricultural marketing cooperative societies (AMCOSs), which are local institutions established in 2018 to provide assistance to smallholder farmers. By then, AMCOSs had 147 males and 83 females, making a total of 230 active members from the three wards of Maposeni, Peramiho, and Parangu. This local institutions have been playing a great role in promoting smallholder farmers' adaptation to climate change as clarified in Table 6.

Table 6: Contribution of Local Institutions to Smallholder Farmers' Adaptation To Climate Change

Contribution of AMCOS	Frequency	Percentages
Provision of weather information	25	20.8
Provision of marketing information	30	25
Provision of farming inputs and pesticides	23	19.1
Supporting drought tolerant crops	17	14.2
Promoting conservation farming	20	16.7
Promoting of improved seeds	05	4.2
Total	**120**	**100**

Source: Field Data, 2022.

The findings in Table 6 indicates that about 20.8% of the respondents stated that AMCOSs facilitated smallholder farmers to access weather information. It was revealed during FGDs that farmers received weather information daily from the representatives of AMCOSs. This information assisted farmers in making agricultural decisions such as when to start farming activities. Moreover, this information helped them determine the kind of adaptation strategies to use depending on the information provided. In support of these findings, a key informant admitted the following:

> *We normally receive different agricultural information when we meet in the village meeting. Representatives from the AMCOS attended these meetings regularly. Therefore, through these meetings, we have been able to receive timely weather information due to the strong network that local civic institutions have established with government officials. It is important to acknowledge that this information has greatly assisted us in knowing the appropriate actions to take concerning agriculture, which is the primary economic activity in our village.* (Key Informant Interview with Village Executive Officer at Peramiho 'A' Village, 2022).

This finding is in line with Sawe (2022), who reported that effective climate change adaptation for smallholder farmers is largely dependent on the nature of local institutions available in the community. Additionally, Mwamfupe (2019) provides

supporting evidence that local institutions play a crucial role in the dissemination of weather information within the local context. This is primarily due to their proximity to the specific sites, and their strong local presence. The finding is also similar to that of Mwalusaka (2021), who reported that institutions serve as a medium where smallholder farmers meet, interact, and share weather information with other farmers for effective climate change adaptation.

Moreover, the finding revealed that about 25% of the respondents stated that agricultural marketing cooperative societies have been providing marketing information for all crops produced by smallholder farmers (Table 6). This is because AMCOSs established internal and external networks with purchasers; making it is easy for them to access markets for crops such as avocadoes, rice, and maize. Moreover, AMCOSs have strengthened smallholder farmers' bargaining powers for the prices of their crops. It was revealed during FGDs that AMCOSs have been helping smallholder farmers in accessing markets by jointly marketing their products. Moreover, these institutions have facilitated integration into value chains, ensuring that farmers receive fair prices for their crops. In support of these findings, a key informant conceded the following:

> *To be honest, the establishment of AMCOS has played a significant role in climate change adaptation. AMCOS has played a crucial role in addressing a significant challenge faced by our village. Before its establishment, our agricultural productivity was hindered by insufficient rainfall, and we also struggled with the lack of markets for our produce. However, since the establishment of AMCOS, we have been able to find profitable markets for our agricultural produce. This has not only provided us with a source of income to sustain our livelihoods, but has also enabled us to invest in other activities such as small businesses. We are grateful to God for this positive change and the opportunities it has brought to our community*. (In-depth Interview with a Village Elder in Lundusi Village, 2022).

These findings correspond with the observation by Manda and Wanda (2017) in their study in Central Tanzania. From this study, it was apparent that smallholder farmers accessed information about weather and proper farming practices through the existing local institutions. Moreover, Prakash and Anand (2016) similarly advance that local institutions are the most powerful means of information dissemination because they are much trusted by the community due to being site-specific.

Another contribution of AMCOSs in enhancing smallholder farmers' adaptation to climate change was the provision of farming inputs and pesticides. This was reported by 19.2% of the respondents. Farming inputs provided were seeds, fertilizers, and pesticides. These farming inputs were also provided under subsidies; enabling smallholder farmers to access and utilize them at low costs. This minimized the vulnerability of smallholder farmers to climate change impacts. For instance, it was explained during FGDs that before the establishment of AMCOSs, the availability of seeds and fertilizers was a big challenge; and once available, they were inaccessible to many due to high costs. Therefore, this implies that AMCOSs have brought a big relief to smallholder farmers and strengthened their adaptive

capacity to climate change. This findings is in line with the one reported by Mwalusaka (2021), and Lutzili (2020).

In addition, findings have revealed that about 14.2% of the respondents reported that AMCOS has been emphasizing the use of drought-tolerant crops (Table 6). It should be noted that drought-tolerant crops are considered as adaptation strategies to climate change. These crops have a high tolerant capacity to drought conditions. Therefore, it was stated during FGDs that AMCOSs have been on the front line in promoting the use of drought-tolerant crops such as cassava and millet to smallholder farmers, especially during difficult times of rainfall shortages and/or excessive temperatures. Through the effort of these institutions, a majority of smallholder farmers have currently adopted these crops. Similar results were reported by Elia (2017): that local institutions play a vital role in the promotion of the adoption of drought-tolerant crops. Also, Manda and Wanda (2017) expressed that there is a need to motivate farmers to establish cooperative societies and farmers' associations in their communities to promote the use of drought-tolerant crops, since this has proved to be an effective strategy to respond to climate change, especially in semi-arid areas of Tanzania.

Moreover, about 16.7% of the respondents reported that AMCOSs have provided education on conservation farming as one of the climate change adaptation strategies (Table 6). According to Sawe et al. (2018), conservation is a farming system that prioritizes ecologically friendly and sustainable practices to ensure agricultural productivity and the preservation of the environment. The three major goals of conservation farming are to maintain soil cover, reduce soil disturbance, and encourage varied cropping systems. Therefore, it was revealed in the FGDs that AMCOSs promoted conservation farming practices such as crop rotation, and mixed crop farming to maintain the fertility of the soil and respond to climate change. This has helped smallholder farmers increase their production amidst climate change as confirmed by one key informant:

> *Currently, the number of smallholder farmers who are engaged in conservation farming has increased. This is because of the education provided by the AMCOS. Education has played a crucial role in increasing awareness among the majority of individuals. As a result, we are now able to cultivate on small plots of land while achieving satisfactory yields. This simultaneous achievement of sufficient yields and environmental preservation has been made possible through the knowledge and practices gained from education* (In-depth Interview with a Village Elder in Maposeni 'B', Village, 2022).

Moreover, the findings revealed that AMCOSs have been promoting the use of improved seeds as one of the climate change adaptation strategies. This was expressed by 4.2% of the respondents. It was explained that improved seeds were emphasized because they take a short period to mature, produce high yields, and hence ensure household food security in the context of climate change. During FGDs, it was expressed that some of the improved maize seeds included DK 77, STUKA, PANNAR, SEED-CO, and ILONGA; while for rice they were TXD 306

(SARO5), Supa, TXD88, and TXD85. This finding was supported by key informants during interview as indicated below:

> *I would like to express my acknowledgment to the AMCOS which has been in the front in advocating the use of improved seeds. Most of the farmers have decided to adopt improved seeds. In one way or another, we have seen its potential despite the shortage of rainfall. As an example, during the previous season, when I cultivated one acre of maize using Dk77 seeds, I was able to harvest 28 sacks of 100kg each. This is a significant contrast to the past decade when I used traditional seeds and could only harvest 4 to 5 sacks of 100kg* (In-depth Interview with Village Elder, Lingusi Village, 2022).

These findings align with previous research conducted by Smith et al. (2018), Kates (2000), and Mendelsohn et al. (2007). These studies argued that when local institutions are carefully considered and empowered, they have the potential to enhance smallholder farmers' adaptation to climate change. Hamad and Sawe (2022) also indicated that the sustainability of climate change adaptation strategies depends on the supremacy of local institutions in a community. Similarly, Elia (2017) reported that local institutions shape the impacts of climate change, and act as intermediaries for external support for climate change adaptation for smallholder farmers.

Conclusion and Recommendations

The study findings have revealed that climate change poses a significant challenge, impacting the majority of the smallholder farmers within the study area. While the adaptation, institutions, and livelihoods framework highlight the significant contributions of local formal institutions in enhancing adaptive capacity and shaping adaptive strategies, the broader contentions of political ecology are essential in understanding the origins and functions of specific institutional configurations. The establishment of local institutions such as the AMCOSs has had a significant impact on smallholder farmers' adaptation to climate change. These local institutions have played a crucial role in reducing the vulnerability of smallholder farmers to climate change impacts and enhancing their adaptive capacities. This has been achieved through the provision and dissemination of weather and agricultural information, as well as the promotion of drought-tolerant crops and improved seeds. Additionally, AMCOSs have actively promoted conservation farming practices, and facilitated the provision of farming inputs and seeds.

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